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Antecedent Aerobic Exercise Training with Schizophrenic Outpatients

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ANTECEDENT AEROBIC EXERCISE TRAINING WITH SCHIZOPHRENIC OUTPATIENTS

by

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ANTECEDENT AEROBIC EXERCISE TRAINING WITH SCHIZOPHRENIC OUTPATIENTS

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This research evaluates the effects of aerobic exercise on the symptoms of schizophrenia. The positive and negative symptoms of schizophrenia were repeatedly measured by using direct observation, surveys, and care giver checklists. Symptoms are subcategorized as positive and negative as suggested by Andreasen (1984). Aerobic exercise classes were taught 4 days a week for 6.5 weeks to chronically mentally ill clients in a community based day activity program. Participants were observed 1 hour and 3 hours following the aerobic session. The results demonstrated that chronic individuals exercised at an intensity sufficient to produce an aerobic training effect based on pulse rates during exercise. Mean resting heart rates decreased indicating improved physical conditioning. Other results indicated increases in the positive and decreases in the negative symptoms of schizophrenia. The increases in the positive symptoms decreased following 3 hours of the exercise session.

ACKNOWLEDGMENTS

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INTRODUCTION

Over the past 20 years, the availability of neuroleptic medicine and the development of community mental health programs have made it possible for formerly hospitalized psychiatric patients to live and work in the community. Unfortunately, as many as 25-30% of schizophrenic patients discharged from hospitals relapse within 1 year with additional relapse, up to 50%, within 2 years. Up to 60% of these patients end up rehospitalized (Hogarty et al., 1979; Mosher, 1971; Talbott, 1974). Neuroleptics are generally effective in the treatment of acute episodes of schizophrenia. Between 80% and 85% of patients demonstrate marked improvements within a few days of treatment (Davis & Gierl, 1984). It is the positive symptoms, such as, hallucinations, delusions, thought disorders, and bizarre behavior, which tend to be controlled by medication. Neuroleptics do not appreciably reduce negative symptoms, such as, avolition (apathy), alogia (impoverished thoughts), anhendonia (asociality), affective blunting, and attention deficits (Carpenter, Heinrichs, & Alphs, 1985). Many patients do not receive much benefit from neuroleptics at all (Gardos & Cole, 1976).

One of the most significant problems with neuroleptics is noncompliance among patients for whom they are

prescribed. As many as 70% reportedly do not take neuroleptics as they are prescribed (Kessler & Waletzky, 1981). This increases the patient's risk of relapse 3-4 times when compared with those who do take medication regularly (Johnson, 1985).

An additional problem concerning the long-term use of neuroleptics is the incidence of serious side effects. Up to 50% of patients develop significant neurological side effects including akinesia, akathisia, dystonia, and tardive dyskinesia (Kane, 1985). The incidence of these side effects increases as dosage and duration of use increase.

These concerns with neuroleptic side effects are encouraging the psychiatric community to prescribe lower doses of medication. This trend may prove beneficial in reducing side effects and, therefore, may increase compliance in some patients but may also increase patient susceptibility to relapse (Bellack, 1986).

Neuroleptics alone do not prevent relapse nor do they teach patients skills for community living (Leff, Hirsh, Gaind, Rohde, & Stevens, 1973; Marder, VanKammen, & Docherty, 1979). Other than reducing positive symptoms, they also do not enhance quality of life for the schizophrenic patient (Diamond, 1985). Given the above listed limitations of neuroleptic treatment of schizophrenia, there is a clear need for alternative and adjunct therapies for the chronically mentally ill patient.

One such alternative may be aerobic exercise. In recent years exercise has become increasingly popular in the general population because of its value in improving health and fitness. In addition to health benefits in the general population, exercise has been shown to be effective in reducing symptoms associated with several mental health problems (Taylor, Sallis, & Neddle, 1985). These include reduction in depression (Goldwater & Collins, 1985; Greist et al., 1979) and anxiety (Folkins & Sime, 1981; Morgan, 1979) and extended abstinence rates among alcoholics (Sinyor, Brown, Rostant, & Seraganian, 1982). Other studies have shown improvements in performance of autistic children (Kern, Koegel, Dyer, Blew, & Fenton, 1982) and inappropriate behaviors of mentally impaired adolescents with mild mental retardation (Bachman & Fuqua, 1983). Decreases in disruptive and noncompliant behavior in severely mentally retarded adults have also been documented (Bachman & Sluyter, 1988).

Little research has been done, however, using exercise with the chronically mentally ill population. Two investigations were conducted using patients who were chronically depressed. Blue (1979) used jogging with two patients suffering from chronic depression. Following nine weeks of jogging both showed a considerable decrease in depression. Similarly, Harty and Wallace (1982) used

aerobic conditioning with seven clinically depressed patients of which only two demonstrated improvement. The subjective nature of Blue's data plus lack of control groups in both of these studies render these data inconclusive.

Two studies of the effects of exercise on chronically mentally ill patients have used control groups. Lion (1978) had three chronic psychiatric patients use jogging to reduce anxiety. The nonjogging control group showed no reductions in anxiety. Using a treadmill, Doyne, Chambless, and Beutler (1983) conducted a study measuring the effects of exercise on four chronically depressed outpatients. Clear reductions in depression were seen in the exercise group when compared with the control group. These two studies document the success of exercise in decreasing anxiety and depression in chronic mental patients.

Research on the effects of exercise with schizophrenics is very scarce. Kastrubula (1976) reported that jogging resulted in decreased psychotic symptoms and reduced need for medication among a large number of schizophrenic patients. Unfortunately, these results are based on subjective impressions and should be viewed with caution. Smith and Figetakis (1970) found that jogging but not isometric exercise reduced "psychotic behavior" in Veterans Administration patients. Although this study

used a control group, assignment into experimental and control groups did not meet the requirements of randomization.

One recent study has been done using aerobic exercise with people with chronic schizophrenia. Jorgensen (1986/1987) used the Cooper walk-run test to document the aerobic training effects of exercise on schizophrenic outpatients involved in a day treatment program. To assess schizophrenic symptoms, Jorgensen used the Symptom Check List 90 Revised (SCL-90-R, Derogates, 1983). Aerobic exercise clearly decreased levels of hostility and somatization but failed to effect change in levels of psychotism, depression, anxiety, and paranoid ideation. Jorgensen's study improves upon other studies in that she used aerobic exercise as defined by attaining pulse rates within training heart rate range. An additional improvement was the use of a control group who participated in various nonaerobic activities. Two weaknesses, however, were the absence of a clear definition of the psychotic symptoms, and no repeated measures based on direct observation of the subjects. More research with improvements in experimental design is needed before conclusions can be made regarding the effects of exercise on symptoms of schizophrenia.

One methodological improvement was suggested by Folkins and Sime (1981), who noted that variations in

duration and intensity of exercise programs make interpretation of results across studies difficult. They suggested that documentation of cardiovascular functioning during exercise is one approach to greater standardization of training effects. Several of the previously mentioned studies using exercise as the independent variable have used aerobic exercise and have used pulse rate to verify that the exercise was indeed aerobic (Bachman & Fuqua, 1983; Bachman & Sluyter, 1988; Jorgensen, 1986/1987).

An additional weakness in this area of research is the tendency to view the symptoms of schizophrenia as a single category rather than observing individual symptoms. Of course, this is not a problem of exercise research alone. The psychiatric community has historically overused the diagnosis of schizophrenia relegating it to little more than a "wastebasket" category. The diagnosis varied across geographical regions as well as across individual clinicians (Grove, Andreasen, McDonald-Scott, Keller, & Shapiro, 1981). Most clinicians and investigators seem to agree that the definition of the disorder should be narrowed (Andreasen & Olsen, 1982).

In recent years, the definition of schizophrenia has been refined as can be seen by comparing the Diagnostic and Statistical Manual of Mental Disorders (2nd ed.) (DSM-II, American Psychiatric Association, 1968) and the

Diagnostic and Statistical Manual of Mental Disorders (3rd ed.) (DSM-III-R, American Psychiatric Association, 1980). DSM-III-R provides a much more objective definition of symptoms, as well as operational criteria for specific symptoms rather than relying on intuition as was previously common (Bellack, 1986). Even within the narrower definition there remains considerable variability and chronic schizophrenia is still considered to be a heterogeneous group of disorders (Andreasen & Olsen, 1982). The heterogeneity of this disorder has for years led clinicians to think in terms of categorizing symptoms into subtypes (Bleuler, cited in Andreasen, 1982; Kleist, 1970; Kraeplin, cited in Andreasen, 1982).

As the definition of chronic schizophrenia has narrowed, new approaches to the assessment and categorization of symptoms have emerged. One such approach divides the symptoms of the disorder into predominantly positive and negative symptoms (Andreasen, 1979; Andreasen & Olsen, 1982; Angrist, Rotrosen, & Gershon, 1980; Strauss, Carpenter, & Bartko, 1974). The distinction has led to the hypothesis that patients with prominent positive symptoms are likely to differ in a variety of important ways from patients who have prominent negative symptoms (Andreasen & Olsen, 1982). Andreasen and Olsen have developed criteria for dividing the symptoms of schizophrenia into three subcategories: (1) positive,

(2) negative, and (3) mixed.

The primary concern of the present investigation is: Does exercise improve symptoms of schizophrenia? A second concern is: Does exercise affect positive and negative symptoms differently? This study will use Andreasen and Olsen's (1982) subcategories of schizophrenia to separate the symptoms of schizophrenia into three distinct symptom subgroups. This is an effort to expand the Jorgensen (1986/1987) study by distinguishing the positive from the negative symptoms of schizophrenia in order to determine the effects, if any, of aerobic exercise on these symptom subcategories.

A third concern of this study is to determine whether or not this population is able to engage in exercise of sufficient intensity and duration to access some of the health related benefits of aerobic exercise experienced by the general population. Aerobic exercise has been demonstrated to help delay, if not prevent, the onset or reduce the severity of several of the major chronic degenerative diseases. Areas in which particular benefit is achieved appear to be weight control, prevention of coronary heart disease, normalization of lipid and carbohydrate metabolism, and delay of bone strength and skeletal muscle function degeneration associated with aging (Haskell, 1984).

This study did not attempt to evaluate specific health related benefits of exercise (e.g., lower coronary heart disease mortality) for chronic schizophrenics. These benefits would be observed only for a large group of exercises and over a long period of time. It only attempted to determine whether or not people with chronic schizophrenia, who were being prescribed neuroleptics, can attain and sustain targeted training pulse rate levels. Heart rates were monitored, not only to measure aerobic effect, but also to determine any changes in resting pulse rate as a function of aerobic exercise. A reduction in resting heart rate correlates with improved cardiovascular functioning (Haskell, 1984). By demonstrating the ability to achieve both an aerobic effect and a decreased pulse rate, it suggests that patients with chronic schizophrenia can access the benefits of aerobic exercise experienced by other groups.

In conclusion, this study used as subjects people with a diagnosis of chronic schizophrenia who were being prescribed neuroleptics. Subjects participated in an aerobic exercise class during which their pulse rates were used to measure aerobic training. The symptoms of schizophrenia experienced by the participants were categorized as positive, negative, or mixed symptoms as defined by Andreasen and Olsen (1982) in order to observe separately any effects on these symptoms.

In addition, resting pulse rates were monitored in order to draw some tentative conclusions regarding the use of aerobic exercise to help chronic schizophrenics access the health related benefits of such a program.

METHOD

Subjects

Six women between the ages of 43 and 68 were selected as subjects for this study. All of the subjects were attending a community-based day activity program. Each subject had a history of chronic schizophrenia, which was first diagnosed in their late teens or early 20s. All had been hospitalized in mental institutions for prolonged periods of time. Subjects 1, 4, 5, and 6 had a diagnosis of schizophrenia, chronic undifferentiated type. Subject 2 had a diagnosis of schizophrenia, paranoid type; and Subject 3 was diagnosed with schizo affective disorder. Subject 6 had a second diagnosis of moderate mental retardation. Symptoms of schizophrenia were categorized using Andreasen's (1984a, 1984b) subgroups of negative and positive symptoms.

Dependent Variables

Selected dependent variables were unique to each subject and were determined by consultation with staff, review of client records, and by direct observation of each subject during regularly scheduled activities.

Table 1 describes the prominent symptoms of each subject and how they are categorized. It also shows other relevant information, such as, diagnosis, age, and the behavioral manifestation of the symptom.

Subject 1 spent much of her time conversing with herself, wandering away from her assigned task, and pacing. This subject was 48 years old and had both positive and negative symptoms of schizophrenia. Dependent variables for this subject were: (a) self talk, (b) wandering from her assigned area, and (c) on task behavior.

Subject 2 was selected because of her almost total attention to assigned tasks to the point that her spontaneous interactions with others were very minimal. Her affect was characterized as "blunted" and she displayed very little facial expression. All of her symptoms of schizophrenia were categorized as negative. The dependent variables observed were: (a) facial expression, (b) spontaneous interaction with others, and (c) on task behavior.

Subject 3 was 68 years old and her symptoms of schizophrenia were predominately positive. Her speech was infrequent but dominated by bizarre content inappropriate to the situation. Much of her speech consisted of unsolicited statements regarding loss of limbs or fear for her own safety. Dependent variables measured for this subject were: (a) bizarre talk, (b) whining or

Table 1

Diagnosis, Age, and Prominent Symptoms of Schizophrenia Observed in Subjects

Subject	Diagnosis	Age	Symptoms	Symptom category
#1	Schizophrenia, chronic undifferentiated type	48	Appears to be conversing with self: lips move, head nods in recognition	Positive symptom (bizarre behavior)
			Frequently wanders from assigned area	Negative symptom (avolition)
			Impersistent in assigned task	Negative symptom (avolition)
#2	Schizophrenia, paranoid type	65	Blunted affect--displays no facial expression	Negative symptom (affective flattening)
			Infrequent interaction with others	Negative symptom (anhendonia)
#3	Schizo-affective disorder	68	Speech conveys abnormal content of thought	Positive symptom (delusions)
			Whines, cries, and grabs others	Positive symptom (bizarre behavior)

Table 1--Continued

Subject	Diagnosis	Age	Symptoms	Symptom category
#4	Schizophrenia, chronic undifferentiated type	42	Speech conveys an abnormal content of thought	Positive symptom (delusions)
			Leg swinging, hair twisting	Not categorized as symptoms of schizophrenia
#5	Schizophrenia, chronic undifferentiated type	45	Impersistence in assigned task	Negative symptom (avolition)
			Infrequent interaction with others	Negative symptom (asociality)
			Frequently wanders from assigned area	Negative symptom (avolition)
#6	Schizophrenia, chronic undifferentiated type and moderate mental retardation	43	Noncompliance with staff requests	These behaviors are not categorized as symptoms of schizophrenia
			Frequent verbal complaints	
			Interrupts others	

crying, and (c) grabbing others.

Subject 4 was 42 years old and she displayed the positive symptoms of delusions characterized by bizarre speech. Dependent variables for her were: (a) bizarre talk, (b) leg swinging, and (c) hair twisting.

Subject 5 typically arrived at the center in the morning, went to her assigned area, completed some of her work quickly, and then read a book selected from a bag of books which she carried with her continuously. After reading for a while, she frequently left the room and sometimes the building. Her symptoms of schizophrenia were typically negative. She was 45 years old. Observed dependent variables were: (a) absence from assigned area, (b) doing other than an assigned task, (c) spontaneous interaction with others, and (d) on task behavior.

Subject 6 was 43 years old and was dually diagnosed. The behavior of this subject was measured differently than the other subjects. She was given a series of three requests by staff during each observation session. The dependent variables were: (a) response to requests which were scored as noncompliance, partial compliance, or disruptive or aggressive; (b) interrupting the speaker was scored on a scale of 1 (not at all) to 4 (continuously); and (c) complaints regarding the requests made by staff were also scored on a scale from 1 to 4. (Appendix A contains samples of each subject's data sheet.)

Medication

All 6 subjects were medication compliant and 5 had been taking the same medication for at least 6 months prior to their participation in this study. Although Subject 4 was prescribed the same medication during the course of the study, changes in the dosage of that medication occurred several times. Medication for the purpose of controlling psychotic symptoms of schizophrenia were prescribed as outlined in Table 2.

Three additional subjects, two men and one woman were dropped from the study prior to its completion. All three of these subjects attended the program site too irregularly to allow for the collection of adequate data. Although only six subjects were selected as research subjects, additional clients at the community based program voluntarily attended the exercise classes.

Setting

Edison Neighborhood Center is a multiservice agency in Kalamazoo, Michigan, providing its community with services in several areas: (a) neighborhood development and revitalization, (b) basic human needs, (c) transportation, and (d) mental health. The mental health day treatment program serves approximately 70 Kalamazoo County residents who are either chronically mentally ill or

Table 2

Prescribed Medication for Each Subject

Subject	Medication	Purpose
#1	Navane 5 mg BID	Control of symptoms
	Artane 2 mg BID	Control of side effects
#2	Mellaril 10 mg TID	Control of symptoms
#3	Haldol 4 mg BID	Control of symptoms
	Lithium Carbonate 450 mg at H.S.	Control of symptoms
	Ativan 1 mg TID	Control of anxiety
	Cogentin 5 mg TID	Control of side effects
#4	Mellaril (dosage varied from 150 mg at H.S. plus 50 mg in A.M. to 100 mg in A.M. plus 200 mg at H.S.	Control of symptoms
#5	Navane 2 mg BID	Control of symptoms
	Elavil 25 mg at H.S.	Control of symptoms
#6	Mellaril 100 mg in A.M.	Control of symptoms
	Mellaril 150 mg at H.S.	Control of symptoms
	Lithium Carbonate 300 mg TID	Control of symptoms

developmentally disabled.

The Edison Neighborhood Center is located in a residential neighborhood in the lower level of a church. It contains four large classrooms, a small kitchen, and bathrooms. Staff offices are also located on this level but are separated by a corridor from the class rooms. The gym is approximately one half the size of a regulation basketball court and is located on the main floor of the church and is up one flight of stairs from the rest of the center. The gym is shared by both the church and the center on a scheduled basis.

Recruitment

Subject selection was by referral from the day activity program staff, review of case records, and direct observation of each subject's behavior as they participated in their regularly scheduled activities. Following initial selection, the researcher and a staff member met with participants to discuss participation requirements, purpose of the study, and potential benefits and risks of participation. A signed informed consent was obtained from each subject or from her guardian prior to inclusion in the study (Appendix B).

Inclusion and Exclusion Criteria

In order to be included in this study several criteria were met. First, all participants demonstrated sufficient maladaptive behavior to interfere with participation in the activities at the day treatment program. The maladaptive behaviors were assessed by staff and referred to the experimenter for confirmation via direct observation. Secondly, all subjects received a health clearance from their private physician to participate and were certified as free of physical limitations that would prevent participation in an aerobic exercise program. Written consent from each subject's private physician was received prior to inclusion in the study (Appendix C).

Finally, clients who had participated in an aerobic exercise or fitness program within the past 6 months were excluded as subjects although they were allowed to attend exercise classes.

Observational Procedure

Two observations were completed of each subject on each of the 4 days of the aerobic exercise class. The first observation was done in the morning 1 hour after the aerobic exercise class and the second was in the afternoon approximately 3 hours following exercise. All behavioral dependent variables were scored using a

10-second partial interval scoring system unless otherwise indicated. The observer scored each interval as an occurrence if the behavior occurred at any time during the interval. If the coded behavior did not occur during the interval, it was scored as a nonoccurrence. A staff member prompted the speech of Subjects 3 and 4 during each observation session in order to consistently measure their speech patterns. Additionally, staff made three requests of Subject 6 during each observation session, which provided consistent measurement of compliance with requests.

Observer Training

Two students from Western Michigan University, Kalamazoo, were hired and trained to be observers. The experimenter first outlined the study and the observation procedure and then discussed the response class definitions with each observer. Next, wearing a Walkman tape recorder to cue each 10-second interval, the observer observed and recorded the behavior of each subject as they participated in activities at the day program. Each observer carried a clip board with observational data sheets attached on which to record responses. The experimenter participated simultaneously in practice sessions also recording data. During practice sessions, disagreements were discussed and definitions clarified. This

practice-discussion-clarification continued until inter-observer agreement was consistently above 95%.

Interobserver Agreement

Interobserver agreement was recorded several times during the baseline and the experimental phases of the study. Each interval was scored as an agreement or a disagreement between the two observers. The mean inter-observer agreement percentage (number of agreement/dis-agreement x 100) was 93% (range of 83-100) across all behavior for all subjects.

Surveys and Self-Reports

Scale for the Assessment of Negative Symptoms

The Scale for the Assessment of Negative Symptoms (Andreasen, 1984a) is a rating scale of the various negative symptoms of schizophrenia designed to be completed by staff familiar with the subject. The scale rates negative symptoms of schizophrenia into five subcategories on a scale of 0 (none) to 5 (severe). The staff psychologist at the day program completed this instrument both during baseline and again during the last week of intervention.

Selected Behaviors Check List

The Selected Behaviors Check List (Appendix D) was designed by the experimenter to determine perceived changes in behavior undetected by other measures. It was completed weekly by the staff psychologist at the Edison Center during each phase of the study. The checklist contained questions relevant to all target behaviors of all subjects. Once completed, the experimenter scored only the target behaviors identified for each subject. An assessment could also be made to see if a particular subject was displaying behaviors other than those targeted for her. A blank on the checklist also allowed room for additional behaviors observed but which were not listed. Possible scores ranged from 0 (not at all) to 4 (almost always). A corresponding letter score of a (more than usual), b (same as usual), or c (less than usual) was also assigned to indicate the direction of any change which may have occurred in the behavior during that week.

Staff and Participant Final Assessment

The Staff and Participant Final Assessment (Appendix E) was administered during the final week of the intervention phase to all subjects and to all staff at the center. Each subject and each of the six full-time staff were asked for their subjective responses to a list

of 15 general statements relating to each subject's appearance and behavior since her participation in the exercise classes. The only difference between the staff and the subject checklist was the tense in which the statements were asked. The purpose of this measure was to reveal any changes in the subjects' behavior perceived by themselves or by the staff. Statements were scored on a scale of 1 (very noticeably worse) to 5 (very noticeable improvement). A score of 3 indicated no change.

Experimental Design

An A-B-A design was used consisting of a baseline phase and an experimental phase followed by a return to baseline phase. The use of a control group was considered; however, it was not possible due to constraints within the day program.

Baseline

Baseline lasted 2.5 weeks with subjects participating in their regularly scheduled daily activities. Several procedures took place during this time. First, resting pulse rates were taken and recorded. Second, individualized exercise goals were set by establishing each subject's training pulse rate. Training heart rate was calculated by first subtracting the subject's age from 220. This number represents their maximum heart

rate. The training heart rate equals 60-80% of this figure (American College of Sports Medicine, 1978).

Third, a baseline of each subject's dependent variables was recorded twice daily while the clients participated in their regularly scheduled activities at the center. Each client's schedule remained the same throughout the study with the exception of Subject 3, whose hours were increased so that she could participate fully in the aerobic classes as well as be present during both of the observation sessions. There was one staff change during the course of the 2 months of the study. This staff change affected only Subject 6 who was assigned to the new staff member's room. No problems with transitional adjustment were noted by either staff or observers.

Finally, the staff psychologist completed the weekly Selected Behaviors Check List beginning during baseline and continuing through the exercise and return to baseline phases of the study.

Aerobic Exercise Intervention

The aerobic exercise intervention phase lasted 6.5 weeks. A certified aerobic instructor was hired to teach four classes weekly. Each class took place in the gym and lasted approximately 1 hour. Each class consisted of recording each participant's resting pulse rate. Reminders, explanation, and feedback about target heart rates

and levels of desired exertion for each subject were also discussed. An assistant was present to help the instructor in these tasks. A pleasant, supportive, and enthusiastic atmosphere was maintained during the aerobic exercise class. Slow, restful music was played during warm-up and cool-down and popular rock and roll style music with a fast beat was played during the aerobic portion of class. Each class began with a 5- to 10-minute warm-up consisting of stretching and bending movements. This was followed by the aerobic portion of class which consisted of rapid walking accompanied by a variety of arm movements. Pulse rates were taken after 20 minutes of continuous aerobic activity. This was done by the instructor, the assistant, and a staff member from the center. Subjects were instructed to keep moving until someone had taken their pulse rate. The session then ended with a 5- to 10-minute cool-down similar to the warm-up.

Following the aerobic exercise class, observers recorded data while the subjects participated in their regularly scheduled activities at the center. Each week the staff psychologist completed the Selected Behavior Check List for each subject.

Return to Baseline

During the return to baseline phase, the trained observers recorded data on the dependent behaviors for 1

week. This was done while the subjects participated in their regularly scheduled activities at the center. It should be noted that this phase of the study began 2.5 weeks following the end of the aerobic class. This may have provided time for the conditioning effects of the exercise to reverse.

Human Subjects Protection

The confidentiality of each subject was protected by assigning a subject number to each participant. The real names of the subjects were not used when discussing this research.

The proposal for this research was reviewed and approved prior to start up by both the Human Subjects Institutional Review Board for Western Michigan University (see Appendix F) and the Human Services Department Research Review Committee for the Kalamazoo County Human Services Department.

RESULTS

Pulse Rates

Periodic checks of pulse rate during exercise sessions revealed that all subjects exerted sufficient effort to maintain heart rates within their individually determined training range (60-80% of their maximum heart rate) for 20 minutes. Resting pulse rates decreased an average of 14 beats per minute (ranging from 8 to 19 beats per minute) by the end of the last week of the intervention. Figure 1 shows mean heart rate changes for each subject.

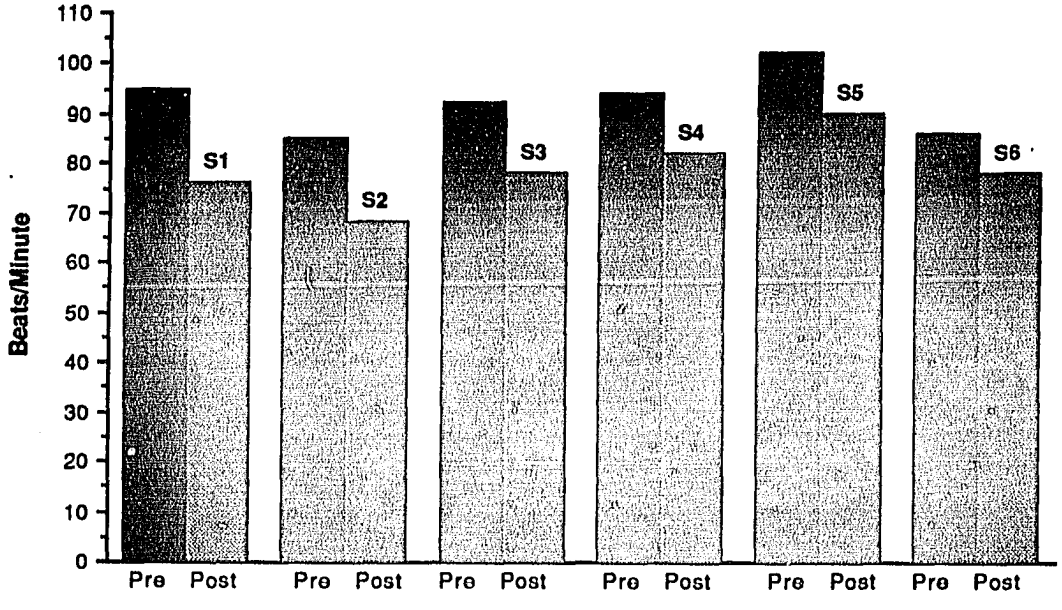


Figure 1. Mean Resting Heart Rates.

Participation was not a problem for the subjects of this study. For the most part, subjects arrived on time for class and participated enthusiastically during all sessions.

Behavioral Measures

Session by session data for each subject are depicted in Figure 2. Each data point represents an average across the two or three behaviors monitored each day for that subject. These figures reveal a variable pattern of behavior averaged across positive and negative symptoms of schizophrenia with no discernible trends.

Subject 1 displayed mixed symptoms of schizophrenia. Subjects 3 and 4 had positive symptoms only, while Subjects 2 and 5 displayed only negative symptoms. Subject 4 experienced an exacerbation of her symptoms during this study. Her attendance at the day program site and at the exercise class was sporadic. She also experienced changes in medication during this time.

For Subject 6, the symptoms of schizophrenia were not the behaviors of interest being measured. The behaviors which were measured were compliance with requests, complaints, and interrupting others. As can be seen in Figure 3, all behaviors for this subject showed small improvements over the course of the study.

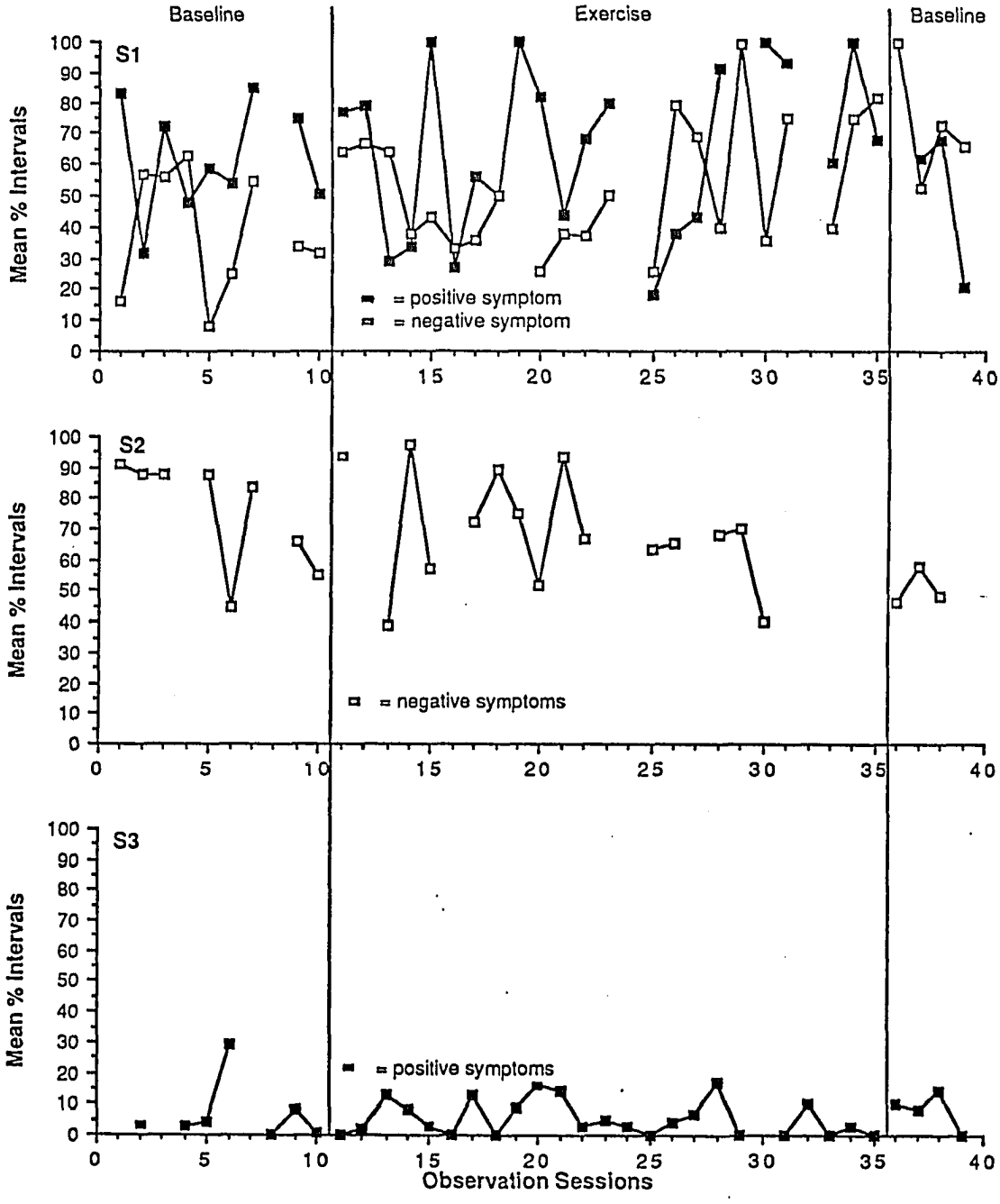
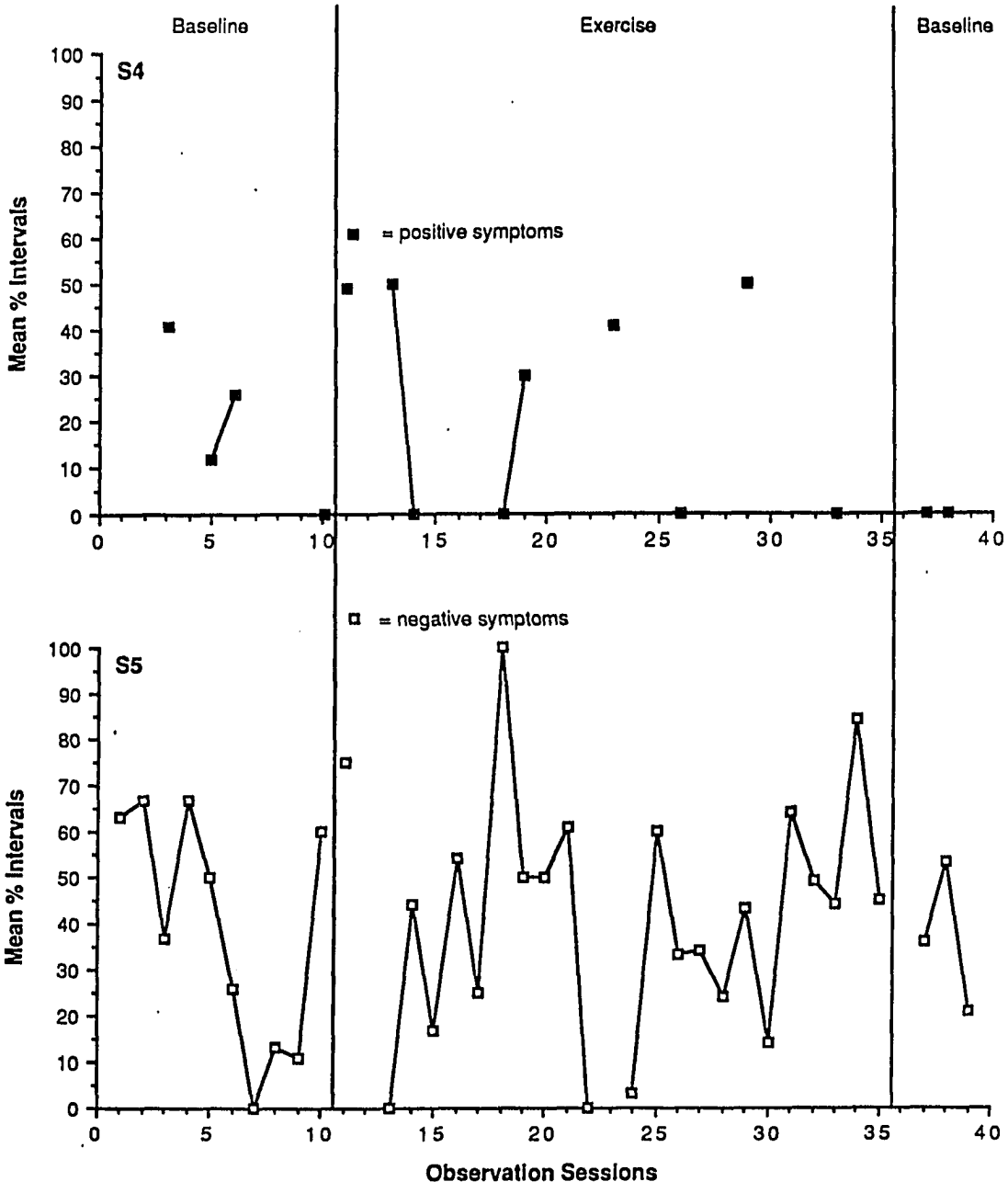


Figure 2. Symptoms of Schizophrenia Averaged Across Positive and Negative Symptoms Categories.

Figure 2--Continued



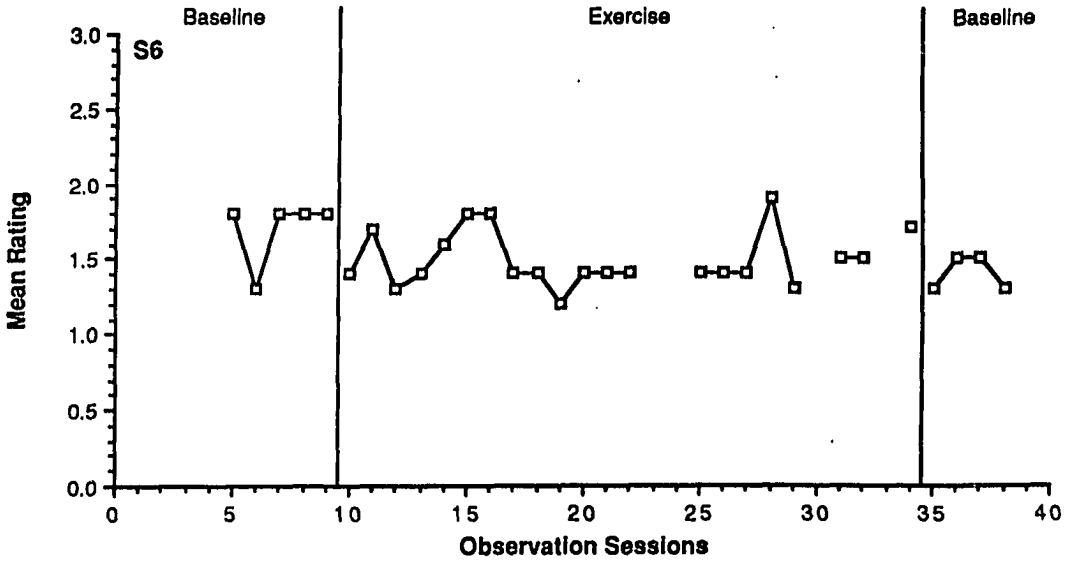


Figure 3. Compliance, Complaints, and Interruptions Averaged Across Observation Sessions.

The mean level of positive and negative symptoms for baseline and exercise conditions can be seen in Figures 4 and 5 for each of the subjects. Note that Subject 1 had mixed symptoms and she experienced a mean 11% increase in the combined positive and negative symptoms. This subject showed a mean overall 4% increase in positive and a mean overall 12% increase in negative symptoms. Subjects 3 and 4 both experienced a mean 3% increase in positive symptoms. Subject 2 had a mean 6% decrease in her negative symptoms. Subject 5 had an overall mean 4% decrease in her observed negative symptoms.

Figure 6 shows the mean level of positive symptoms at 1 hour and 3 hours after aerobic exercise. Interestingly, 2 of the 3 subjects who had positive symptoms of

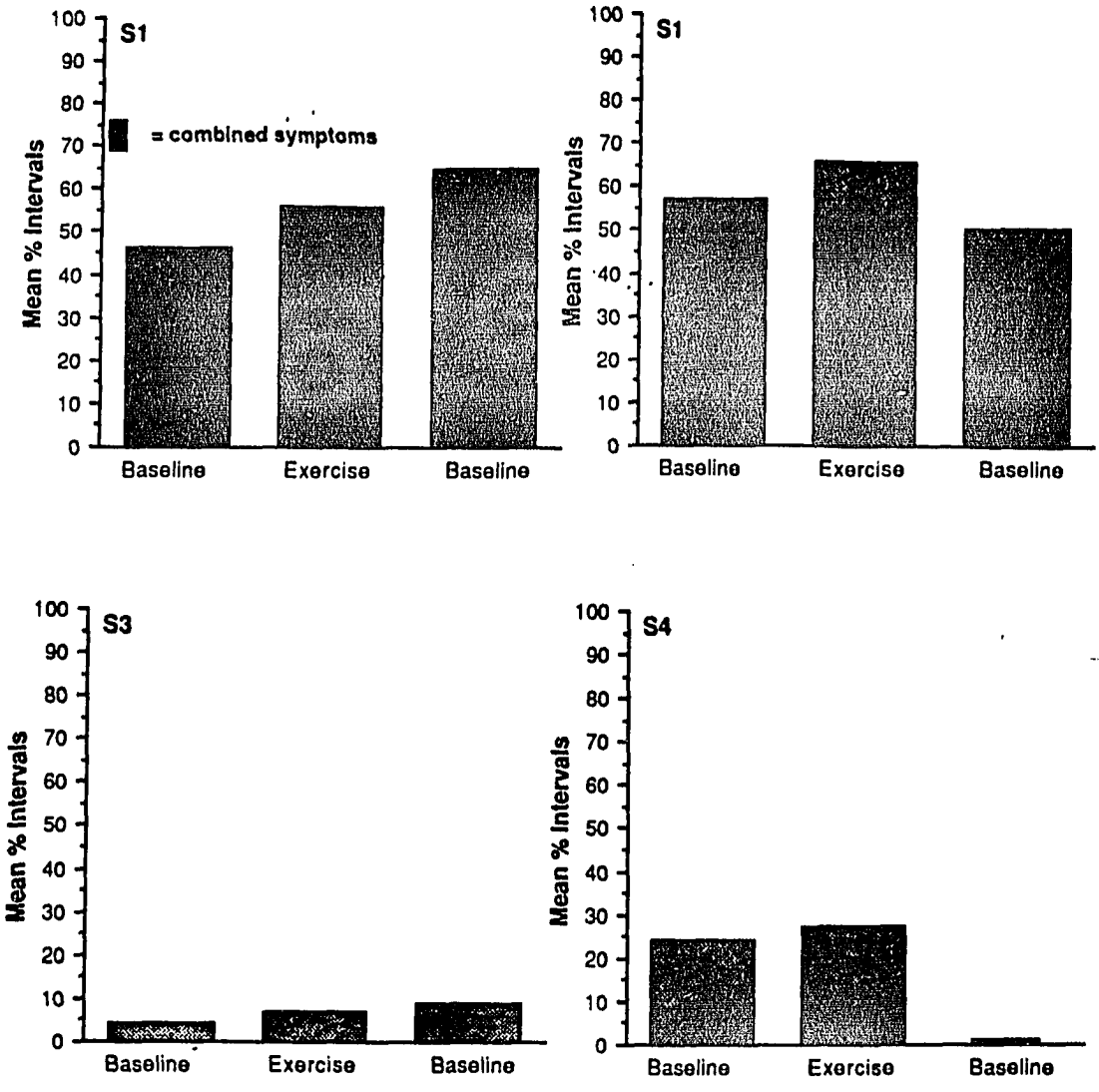


Figure 4. Mean Level of Positive Symptoms.

schizophrenia experienced a mean increase in the first hour following the exercise session. In fact, Subject 1 had a mean 14% increase and Subject 4 a mean 7% increase. The third subject demonstrated very little change in positive symptoms. By 3 hours following the exercise session, both Subjects 1 and 4's positive symptoms had

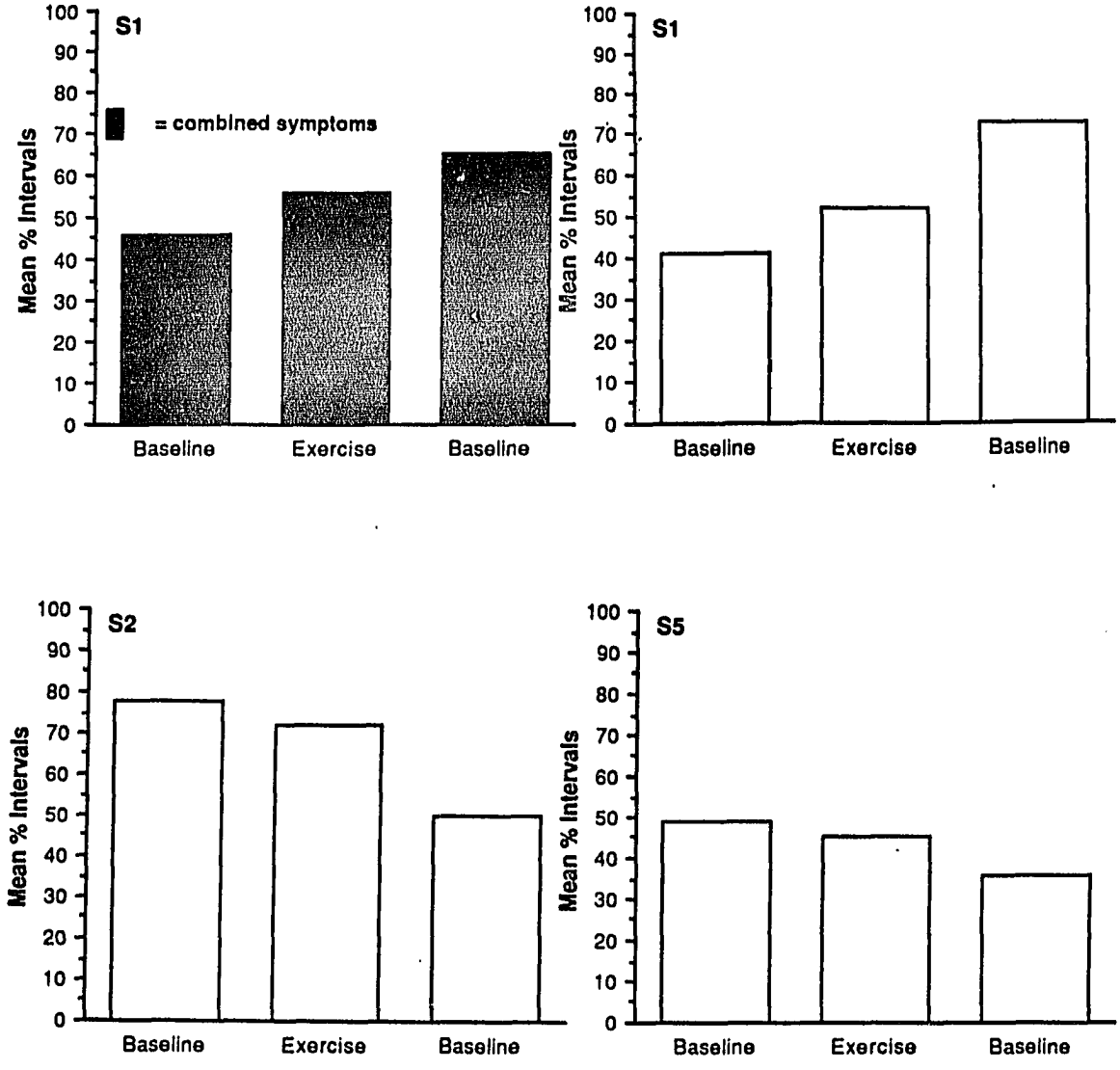


Figure 5. Mean Level of Negative Symptoms.

reduced. The decrease for Subject 1 after 3 hours was a mean 8%, and Subject 4 had a mean 15% decrease.

Figure 7 displays the mean level of negative symptoms at 1 and 3 hours after aerobic exercise. During baseline one observation session was done in the A.M. and one in the P.M., 3 hours apart. With the exception of

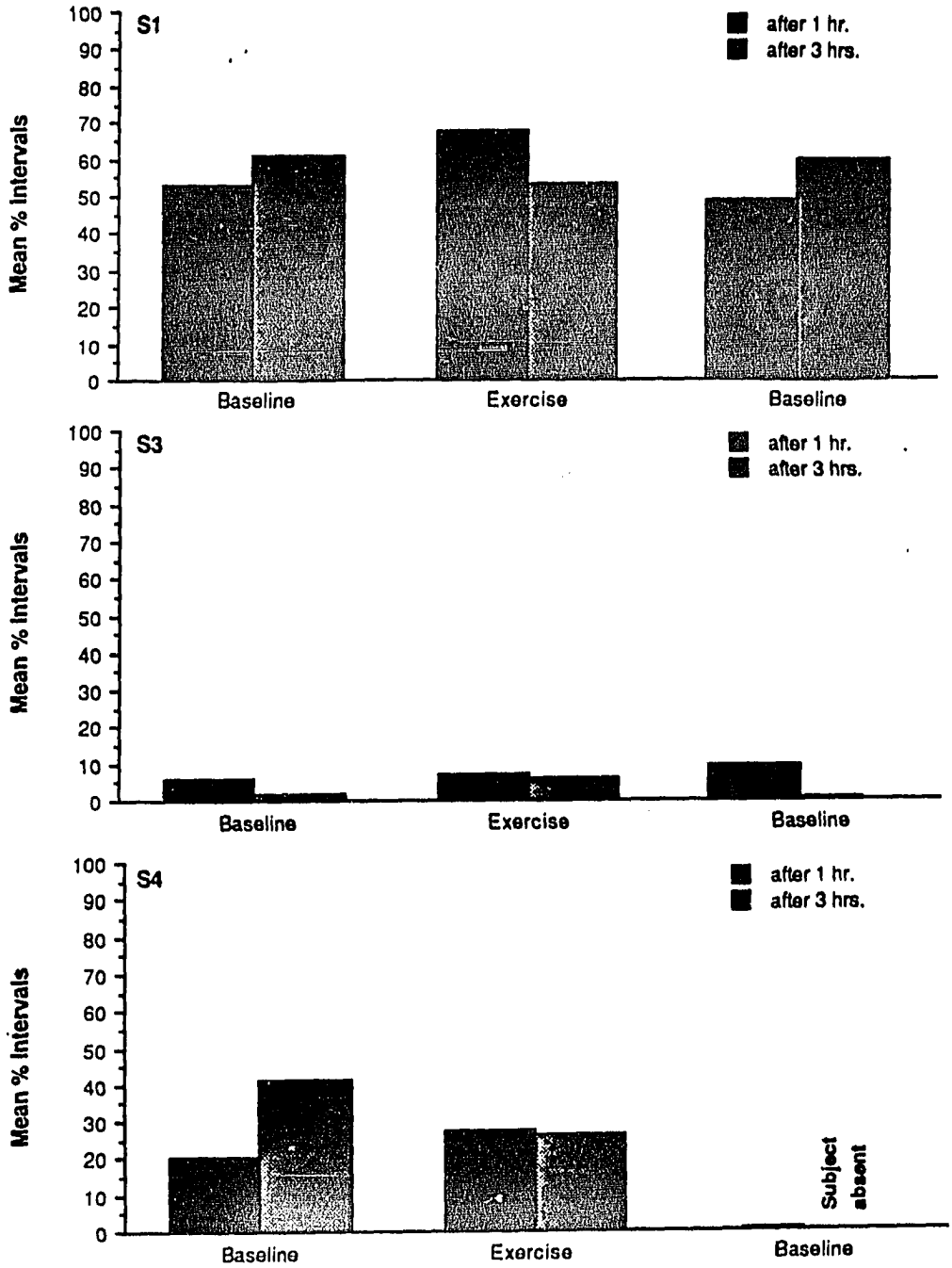


Figure 6. Mean Level of Positive Symptoms at 1 and 3 Hours Post Exercise.

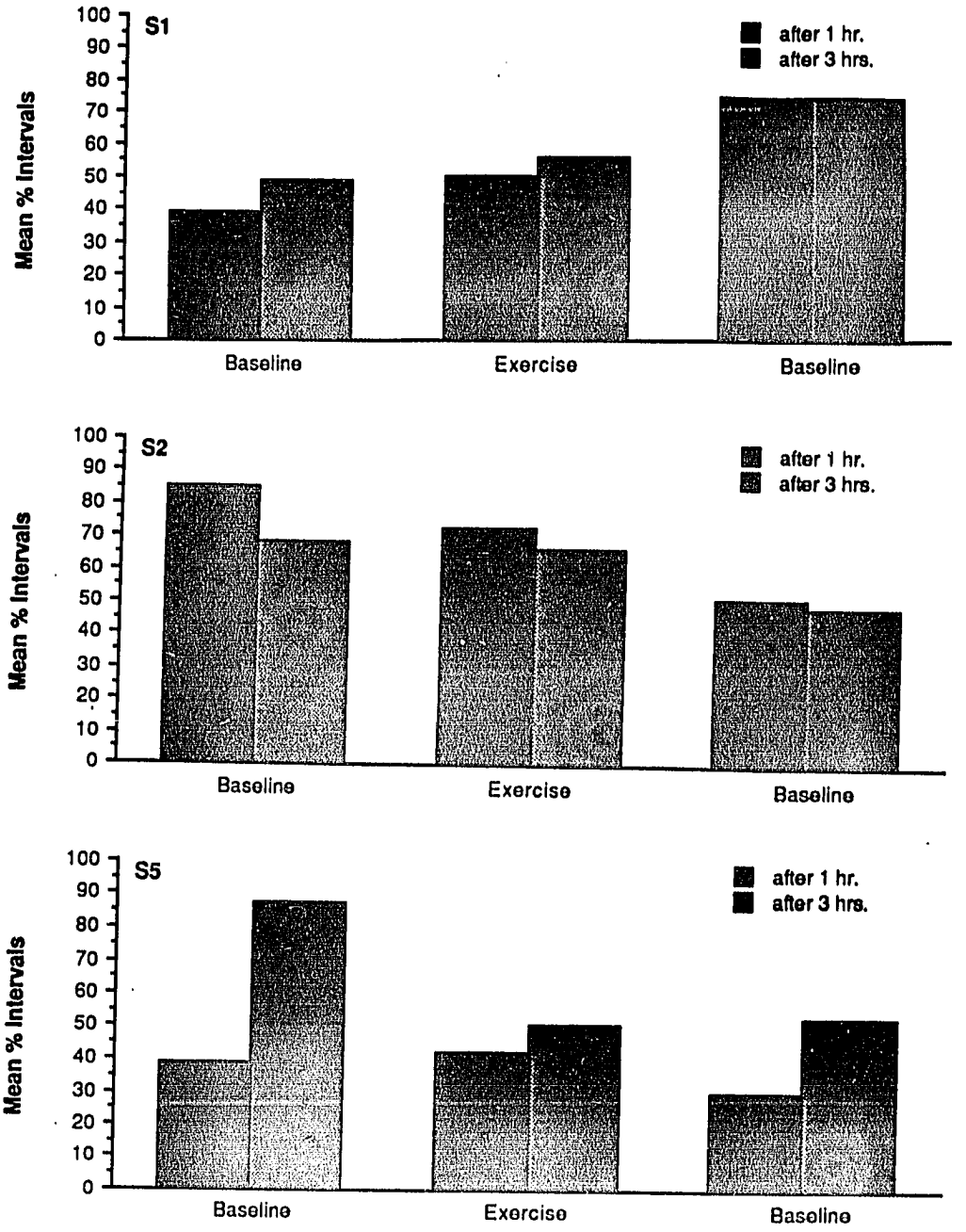


Figure 7. Mean Level of Negative Symptoms at 1 and 3 Hours Post Exercise.

Subject 1, who had mixed symptoms, the two remaining subjects who had negative symptoms only experienced a slight decrease in those negative symptoms. Subject 2 had a mean 12% decrease after 1 hour with an additional 2% decrease 3 hours later. Subject 5, in contrast, experienced a 6% increase 1 hour following exercise but a 37% decrease 3 hours later.

Surveys and Self-Reports

Scale of the Assessment of Negative Symptoms

The negative symptoms of schizophrenia measured by this instrument (Andreasen, 1984a) and scored subjectively by the staff psychologist for each participant showed that negative symptoms decreased during the intervention for those subjects who displayed only negative symptoms. Three subjects, however, displayed positive symptoms of schizophrenia; and for them, this instrument indicated an increase of negative symptoms. Table 3 lists changes in negative symptoms as assessed by the Scale for the Assessment of Negative Symptoms.

Interestingly, increases in the positive symptoms of these three subjects are also indicated on other measures.

Table 3

The Scale for the Assessment of Negative Symptoms

Subject	Global rating changes									
	Blunting		Alogia		Avolition		Anhendonia		Attention	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
#1	4	4	1	3	4	4	4	4	5	4
#2	4	4	3	3	4	3	4	3	3	3
#3	3	3	2	4	3	3	3	4	3	4
#4	3	3	3	3	3	3	3	3	4	4
#5	4	3	4	3	4	3	4	4	3	3
#6	3	2	3	3	2	2	3	2	3	3

Note. The number represents the severity of the negative symptom: 0 = none, 1 = questionable, 2 = mild, 3 = moderate, 4 = marked, 5 = severe.

Selected Behaviors Check List

The Selected Behaviors Check List was designed to detect changes in behavior undetected by other measures. The number represents the frequency with which the selected behavior occurred. The corresponding letter indicates the direction of change: (a) less, (b) usual, and (c) more. The instrument detected very little change across subjects as Table 4 demonstrates.

Table 4

Selected Behavior Check List
Mean Weekly Staff Report

	Subj. 1	Subj. 2	Subj. 3	Subj. 4	Subj. 5	Subj. 6
Baseline	3.0 b	2.9 b	2.5 b	2.5 b	2.0 b	2.8 b
Exercise	2.9 b	2.2 b	2.6 b	2.5 b	1.9 b	2.3 b
Return to baseline	2.8 b	1.8 a	2.2 b	2.0 b	1.3 b	1.8 a

Note. The number represents the frequency of the behavior: 0 = not at all, 1 = rarely, 2 = occasionally, 3 = frequently, 4 = almost always.

The letter indicates the direction of change: a = less, b = usual, c = more.

Staff and Participant Final Assessment

The Staff and Participant Final Assessment questionnaire was given to each participant as well as to all

staff at the Edison Community Center during the last week of the intervention. Its purpose was to assess overall staff perceptions of change in each subject or change that the subjects saw in themselves.

Table 5 demonstrates that although some individual staff members perceived more change than others in the behavior of their clients, the average improvement reported by staff was slight. All subjects reportedly experienced some change in their behavior. Two subjects (Subjects 3 and 6) thought that they changed quite a lot as a result of their participation in the aerobic exercise classes.

Table 5

Staff and Participant Final Assessment

	Subj. 1	Subj. 2	Subj. 3	Subj. 4	Subj. 5	Subj. 6
Staff mean	3.3	3.6	3.4	3.4	3.5	3.6
Subject self-report	3.4	none	4.7	3.7	3.3	4.3

Note. The number represents staff or subject mean assessment of change: 1 = very noticeably worse, 2 = somewhat worse, 3 = no change, 4 = some improvement, 5 = very noticeable improvement.

DISCUSSION

The primary purpose of this investigation was to observe whether or not participation in aerobic exercise would affect the behavior of people with chronic schizophrenia. The results indicate that, although the behavioral observation sessions showed slight changes, they were not significant enough to be reported by staff on subjective measures. The subjects reported slightly more change in themselves as a result of the exercise than did staff working with them day to day. The small changes in behavior which did occur were variable; some behavior improved while other behavior did not. This is inconsistent with the results of other studies in the mental health area where definite changes in behavior have been reported. Jorgensen (1986/1987) also reported varied results with her subjects. One explanation for the varied results with this population is that exercise may affect the various symptoms of schizophrenia differently. In other words, exercise may improve some symptoms but not others. Jorgensen used the SCL-90-R (Derogates, 1983) to measure psychotism. Psychotism as defined by this measure provides a graduated continuum from mild interpersonal alienation to dramatic evidence of psychosis (Derogates, 1983). If, in fact, exercise

affects different symptoms or groups of symptoms in different ways, then measuring such a wide range of symptoms could provide varied results. Increases in some symptoms and decreases in others within the same measure could tend to neutralize the overall effect of the changes.

A second concern of this study was to observe the effects of aerobic exercise on the positive and negative symptoms of schizophrenia as categorized by Andreasen (1984a, 1984b). This would provide an expansion in this area of research by observing the effects of exercise on distinct categories of symptoms rather than on all symptoms. It has already been demonstrated that positive and negative symptoms are uniquely different and patients with predominantly positive symptoms are likely to differ in a variety of important ways from patients with predominantly negative symptoms (Andreasen & Olsen, 1982). Differential effects in the treatment of the symptoms of schizophrenia has also been demonstrated. Neuroleptic medication, for example, does not appreciably reduce negative symptoms; however, it improves positive symptoms in 80-85% of schizophrenic patients (Davis & Gierl, 1984).

Three subjects in this study exhibited primarily positive symptoms of schizophrenia. Two others displayed negative symptoms. Although these findings are not great enough to be clinically significant, all of the positive

symptoms showed some increase associated with the exercise intervention. Interestingly, these increases in positive symptoms were slightly higher immediately following the aerobic exercise session and decreased within 3 hours of exercise. On the other hand, those subjects displaying negative symptoms demonstrated small decreases in the level of the negative symptoms as a function of exercise. This is the first time that research has attempted to observe the effects of exercise on separate symptom categories of schizophrenia.

There are several possibilities for future research in the area of aerobic exercise and schizophrenia. For instance, isolating the factors responsible for the changes documented in this and other exercise studies will require further research. Among the factors that should be considered are physiological mechanisms involving changes in brain chemistry (e.g., endogenous opiate levels) thereby causing the observed effect. A second explanation is a behavioral one. Participation in the class potentially provides both positive reinforcement, such as increased attention and social interaction, as well as negative reinforcement, such as escape from a less desirable activity. Additionally, however, as a result of their involvement in the exercise class, the participants are provided with several opportunities to engage in a variety of new behaviors which are

incompatible with behavior associated with their symptoms. For instance, those individuals experiencing negative symptoms will find not socializing or being apathetic incompatible with the level of social interaction they experience during the class. Even after the class, talk of or inquiries about class provides opportunities for increased interaction which makes symptom behaviors more difficult to engage in. The same can be said of participants experiencing positive symptoms. By participating in the exercise class, they are involved in behavior which may be incompatible with their symptoms. It is, for example, difficult to respond to internal stimuli, such as voices, at the same time as responding to external stimuli, such as answering inquiries about class. In order to isolate these variables, future research should include a control group which provides a nonaerobic activity while also providing a high level of social interaction, as well as a common topic for conversation outside of class.

Further research should continue to distinguish between the positive and negative symptoms of schizophrenia. There are important treatment implications for patients with schizophrenia if these findings can be substantiated further. If different interventions affect subcategories of symptoms differently, it would allow treatment to be based on the nature of a particular symptom subgroup

rather than on general symptoms.

One benefit of aerobic exercise is increased basal metabolism (Haskell, 1984). Does this increase in metabolic rate alter the effect of neuroleptic medications which would account for the changes in symptoms?

Another question for future research is the effect of extended exercise on this population. Will long-term use of aerobic exercise moderate the cyclical nature of chronic mental illness? Regular long term use of aerobic exercise may affect the frequency, intensity, and/or duration of symptom exacerbation (Pepper, 1981). A longitudinal study which tracks symptom exacerbations across time would help to answer this question.

A point of consideration when an A-B-A design is used in aerobic exercise research is the length of the return to baseline phase. Presumably some conditioning has occurred as a result of the intervention and this would take time to reverse. A time lag between the intervention and return to baseline phases or a longer return to baseline would allow researchers to detect if the behavioral effects reversed immediately upon termination of aerobic exercise or reversed only gradually as physical fitness returned to its former level.

Although these data do not represent a large enough sample to be any more than suggestive, they do indicate that aerobic exercise may exacerbate the positive symptoms

of schizophrenia, especially immediately following the exercise session. There is also an indication, at least in this group of subjects, that this effect remediates within a few hours of the exercise. Negative symptoms when present without positive symptoms, however, decreased with aerobic exercise. This did not show any particular pattern in that the decrease occurred in some subjects within 1 hour while in others the decrease occurred after 3 hours. Although aerobic exercise may temporarily increase positive symptoms, which might be viewed as a side effect, these may be less problematic than the serious side effects demonstrated with the use of neuroleptics (Kane, 1985).

Possible temporary increases in positive symptoms would not necessarily restrict patients from participating in exercise activities. Although depending on the amount and type of increase, additional staff management may be required. Both the Jorgensen (1986/1987) study and the current one used chronic outpatients as subjects. The fact that these clients are living in the community and attending a day program indicates that their symptoms may be less severe than their hospitalized counterparts or that their symptoms are under reasonable control. It would be interesting to observe the effects of aerobic exercise on inpatients whose behavior is frequently more maladaptive and whose symptoms of schizophrenia may be

more florid. Perhaps more dramatic results would be seen.

Another interesting extension of this line of research would be to monitor the subjective impressions of the patients themselves during exercise. If positive symptoms do, in fact, increase, is this distressing to the patient or is it perceived as pleasant if it is noticed at all?

More research in this area needs to be done over a longer period of time to see if, for example, extended aerobic training affects symptoms in different ways. Investigation over time would also test the durability of these results. Use of a control group would be highly recommended in order to provide a comparison of the effects between intervention versus no intervention.

One problem in this area of research has been a lack of a uniform definition of aerobic and a uniform way to measure exertion levels. Pulse rate seems to be the leading contender for an answer to this problem. Training heart rate is not difficult to calculate and pulse rate is relatively easy to monitor.

All of the subjects of this study were being prescribed and were taking medication. This study demonstrated that, despite the use of neuroleptics, participants were able to achieve aerobic heart rate levels. This was accomplished without extraordinary levels of exertion. Mean resting heart rates decreased a mean 14

beats per minutes. Heart rate decreases occurred even in subjects with lower levels of participation, for example, 3 rather than 4 days per week.

A third concern of this investigation had to do with health benefits associated with exercise and whether chronically mentally ill people could also access those benefits. This study has demonstrated that this population can engage in aerobic exercise of sufficient intensity and duration to attain an aerobic training effect. Also given changes in resting heart rate, which at least implies that physiological changes occurred, it would appear that access to health related benefits is possible for this group. Additional research should focus on a variety of health related issues. This population is historically not a particularly healthy one (Beachum, 1990; Walters, 1990) and the people in this population could benefit if more attention were given to their physical health.

Attendance and participation posed no problem with these subjects. Exercise class was designated as the first activity of the day and the client and staff expectation was for participants to go directly to the gym upon arrival at the center. Enthusiasm among nonparticipating clients at the center was so high during the first weeks that soon the majority of clients attending the center had asked to join the class! The low staff to client ratio

required for an exercise class allowed most staff an hour of "free" time during the aerobic class. The administration evidently realized sufficient benefits for staff and sufficient changes in the attitudes and behaviors of their clients that plans to add an aerobic class to the regular curriculum were underway following completion of this study.

Given the findings in this group of subjects, aerobic exercise may prove to be a somewhat beneficial adjunct in the treatment of chronic schizophrenics, especially for people with predominantly negative symptoms. It may, however, be prudent to use discretion when using aerobic exercise with schizophrenic individuals, especially those with positive symptoms. Because aerobic exercise appears to increase positive symptoms, it may be advisable to introduce it only once the florid positive symptoms are under control which can be achieved in most cases quite quickly with neuroleptics. It also appears from this sample that aerobic exercise may provide access to both health related benefits, such as, weight control and prevention of coronary heart disease, as well as mental health related benefits, such as, decreased anxiety and depression, in similar ways as has been demonstrated for other groups. More research needs to be done in this area to determine the long-term effects of aerobic exercise on the symptoms of schizophrenia.

APPENDICES

Appendix A

Subject Dependent Variables

Subject 1

SUBJECT	DATE	OBSERVER	RELIABILITY

score a + if behavior occurs any time during the interval, score an o if behavior does not occur any time during the interval.

TIME	absent from room	conversing with self	head down on table	on task	
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
TOTAL					
PERCENTAGE					

TIME	absent from room	conversing with self	head down on table	on task	
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
TOTAL					
PERCENTAGE					

subject 2

SUBJECT	DATE	OBSERVER	RELIABILITY

score a + if behavior occurs any time during the interval.
score a o if behavior does not occur any time during interval.

TIME	No facial expression	head on table	interaction with others	on task	
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
TOTAL					
PERCENTAGE					

TIME	No facial expression	head on table	interaction with others	on task	
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
TOTAL					
PERCENTAGE					

Subject 3

SUBJECT	DATE	OBSERVER	RELIABILITY

score a + if behavior occurs any time during interval.
score a o if behavior does not occur any time during interval

* score while engaged in conversation with staff or score - if not speaking

TIME	whining or crying	grabbing	bizarre talk		
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
TOTAL					
PERCENTAGE					

TIME	whining or crying	grabbing	bizarre talk		
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
TOTAL					
PERCENTAGE					

Subject 6 | | | |
SUBJECT | DATE | OBSERVER | RELIABILITY

score a + if behavior occurs any time during the interval. score a o if behavior does not occur any time during the interval.

*score while staff is engaging in speech--or score - if not speaking

TIME	Poverty of speech content	hair twisting	leg swinging		
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
TOTAL					
PERCENTAGE					

TIME	poverty of speech content	hair twisting	leg swinging		
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
TOTAL					
PERCENTAGE					

Subject 5

SUBJECT	DATE	OBSERVER	RELIABILITY

score a + if behavior occurs any time during the interval. score an o if behavior doe not occur any time during the interval.

TIME	absent from room	doing an assigned task	interaction with others	doing other than assigne task	head down on table
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
TOTAL					
PERCENTAGE					

TIME	absent from room	doing an assigned task	interaction with others	doing other than assigne task	head dvon on table
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
TOTAL					
PERCENTAGE					

Subject 6 | SUBJECT | DATE | OBSERVER | RELI

Time Request	Compliance (Circle appropriate response)		
#1	NC PC C A D	interrupts Speaker 1 2 3 4	Complains 1 2 3 4
#2	NC PC C A D	interrupts Speaker 1 2 3 4	Complains 1 2 3 4
#3	NC PC C A D	interrupts Speaker 1 2 3 4	Complain. 1 2 3 4

Time			
#1	NC PC C A D	interrupts Speaker 1 2 3 4	Complain 1 2 3 4
#2	NC PC C A D	interrupts Speaker 1 2 3 4	Complain 1 2 3 4
#3	NC PC C A D	interrupts Speaker 1 2 3 4	Complain 1 2 3 4

NC = non compliance
PC = partial compliance
C = compliance
A = aggression
D = disruptive/Tantrum

1 = not at all
2 = a few Times
3 = several Times
4 = Continuely

Appendix B

Informed Consent Form

INFORMED CONSENT

The Edison Community Center will be supplementing its exercise program for clients who the staff feel can benefit from it. We would like you or your guardian's permission for you to participate in an aerobic exercise program. A description of the program follows:

Title: "Aerobic Exercise Training with Chronically Mentally Ill Patients"

Purpose of Study: We will attempt to determine whether or not clients at Edison Community Center can benefit from aerobic activities by measuring their heart rates. In addition, we want to see if these activities influence behavior--such as inappropriate behavior, attention span and depression. There is some evidence already that exercise has a positive influence on these behaviors.

How the Program Will be Conducted: Each participant will engage in aerobic activity for up to 30 minutes four days per week lead by a qualified aerobic instructor. The sessions will include a warm-up phase, an exercise phase and a cool down phase. These will include: arm swings, joint flexion, body twisting, light toe touches and walking during the warm-up phase. Followed by the exercise phase during which the pace of the exercise will gradually increase. Movements will be expanded to include such activities as: arm raises, fast walking, jumping, marching, toes touches and body twisting. A cool down phase will follow the exercise phase, lasting approximately 5-10 minutes. Cool down will include such activities as arm swings, joint flexion, body twisting, light toe touches and walking.

Observers will record selected behaviors following the sessions. Observers will be students at Western Michigan University and will collect data on such behavior as: eye contact, grabbing, whining, body rocking and on task and off task activity. Each participant will be asked to complete certain standardized tests such as Beck's Depression Scale. Edison staff will also be requested to complete weekly reports designed to report such activities as: facial expression, refusal to cooperate, class participation and on task and off task behavior.

Pulse rates will be monitored during the sessions. All data will remain confidential and will be kept in the participant's case record at Edison Community Center. It is possible that the study will be published in a professional journal or presented at a professional conference. If this happens, participants will neither be identified nor will any identifiable information be released without the participants consent.

Potential Benefits of the Program: Aerobic exercise is known

to improve blood circulation, respiratory functions, muscle tone and general health. Additionally, there is some evidence that in people with mental disabilities aerobic exercise improves behavior and mood. Each participant will also receive the attention of a qualified aerobic instructor.

Potential Risks of the Program: We have attempted to eliminate as many risks as possible in the program. Those remaining are those common to anyone who may engage in exercises and includes pulled muscles, abrasions as a result of a fall, fatigue or exhaustion. To lessen these risks, it is necessary that a physician give his/her permission before the program begins. A medical examination is not required. Further safeguards include supervision by several adults, warm-up exercises, cool-down periods and close monitoring of each participant's pulse and respiration rates. Further, no participant will have to engage in the program should s/he decide to leave. Participation in this project or a decision not to participate will not affect current services being received at Edison Community Center.

Who is Operating the Program? The program will be run at Edison Community Center. Funds for the program will come from Western Michigan University's Center for Human Services. Kathlyn Fuller, a master's student in clinical phychology at Western Michigan University and Margaret Hunter, an Occupational Therapist at Edison Community Center will be responsible for operating the program. Ms. Hunter will supervise the project at Edison. Dr. Wayne Fuqua, as faculty adviser to Ms. Fuller, will also supervise the project. A qualified aerobics instructor and trained student observers from Western Michigan University will serve as staff for the program. From time to time Dr. David Sluyter from the Center for Human Services and Dr. Wayne Fuqua will visit the project site in order to asses the projects progress.

How Long Will the Project Last? The aerobic exercise classes are scheduled to begin in late September, 1989 and will be completed by the end of December, 1989.

Question About the Program? Questions about this program may be directed to Margaret Hunter at Edison Community Center or to Kathlyn Fuller who will be availble at each exercise session.

Please check the appropriate response and sign.

_____I give permission to participate in the exercise program described on the previous pages. I understand that the participant is free to withdraw at any time by speaking to or writing a request to Margaret Hunter or to Kathlyn Fuller. I also give permission for the results of this program to be published so long as the participant's identity is not revealed.

_____I do <u>not</u> give permission to participate in the above named exercise program.

Signature:_____

** Witness:_____

Date:_____

** As a witness I ensure that the person signing consent did so with full knowledge of what they were signing, was the authorized party to grant consent and did so willingly.

Appendix C

Physician's Consent Form

PHYSICIAN'S STATEMENT

Please check the appropriate statement and sign.

It is my opinion that _____

_____ is physically able to participate in an exercise program which includes up to 30 minutes of aerobic exercise such as: marching, jumping, jogging and arm swinging. These movements will produce a moderately high but safe pulse rate. Each participant will self monitor their pulse rate, with assistance from the instructor and an assistant, at the artery on the neck or wrist.

_____ is physically able to participate in the exercise program only with the following restrictions (please specify clearly):

_____ is not physically fit to participate in the outlined exercise program.

Signature _____

Date _____

Appendix D

Selected Behaviors Check List

client _____ date _____ staff _____

Directions: Please complete the following based on the client's behavior within the last 3-4 days.

Scoring: 0 = not at all
1 = rarely
2 = occasionally
3 = frequently
4 = almost always

a = less than usual
b = same as usual
c = more than usual

Number Scale	Letter Scale	
_____	_____	Grabs others or from others
_____	_____	Talks in a bizarre manner: nonsense, delusional
_____	_____	Wanders from assigned area
_____	_____	Stays on task for duration of activity
_____	_____	Whines or cries
_____	_____	Demonstrates appropriate social behavior
_____	_____	Lays head or body on table or floor
_____	_____	Talks to self
_____	_____	Face has no expression
_____	_____	Facial expression not consistant with environmental cues: smiles or laughs inappropriately
_____	_____	Interrupts speaker
_____	_____	Refuses to cooperate

New behaviors observed within last 3-4 days:

A. Adaptive: _____

_____

B. Maladaptive: _____

_____

Appendix E

Staff and Participant Final Assessment

12-19-89

Please circle most appropriate response as it relates to me since my participation in the exercise class.

_____

I am friendly	1 2 3 4 5
I am cooperative	1 2 3 4 5
My personal hygiene is	1 2 3 4 5
My interpersonal interactions are	1 2 3 4 5
My attendance in class is	1 2 3 4 5
My self esteem is	1 2 3 4 5
I complain	1 2 3 4 5
I am outgoing	1 2 3 4 5
I participate in class	1 2 3 4 5
My self confidence is	1 2 3 4 5
I do work expected of my	1 2 3 4 5
I am patient	1 2 3 4 5
I interrupt others	1 2 3 4 5
I am observant of the world around me	1 2 3 4 5
My personal appearance is	1 2 3 4 5

Other observations not noted above:

_____ 1 2 3 4 5

_____ 1 2 3 4 5

1= very noticeably worse
2= somewhat worse
3= no change
4= some improvement
5= very noticeable improvement

Appendix F

Human Subjects Institutional Review Board Confirmation

Human Subjects Institutional Review Board

Kalamazoo, Michigan 49008-3899

WESTERN MICHIGAN UNIVERSITY

TO: Kathlyn Fuller

FROM: Ellen Page-Robin, Chair E.P-R

RE: Research Protocol

DATE: February 7, 1989

This letter will serve as confirmation that your research protocol, "Behavior Management of Aerobic Exercise Training in Chronically Mentally Ill Patients: An Investigation of Exercise Adherence and Disruptive Behavior" was approved at no more than minimal risk after full review by the HSIRB.

If you have any further questions, please contact me at 387-2647.

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