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Effects of exercise, arts and crafts activities, and social attention on social interaction, directed activity and maladaptive behavior in adults with mental retardation and emotional disturbance: An ecobehavioral perspective

Shively, Randall Kenneth, Ph.D.

The Ohio State University, 1989
EFFECTS OF EXERCISE, ARTS AND CRAFTS ACTIVITIES, AND SOCIAL ATTENTION ON SOCIAL INTERACTION, DIRECTED ACTIVITY AND MALADAPTIVE BEHAVIOR IN ADULTS WITH MENTAL RETARDATION AND EMOTIONAL DISTURBANCE: AN ECOBEHAVIORAL PERSPECTIVE

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of Ohio State University

By

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1989

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CHAPTER I

INTRODUCTION AND STATEMENT OF THE PROBLEM

Introduction

The study of the relationship between mental retardation and emotional problems has been limited until recently. In the past, these two areas have been viewed as separate entities with separate systems utilized for diagnosis and treatment. However, increased interest in the institutionalized retarded brought the discovery of psychotic behavior to the forefront (Beier, 1964). Penrose (1954) had foreseen this inevitable relationship when he stated:

A person of any level of intellectual capacity can suffer from any degree of mental illness. The susceptibility to disorder may indeed be correlated with intelligence level, in that certain kinds of deficit may predispose one to psychosis.....conversely, mental illness as the primary condition, may contribute to a lowering of intellectual level. (p. 98)
This substantiates the inseparable union between mental retardation and mental health. With tremendous demand placed on the individual in this highly complex and technological society, pressures overwhelm the retarded. Their lowered performance invites emotional stress. Tarjan (1977) states that stressors that have no effect on the average person, often produce psychological problems in the retarded.

It would appear from several studies and observations of mentally retarded populations, that there is a higher incidence of emotional disturbance than found in the general population (Tredgold, 1948; Dewan, 1948; Menaloscino, 1966; Symanski, 1980). This has been substantiated by two popular epidemiological studies which found that between 20-40% of the chosen populations had psychiatric problems (Lemkau, Tietze, and Cooper, 1942; Rutter, Tizard, and Whitmore, 1970).

Historically, the symptoms of mental retardation and emotional disturbance were not differentiated because of overt similarities (Menaloscino, 1965). The two conditions were equated until the study of psychopathology became more refined, and then they were strictly separated into distinct categories for both diagnosis and treatment. This separation continued until the late eighteenth and early nineteenth centuries. At this time advances in anatomy and physiology coupled with an increased interest in the institutionalized retarded, drew closer public attention to
abnormal behavior patterns; this interest began the progressive study of the coexistence of mental retardation and emotional disturbance.

The Ohio Association for Retarded Citizens in the 1970's claimed this population was not receiving appropriate treatment and were merely being shuffled back and forth between mental health and mental retardation facilities (Arnoczky, 1981). Often in the individual with both symptomatologies, only one was acknowledged while the other was neglected. The mental health system claimed the individual was too low functioning to profit from programming while the institutions claimed the individuals were too violent, aggressive, and withdrawn; neither side would claim responsibility. To remedy the situation, a class action suit was filed on behalf of these individuals under the Federal Civil Rights Act and the Rehabilitation Act of 1973. In 1976, the Ohio Association for Retarded Citizens intervened on behalf of the emotionally disturbed/mentally retarded residing in state institutions. As a result of these political actions, the Ohio Department of Mental Health and Mental Retardation agreed to conduct comprehensive evaluations on the class members' individual needs and establish special units for this needy population.
Statement of the Problem

With individuals who are emotionally disturbed/mentally retarded there has been a preponderance of treatment efforts that have relied on medication and/or aversive behavior techniques to control manifestations of emotional disturbance. Revinus (1980) warns that a tremendous potential exists for psychotropic medication misuse with this population. He believes psychotropic drugs should be used to treat specific diagnoses and symptoms but should never be used in lieu of environmental improvements and individual programming. A lack of physical programming has often led to a sedentary existence for this population and has not provided meaningful activities to attempt to teach alternative responses to take the place of aggressive, socially inappropriate ones. However, several recent studies have shown that exercise is a meaningful activity for this population and have demonstrated beneficial results (Jansma and Combs, 1987; Tomporowski, 1985).

Importance of Present Study

Physical fitness has been found to be as important for the mentally retarded adult as it is for the non-handicapped (Moon and Renzaglia, 1982). They mention several specific benefits: it provides a pleasurable, successful learning experience, it is not age or situation specific, it can continue for a lifetime, and it has the potential to positively influence cognitive and affective areas.
This study is unique in that it controls for the impact of the experimenter's attention on frequencies of behavior change by keeping the experimenter's attention constant across treatment groups. This variable has not been considered in past exercise studies. Attention has the potential to influence this population's behavior since often in the institutionalized setting there is a deprivation of staff/resident social and recreational interaction.

Past research has concentrated on either how exercise affects maladaptive behaviors (Jansma and Combs, 1987) or on how it affects adaptive behaviors (Tomporowski, 1985). This study will focus on how maladaptive, social interactive, and self directed behaviors are simultaneously affected by an exercise treatment. This will represent a comprehensive, ecobehavioral perspective toward behavior change.

Although Tomporowski (1985), found no significant change in adaptive behavior as a result of exercise, he used the AAMD Adaptive Behavior Scale as his assessment instrument. However, behavior ratings from trained observers should produce a more sensitive assessment of immediate behavior change when measuring results of an intervention than a third party assessment administered infrequently. An advantage of overt behavioral assessment is that it takes into account specificity of behavior across situations (Kazdin, 1980). Questionnaires, rating scales, and subjective evaluations tend to have limited possibilities for
identifying specific variables that do and do not support adaptive behavior in real-life situations (Sackett, 1976). However, quantitative observational methods can be used to address basic research questions concerning mental retardation and to help solve practical problems of retarded people. The distinguishing feature of quantitative observation is that human perceptions and judgments are used to identify particular responses occurring in the ongoing flow of behaviors. A primary purpose of quantitative observational research is to gain information in describing and identifying adaptive functions in the course of everyday person-environment transactions. Whether a given behavior occurs and the type of behavior that occurs are both likely to be a function of specific environmental cues (Kazdin, 1980). This specificity of behavior has been neglected in many assessment approaches. The aim of this investigation is to capture subtle behavior changes that might otherwise go overlooked.

Finally, there is a need in the exercise literature to gain physiological recordings of physical conditioning treatments as well as to compare how these physiological changes relate to overt behavior change. This study will directly measure the physiological component not specifically addressed in past studies with this population, and attempt to compare it to overt behavior changes.
Experimental Questions

1. What differential effects do participation in structured physical exercise and social attention vs participation in structured social activities and social attention have on the frequency of social interaction, directed activities, and maladaptive behaviors in individuals with emotional disturbance and mental retardation up to two hours post-exercise?

2. Are there any behavioral benefits that generalize to the living environment as a result of either the exercise or social activity treatment groups?

3. Can the participants in the exercise group keep their heart rates in their specified training zones as measured by the Heart Watch?

4. Does cardiovascular fitness as measured by training heart rate have a significant correlation with behavior changes in individuals with emotional disturbance and mental retardation?

Note: A secondary question will be raised as to how motivation as measured by the Exercise Benefits Questionnaire relates to changes in maladapted behaviors, social interaction, and goal directed behaviors. Since number of observation points is small and the questionnaire is being field-tested, significant correlations between the questionnaire and the changes in behavior may not be
found. However, this question needs to be addressed since the individuals perception of his/her exercise experience is crucial to the willingness to give maximum effort and therefore gain the greatest physiological results. A more calming effect in regard to behavior problems could be expected from maximum motivation and effort.

Assumptions of Study

1. The subjects will be familiar and comfortable with the exercise routine before the experimental program is initiated.

2. Seven weeks of daily exercise (Monday through Friday) for one-hour per day is a sufficient time interval to measure physiological improvement.

3. Regularly scheduled activities of the subjects would not affect performance of the subjects in their treatment programs.

4. The physical fitness activities are at the appropriate developmental level for the participants.

5. Behavior changes recorded in the subject's immediate living environment will represent generalized effects from the treatment groups.
6. The Modified Ecobehavioral Assessment is a sufficiently sensitive instrument to measure daily behavior changes.

**Definition of Terms**

1. **Adaptive behavior** - the manner in which an individual copes with the natural and social demands of his environment as measured by the *AAMD Adaptive Behavior Scale* (Heber, 1959).

2. **Pro-social behaviors** - a series of relevant behaviors which take place in a social context (Rojahn and Schroeder, 1979).

3. **Antisocial behaviors** - behaviors which are usually aversive to others, take place in a social context, and frequently interfere with community adjustment. Aggression and general disruption are the most frequent antisocial behaviors. (Mulick and Schroeder, 1980).

4. **Emotionally disturbed/mentally retarded (EDMR)** - mentally retarded individuals with diagnosed emotional and/or severe behavior problems (Parsons, May, and Menaloscino, 1984).

5. **Dually-diagnosed** - a term used to identify a person who exhibits emotional disturbance and mental retardation.

6. **Mental retardation** - refers to significantly subaverage general intellectual functioning existing concurrently with deficits in
adaptive behavior and manifested during the developmental period (Grossman, 1973).

7. **Ecobehavioral approach**-viewing a person's behavior as an ongoing, complex interrelationship with the social and physical environment (Rojahn and Schroeder, 1979).

8. **Muscular endurance**-the capacity of a muscle or group of muscles to continue contracting over a long period of time against a light to moderate resistance (Corbin and Lindsey, 1985).

9. **Flexibility**-the range of motion available at a particular joint or group of joints (Corbin and Lindsey, 1985).

10. **Cardiovascular endurance**-the ability of the circulatory and respiratory systems to supply oxygen during sustained activity (Corbin, Dowell, Lindsey, and Tolson, 1981).

11. **Overload**-a principle that specifies that for an aspect of fitness to improve, one must "overload" by putting more stress on the muscle than it normally encounters in daily use (Corbin and Lindsey, 1985).

12. **Fitness target zones**-a range of exercises from the minimum necessary to cause improvement in fitness to the maximum, beyond which exercise may be counter-productive. If you exercised above
the minimum and below the maximum, you are exercising in the fitness target zone (Corbin and Lindsey, 1985).

13. **Warm-up and Warm-down Exercises**-light to moderate activity, including stretching, done prior to and following serious exercise. Its purpose if to reduce the risk of injury and soreness and possibly to improve performance in a physical activity (Corbin and Lindsey, 1985).

14. **Resting Heart Rate**-the pulse counted for one minute while the person is not moving. It is preferably taken in the morning (Corbin and Lindsey, 1985).

15. **Working Heart Rate**-the range between the resting heart rate and the highest rate for one's pulse (Corbin and Lindsey, 1985).

16. **Social Attention**-verbal and physical reinforcement, questions, and verbal directions given to the subjects to keep their attention on task.
CHAPTER II

LITERATURE REVIEW

Characteristics of the Emotionally Disturbed/Mentally Retarded (EDMR)

Several studies have shown that with the mentally retarded population there is a higher incidence of emotional disturbance than in the general population (Penrose, 1945; Tredgold, 1947; Saenger, 1967; Shellhaus and Nahira, 1969; Menaloscino, 1977; Tausig, 1985). Menaloscino (1966) estimated the incidence of emotional disturbance among the institutionalized mentally retarded to be as high as 30-40%. Penrose (1945) studied 1280 cases of retardation and found that 204 had some distinct form of emotional disturbance. He concluded that the overt aggressive and socially inappropriate behaviors were key factors in the institutionalization of many of these individuals. Tredgold (1947) studying institutionalized retarded in England also concluded that this population was more susceptible to emotional disturbance than the general population.
Recent studies have supported emotional disturbance as a direct factor in institutionalization (Saenger, 1967; Shellhaus and Nihira, 1969; Tausig, 1985). Chess (1971) supported this notion by showing that 60% of the mentally retarded children in community placements or living at home demonstrated symptoms and signs of mental illness. It is clear that these abnormal behaviors could make some of these individuals prime candidates for institutions. Tausig (1985) examined the factors responsible for families placing developmentally disabled members in institutions. He found for the retarded under 21 years of age, behavior problems were the most important factor. Jedrysek and Soles (1980) found that parents of mentally retarded children from pre-school through adolescence had unrealistic expectations of their children, lacked knowledge of how to train their children, expected little progress, and dealt inconsistently with maladaptive behaviors. They often opted to place their child in an institution.

The question now needs to be raised as to why a retarded population would be more susceptible to emotional disturbance? Explanations are as multiple and complex as the potential etiologies of mental retardation, yet understanding the relevance of this question is crucial in order to prevent and treat the emotional disturbance. Reiss and Benson (1985) looked at depression in mildly retarded individuals and concluded that low levels of social support were associated with depression. Stigmatization and rejection by significant others highlighted this
lack of support. Menaloscino (1977) discussed factors related to the level of retardation as influencing one's susceptibility to a psychiatric disorder. He viewed the severely retarded as characterized by nervous system impairment, multiple handicaps, sensory deficits, and seizure disorders. These factors all limited successful interpersonal/social transactions and impeded the development of a strong personality structure. He viewed the moderately retarded as similarly vulnerable due to a slower rate of development and a concrete approach to problem solving. This group is often rejected by significant others whose interpersonal contact they so desperately seek. Finally, although the mildly retarded can verbalize their needs and emotions, their initial verbalizations often mask the full depth of their interpersonal and intrapersonal distress. They are often labeled by society as deviant which has an overriding influence on the development of their self-concept. Tarjan (1977) points out that the retarded often are under tremendous stress from society from which they are ill prepared to handle.

Diagnosis of emotional disturbance in the mentally retarded has been plagued with difficulty. The majority of emotional disturbances listed as capable of producing mental retardation are more descriptive as symptoms than specific as diagnostic entities (Menaloscino, 1977). These symptoms could have a multitude of diagnostic causes. Does an individual's psychosis suppress intellectual functioning and adaptive behavior, or is the psychosis
actually a behavioral manifestation of one's level of retardation? It has been accepted that individuals at all levels of retardation exhibit signs and symptoms of mental illness, but at the more severe levels of retardation it is very difficult to attribute etiology (Westling, 1986). It is very difficult to differentially diagnose the condition due to the psychiatrist needing to concurrently examine: symptomatology related to multihandicaps associated with mental retardation, cognitive deficiencies, stimulation, education, expectations that the individual has experienced, and environmental conditions (Szymanski, 1980). Schroeder, Mulick and Schroeder (1979) concluded that the differentiation of etiologies for such behavioral disturbances has not led to differential treatments. They therefore endorse the emphasis being placed on management issues, rather than diagnosis.

Research has supported that the most frequent emotional disturbance in the EDMR population is schizophrenia (Garfield, 1963; Phillips, 1977). It has shown up mostly in the mildly retarded. Menaloscino (1986) found 138 out of a sample of 543 dually-diagnosed clients (25%) supported a diagnosis of schizophrenia. Schizophrenia symptoms included bizarre behavior, persistent withdrawal, echolalic speech, and affective unavailability. The next most frequent disorder found was organic brain syndrome with a behavioral or psychotic disorder (19%) which was clearly differentiated from the schizophrenic group.
Next came adjustment disorders (19%), personality disorders (13%), and finally anxiety disorders (4%). Anxiety disorders were clearly linked to chronic frustration, unrealistic family expectations, and persistent interpersonal deprivation.

Arnoczky (1981) studied the characteristics of this population by closely studying records of those institutionalized dually-diagnosed clients (N=242) that were part of the OARC vs Moritz law suit. She found that 85% of these people were on psychotropic medication (many on multiple psychotropics) and that 50% had multiple handicaps which in most included a seizure disorder. She also found that schizophrenia was related to mild, moderate, and severe levels of retardation and that disorders of infancy, childhood, and adolescence were related to severe and profound levels of retardation. Although this only represents an institutional population, it is a major attempt at better understanding this most difficult population.

In summary, there is still much confusion in identifying emotional disturbance in the mentally retarded. It seems like the retarded are more susceptible to mental illness, particularly due to overwhelming environmental demands. Behavior problems have been directly implicated as resulting in the institutionalization of the EDMR person. Although more information pertaining to this population is now known, differential diagnosis with this population has been plagued with many problems. As Schroeder,
Mulick, and Schroeder (1979) point out, it might be advantageous to place our energy on effectively managing this population.

**Exercise Effects on Problem Behaviors**

Mulick and Schroeder (1980) defined anti-social behaviors as taking place primarily in a social context and usually being aversive to others. Anti-social behaviors can be viewed as a product of a person's past learning history as well as the schedule(s) of reinforcement under which they have operated. Bandura (1973) states that anti-social acts are shaped through the process of modeling and vicarious reinforcement, a history of reinforcement for competitive interaction, and material gains resulting from such anti-social acts. With the emphasis on the relationship between social context and problem behaviors there are several implications that can be drawn in relation to exercise. First, exercise can be viewed as a reinforcing outlet that gives the individual with retardation valuable options for use of free time (Moon and Renzaglia, 1982). With feelings of control and positive options in their immediate environment, inappropriate outlets for attempts to gain the same feeling of control might decrease. Boe (1977) has found that rates of aggression have decreased when schedules of response independent reinforcement are added in residential environments. Second, exercise is a social activity which gives the individual with retardation new possibilities for positive social relationships and experiences. Burchard and Tyler
(1965) have shown how aggressive behavior can be shaped and maintained by reinforcing consequences through adult and peer attention. These new social experiences through exercise have the potential to be incompatible with anti-social responses that have previously competed for adult and peer attention. Mulick and Schroeder (1980) stress how environmental conditions and social organization influence markedly the occurrence of aggression in the institutionalized retarded perhaps because of antecedent conditions responsible for conflict. These new social opportunities may be aided by setting new antecedent conditions to replace those that were responsible for past conflicts.

As Moon and Renzaglia (1982) have emphasized, exercise programs have become popular as legitimate interventions for the mentally retarded. They view physical fitness opportunities as important for the mentally retarded adult as for the non-handicapped. Fitness strategies have grown in importance for the retarded because the retarded have a lot of free time available, they often lack the self-direction to know their options, and they have the same right to enjoy recreational activities as the non-handicapped. In addition, research studies have supported the notion that the overall fitness level of the mentally retarded is generally inferior to that of non-handicapped individuals, regardless of the measurement procedure used. Fox and Rotatori (1982) viewed the sedentary life style that many institutional
retarded live as leading to a general characteristic in this population of obesity and poor muscle tone.

Exercise was used in a structured behavior program for two children who were severely emotionally disturbed exhibiting frequent behavior disruptions in the classroom (Luce, Delquardi, Hall, and Hall, 1980). Each time a subject would act out a contingent exercise procedure was instituted consisting of repetitious standing and sitting. This procedure was found to be more powerful than a DRO (differential reinforcement of other behaviors) procedure and could be administered independently. Mulick and Schroeder (1980) stressed the need for more attention to the problem of how training specific incompatible responses can be used most effectively among the retarded to reduce anti-social behavior. Contingent exercise could provide one possible means.

Evans, Evans, Schmid, and Pennypacker (1985) suggests vigorous exercise regardless of its form may influence certain classes of subsequent behaviors. They suggest exercise may be an effective therapeutic tool to be used in conjunction with other behavior change procedures.

Although the Luce et al (1980) study points to the value of using exercise contingently, many studies have shown that non-contingent exercise used as a recreational outlet has positive impact on the frequencies of a variety of inappropriate behaviors.
Jansma and Combs (1987) investigated the effects of both fitness training and reinforcement on a variety of maladaptive behaviors found in an institutional setting: aggression, self-injury, property destruction, non-compliance, disruption, and stereotyped behaviors. Data was taken on five dually-diagnosed individuals at one hour post-exercise. They found that in both individual and group comparisons there was a significant decrease in overall maladaptive behaviors as a result of the exercise treatment. These authors concluded that exercise in combination with reinforcement could be a viable option to replace some or all of medication and physical restraint, often used to control the behaviors of the emotionally disturbed/mentally retarded.

Exercise has been used recently in several studies to treat stereotyped behaviors and self-injurious behaviors. Watters and Watters (1980) found that jogging significantly reduced self-stimulatory behavior in a retarded population. Bachman and Fuqua (1983) did a follow-up study. They tested the mentally retarded under three exercise conditions: (1) daily alternating conditions of warm-up exercises and jogging at a moderate rate for a short distance, (2) daily alternating conditions of no exercise periods and jogging at a vigorous rate for moderate distance, and (3) jogging at a vigorous rate for a moderate distance on consecutive
days. Observations of the subjects' behavior were taken immediately, one hour, and two hours following exercise. Their results supported Watters and Watters (1980) findings showing an inverse relationship between exercise level and the reduction of stereotyped behaviors.

Kern, Koegel, and Dunlap (1984) compared the effects of 15 minutes of mild exercise in the form of ball-play with the effects of a vigorous jogging routine on stereotyped behaviors. They found that only the condition of vigorous jogging significantly reduced the stereotypy. Baumeister and McClean (1984) studied the effects of a jogging program on high rates of self-injurious behavior and stereotyped mannerisms in two severely retarded adults. During the six-week exercise program the joggers increased their distance from one to three miles and their behavior gradually decreased. When the program was discontinued the high rates of behavior problems were again evidenced.

Lewis (1981) investigated how several different environments affected the rates of stereotyped behaviors and self-injurious behaviors in the severely and profoundly institutionalized retarded. He compared the therapeutic effects of an aquatic, gymnasium, and classroom environment. Results showed that the stereotyped behaviors were significantly reduced only in the aquatic environment; he recommends the development of similar programs for reduction of self-injurious behavior and stereotypies.
All the aforementioned studies lend support to exercise-influencing high rates of stereotyped and self-injurious behaviors in the mentally retarded. In addition, Jansma and Combs (1987) study lends support to the notion that anti-social behavior can also be controlled through both fitness training and reinforcement. The implications that can be drawn from these studies are very important due to the needs to find alternative behavioral treatments that are not dependent upon the use of aversives nor the over-use of psychotropic medications.

Exercise has been viewed as a mechanism to self-regulate both psychic and somatic conflict (Folkins and Sime, 1981); It has only been recently accepted that both the mind and the body reciprocally affect one another as a result of exercise (Buffone, 1980). The exact reason for the reduction of these behaviors can only be hypothesized, but exercise use as a legitimate treatment is gaining experimental support.

These studies lend support for use of exercise as a treatment for severe behavior problems and for use in conjunction with other treatment regimens. However, exercise treatment raises many interesting questions such as, "Is behavior change specific to the time immediately following exercise (transient effect) or could there be long term cumulative effects during a subject's day as a result of intense exercise?" "Are specific behavior changes as a result of exercise common across individuals who have
maladaptive behaviors or do different individuals demonstrate unique changes?" "Are gains in physiological areas related to improvements in behavior?" Answers to these questions could provide guidance to how a specific exercise program could best be developed for an individual with mental retardation and emotional disturbance.

Exercise Effects on Adaptive Behavior

Exercise can be viewed as a means of influencing a variety of adaptive behaviors in the mentally retarded. Folkins and Sime (1981) and Lazarus (1975) believe that physical training enhances a person's ability to adapt and cope with their environment. The difficulty in substantiating gains of adaptive behavior is one of definition. Researchers have not agreed on how exactly adaptive behavior should be conceptualized, although they all agree on the need for its assessment (Jansma and McCubbin, 1986). Coulter and Morrow, (1978) state that although the different scales which attempt to measure adaptive behavior have similar conceptual definitions, the behaviors actually measured can be quite different. Thus, cross comparisons between different studies have not always been possible.

Several recent studies have looked at how an individual with retardation adapted to his exercise experience (Jansma and McCubbin, 1986; Tompowski and Jameson, 1985; Hussey, Maurer,
and Schofield, 1976). Jansma and McCubbin (1986) investigated if physical fitness would affect a subject's adaptive behavior as measured by the AAMD Adaptive Behavior Scale (Nihira, Shellhaus, and Leland, 1974). This scale consists of two parts, the first organized along developmental lines measuring personal independence and daily living and the second part measuring maladaptive behavior related to personality and behavior disorders. In this study, institutionalized subjects trained for fourteen weeks exercising four times a week. Results showed an adaptation to the exercise experience itself with increased levels of physical fitness, but no statistically significant effects on adaptive behavior. The authors suggested a decrease in non-compliant behavior due to exercise based on anecdotal reports. A lack of significant results was explained as a result of the insensitivity of the assessment instrument, the length of the study, and the inconsistency of the informants. Tomporowski and Ellis (1985) examined how cardiovascular conditioning could affect intellectual and adaptive functioning in severely and profoundly retarded adults. Although cardiovascular efficiency was increased, there were no significant changes in either intelligence or adaptive behavior. Plausible explanations for the lack of change in adaptive behavior was both the lack of sensitivity of the measuring instrument as well as the difficulty in changing central nervous system functioning in an adult population. Subjective reports during this study's exercise suggest it as a more effective means of
habilitating this population than some of the more traditional approaches.

Hussey et al (1976) investigated how exercise would affect workshop performance, activity levels, attention seeking, and social behaviors in the mentally retarded. Subjects were given social and monetary incentives to encourage maximal effort during the exercise. Results indicated all subjects showed behavioral benefits during exercise improving on all the exercise tasks, however, no behavioral benefits generalized to the workshop setting on any of the dependent measures. However, Schurrer, Weltman, and Brammell (1985) found from their cardiovascular training program with mentally retarded adults that as a result there was increased interest with other non-athletic activities, demonstrated efforts at independent functioning, and increased work productivity.

Tomporowski and Jameson (1985) led two exercise programs with severely and profoundly retarded institutionalized adults. Both programs offered progressive training in cardiovascular fitness. Almost all of the subjects improved their physical endurance and ability to exercise. The ability to improve physical fitness was viewed as highly adaptive, but the most important observation was the high level of motivation displayed by the participants. The authors conclude that due to inherently motivating characteristics of exercise, educators could use this
exercise medium to teach adaptive skills such as command training, communication, counting, discrimination, and social skills instruction to low functioning retarded.

These previously mentioned studies give support to the notion that individuals with retardation adapt well to exercise experiences, however, reveal the difficulty in accurately measuring adaptive change.

Exercise has been shown to be potentially beneficial in aiding the individual with mental retardation to improvements in work production and problem solving. Ju-Peilj (1985) studied how daily martial arts exercises affect attention, memory, and motor coordination in third graders with mental retardation. Subjects in the study participated in martial arts exercises for one year. Results showed exercise over the year significantly improved concentration and memory ability, but had no significant effects on motor coordination. Evans, Evans, Schmid, and Pennypacker (1985) showed that with behaviorally disordered adolescents vigorous exercise in the form of jogging facilitated positive changes in the classroom. The adolescents had fewer talk-outs, increased the percentage of problems completed per class session, and gained more favorable ratings from their teachers. Beasley (1982) studied fifteen adults with mental retardation who participated in a daily jogging program (eight weeks) to assess the effects on the rate of production at a workshop task. The program was found to
be successful in both increasing fitness and work productivity. The authors, however, question whether the subjects were overly dependent on their monitors as the source of motivation to train. Schurrer's et al (1985) study addressed this question by allowing five adults with retardation to voluntarily participate in a 23 week training program. He found most subjects were self motivated and attended the exercise groups the majority of times. He found that the subjects during treatment showed interest in other activities, demonstrated independent behavior, and increased work productivity. Allen (1980) and Thoren (1971) have shown that physical training can improve school performance and self concept while providing successful experiences for retarded students.

These studies support the notion that exercise is a good medium to teach adaptive skills to the mentally retarded. Problem behaviors have not only been shown to decrease, but problem solving and work productivity have been shown to be positively affected by exercise (Beasley, 1982; Allen, 1980; and Schurrer, 1985). It is encouraging that several authors have viewed exercise as a source for motivation that could provide a mechanism for further learning of adaptive skills (Tomporowski and Jameson, 1985; Schurrer, 1985). Motivation through the medium of exercise needs to be thoroughly explored so that ways to gain beneficial results can be maximized. Enhanced motivation opens the door to the possibility that a variety of socially appropriate behaviors could be taught as the individual with retardation gains control.
over his/her behavior. An internal feeling of mastery with improvements in exercise could have implications for improved efforts in other areas. Positive life benefits could be maintained if individuals could be taught to incorporate exercise into their routines (Buffone, 1980).

The Ecobehavioral Approach

Recently ecological psychology has become a valuable approach in managing therapeutic environments. It deals with environmental cues (situation specific) that often occur with or immediately preceding maladaptive behaviors. This orientation emphasizes system-like interdependencies among environment, organism, and behavior (Willems, 1974). Moos (1974) states that human behavior cannot be understood apart from the environmental context in which it occurs; accurate predictions of behavior or treatment outcome are dependent upon this relationship. He advocates that both physical and social environments should be studied together, since neither can be fully understood alone. Willem (1974) argues that if we intervene and change one aspect of behavior, others are affected that we need to understand.

The ecological perspective tends generally to emphasize molar phenomena. There is a related emphasis on environmental, behavioral, and organismic holism and the simultaneous, complex
relationships (Schoggen, 1978). Due to the emphasis on holistic relationships, systems theories and approaches are becoming valuable tools to represent the interdependence and simultaneous, time-related complexity of various behaviors. This understanding of the behavior-environment system will allow rational anticipation in using the most effective operant approaches in treating problem behaviors instead of continuing to fight brush fires with ineffective treatments (Willem, 1974).

Schoggen (1978) has emphasized the need for more studies of ecological environments with the mentally retarded; molar actions need to be viewed in a variety of ecological environments and behavior settings. Schoggen views the current environmental situation in large institutions as an "overmanned ecology". This can result in depriving the retarded of: participating responsibly in activities, opportunities in doing things for themselves, setting goals and trying to reach them, risking failure and relishing success, and joining friends and avoiding enemies. The same behavior(s) that gain acceptance and approval in an undermanned setting may be the basis for rejection and disapproval in an overmanned setting, and vice versa.

Although it has been accepted for years that ecological variables influence the incidences of behavior problems, only recently have researchers provided objective data for managing therapeutic environments (Schoggen, 1978). The results of
treatment outcomes have shown that the perceived treatment environment is as important as objective characteristics such as the size of the program, staffing, and patient background variables (Moos, 1974).

Territoriality has often been studied in relation to its effects on the behavior of the retarded. Paluck and Esser (1971) studied territorial behavior of severely retarded boys in an experimental day-room. They found that territoriality was a very strong factor contributing to aggression. They observed improvements in psychological health when a boy would move from an isolated and uncontested area to a popular and contested territory and a move from fixed territorial ownership to participation in a staff power structure as an expression of dominance. Hereford, Cleland, and Fellner (1973) found that for profoundly retarded males in an institution, nocturnal enuresis and encopresis markedly decreased after territorial expansion. This was interpreted as scent-marking territorial areas. When visual boundaries were constructed, a further decrease was evidenced.

Talkington, Hall, and Altman (1971) compared matched groups of non-communicating and communicating retarded subjects on nine measures of aggression. The non-communicating group demonstrated significantly more aggressive attention-seeking behaviors: destroying property, tearing their own clothes, requiring restraint, breaking windows, and engaging in aggressive
outbursts. Opportunities at communicating are often attempted through the retarded's immediate environment and the physical environment and its antecedents often dictate how these communications are expressed.

Finally, Mulick and Schroeder (1980) highlight the need for an ecobehavioral approach in their discussion of successful treatment approaches for people with mental retardation who display anti-social behavior. They stress that only examining specific intervention procedures is not enough, but that the entire programmatic context of the behavior(s) must be considered. They state that "any other approach will continue to leave us with a collection of 'procedures' and 'treatments' that may or may not be compatible with each other, that may or may not work depending on unmeasured subject and setting characteristics, and that may or may not lead to the development of a competing pro-social behavior repertoire" (page 412).

In summary, the Ecobehavioral Approach presents a molar view of behavior where there is a complex series of interdependencies between a person and their environment. Total focus on one aspect of behavior can rob the viewer of a more enlightened look at the contributors to a certain behavior pattern. The progression of behavior is a dynamic time-related process that today is often being conceptualized through systems theories and
approaches. The environment is being examined closely as more studies show how a change in the environment can have a direct impact on the resulting behavior.

Exercise Effects on Anxiety and Stress

Exercise has been shown to have therapeutic effects with a variety of clinical problems. In the past, researchers have shown convincingly that the mind can affect the body (Pelleittier, 1977) as evidenced by the prevalence of several psychosomatic disorders. However, until recently, the inverse relationship of the body's effects on the mind was not taken seriously (Buffone, 1980). It is now becoming widely accepted that physical exercise can lead to positive psychological outcomes in a wide range of disorders. It has been shown to improve the psychological functioning of the drug and alcohol addicted (Dodson and Mullens, 1969; Guthrie and Gary, 1972); phobias (Orwin, 1973; Orwin, 1974); individuals with extreme anxiety (Morgan, 1973; Driscoll, 1976); the obese (Collingwood and Willet, 1971); anorexia nervosa and lifestyle changes (Kostrubala, 1976); poor self-concept (Collingwood, 1972); insomnia (Morgan, 1973) and depression (Kavanaugh, Shepard, and Tuck, 1975; Brown, Ramirex, and Taub, 1978; Conroy, Smith, and Felthaus, 1982).

Since a large percentage of patients seen by general practitioners today suffer from anxiety neurosis, stress in its
treatment has been a commonly studied topic. Selyle (1959) developed a classic theory on the process on which stress affects the body. He outlined how the body progresses through natural stages when reacting to a stressor - an alarm reaction, followed by a plateau of defensive resistance, and finally if overburdened a stage of complete exhaustion. He labeled this bodily process the General Adaptation Syndrome. Stress, Selyle claimed is unavoidable and constantly impinges on the organism who adapts non-specifically to the stressors with bodily changes. Stress can take the form of pleasant or unpleasant stimuli; it is the demands for biological readjustment that define stress. Selyle (1976) views exercise as one of the least dangerous stressors. He states that certain emotional factors such as frustration are particularly likely to produce distress to the body, whereas in most cases physical exercise will have the opposite effect.

Exercise has been demonstrated to reduce stress in several studies (Bahrke and Morgan, 1978; Wood, 1977; Mitchum, 1976; Morgan and Horstman, 1976; Morgan, Roberts, and Feinerman, 1971). Morgan (1971) showed that with both moderately and highly anxious subjects that 45 minutes of vigorous exercise substantially decreased state anxiety. Morgan and Horstman (1976) replicated earlier findings in showing anxiety to be dramatically reduced in thirty men diagnosed as anxiety neurotics and thirty men with no diagnosed problem. In this study, anxiety increased during early periods of exercise, reached an asymptote half-way
through the workout, and then dramatically decreased following the exercise. These anxiety reductions were attributed to changes to biochemical functioning: decreases in lactate levels, plasma epinephrine, and plasma norepinephrine. Morgan and Bahrke (1973) evaluated state anxieties in adult males before an intense workout, immediately following, and 15 and 30 minutes after the activity. Significant reductions took place during post exercise periods.

Mitchum (1976) investigated state anxiety in 20 adult males and females and found significant reductions following 15 minutes of a racket ball activity. Anderson and Morgan (1973) engaged 17 adult females in a modified Balke treadmill test and reported that state anxiety decreased significantly in the group collectively as well as in those judged to be clinically anxious prior to the study.

Although these studies point to reductions of anxiety in both normal and highly anxious subjects, actually contributing a causal relationship to exercise must be approached with caution (Morgan, 1979). Other confounding variables could possibly be influencing the results. Other passive therapies such as meditation have been shown to manage anxiety as well as exercise therapy (Bahrke and Morgan, 1978). An interesting finding was that while physical exercise and meditation seemingly represent opposing ends of the arousal continuum, exercise producing arousal, and meditation reducing arousal, both result in anxiety reduction.
Several conclusions can be drawn from these studies. Light exercise has been shown not to modify state anxiety (Morgan, 1979; Sime, 1977) but it has not been determined how vigorous exercise must be to show a significant effect. This could have strong implications when designing an exercise program. Also, although both exercise and passive therapies have been shown to quantitatively reduce anxiety, there could be qualitative differences in how exercise affects the body (Morgan, 1979). Many physiological results may occur with exercise that do not occur with more passive therapies. Finally, most studies have looked at the effects of exercise on anxiety for only short periods of time following exercise. But as Buffone (1980) suggests, exercise established as a life habit could carry treatment effects beyond therapy and could be used as a preventative tool to ward off daily stresses and difficulties.

Theoretical Explanations of Exercise Impact on the Organism

In 1984 at the National Institute of Mental Health Conference several affective benefits of vigorous exercise were concluded: (1) exercise is associated with reduction of stress emotions such as state anxiety, (2) exercise has been associated with the decreased level of mild to moderate depression and anxiety, (3) appropriate exercise results in reduction in various stress indices such as neuromuscular tension, resting heart-rate, and stress hormones, (4) physical fitness is positively associated with mental health
and well-being, and (5) physically healthy people who require psychotropic medication may safely exercise when medications are titrated under close medical supervision (Morgan, 1982). Although these benefits have been repeatedly seen, the mechanism behind these behavioral changes is not clearly understood.

Many early theories pertaining to behavior change dealt with how aggression could be decreased through cathartic means such as was found in Freud's (1930) aggression-catharsis hypothesis. This theory was consistent with a widely accepted and popular theory of the frustration-aggression hypothesis model by Doob, Miller, Mower, and Sears (1939). This theory states that frustration leads to an arousal of the aggressive drive motivating the person to take aggressive action. The performance of the act reduces arousal and makes further aggression less likely. This theory is popular but no conclusive evidence can be drawn due to the lack of most studies in collecting both physiological and behavioral data concurrently. However, other researchers such as Layman (1972) suggest that reduction in aggression is related to something other than merely a "draining" of pent-up energy. But, how this physical release affects the mechanisms responsible for a maladaptive, aggressive response needs to be dissected and studied thoroughly. Research evaluating how physical activity interventions affect behavior change could provide much needed information regarding programmatic efforts for individuals with both mental retardation and emotional disturbance.
Several different types of theories have been postulated to explain how exercise reduces conditions associated with severe behavior problems (Morgan, 1982). Each has some basis for support, but not one has gained popular acceptance to the total exclusion of the others.

First, there are a group of psychological theories which do not necessitate physiological explanations as a prerequisite for behavior reduction. One popular theory, the "distraction hypothesis" claims that target behaviors are reduced because exercise diverts one's attention away from stressful stimuli, which creates a positive affective change, not due to the exercise in itself (Bahrke and Morgan, 1978). This theory gained some support when it was found that exercise, meditation, and distraction placebo all possessed anti-anxiety properties. However, a weakness in the study's methodology makes this hypothesis somewhat questionable. Another theory looks at exercise from a "meditation model" where an individual who exercises regularly performs similar repetitive, rhythmic motions as one who is engaged in sedentary meditation. This triggers the mechanisms responsible for an altered state of consciousness. Ismail and Trachman (1973) propose a "locus of control" theory which states that physical training gives a person a sense of mastery or control over themselves and their environment. This sense of control becomes associated with enhanced self-concept, reduced anxiety, and positive effects on other personality
variables. Finally, Folkins and Sime (1981) endorse a theory that
was developed by Lazarus (1975). Lazarus proposes that fitness
training enhanced the person's ability to adapt and cope with the
environment. Increases in physical fitness can reduce excitation to
emotional provoking stimuli by slowing autonomic responses
(example: blood pressure, heart rate). Thus impulsive, hostile
behavior is less likely to occur. Zillman, Johnson, and Day's (1974)
study support this theory by concluding that subjects who were
more physically fit were less provoked to aggression than unfit
subjects. Michael (1957) arrived at similar conclusions by
suggesting that exercise strengthens the adaptive mechanisms of
the body.

Second, there are a group of theories that postulate that
given central nervous system changes affected directly by exercise
result in reductions of problem behaviors. The "monamine
hypothesis" states that exercise raises norepinephrine and
serotonin levels, which directly reduce depression. Norepinephrine
and serotonin levels are often implicated in moderate depression
and schizophrenia (Morgan, 1982). This theory has gained most of
its experimental support from research conducted with small
animals. One human study done by Ransford (1982) gave some
support to this hypothesis when he showed that drug therapy
restored levels of norepinephrine and serotonin, relieving
depression. Another theory based on the "brain function model"
views behavior to be directly effected by increased blood flow and
oxygenation to the brain. The suggestion is that the increased oxygenation produced an positive effect on the function of the central nervous system.

Third, there are a group of theories linked to neurohumeral changes (Buffone, 1980). The first set of theories are based on the effects of "endorphins" on brain functioning. These theories state that endogenous morphine-like substances are released from the brain directly impacting on one's mood and consequently affecting behaviors (Morgan, 1982). Pert and Bowie (1979) found that rats changed their opiate receptor occupancy following exercise. The increased opiate receptor occupancy created a psychological state of euphoria. This same mechanism is used to explain exercise addiction in human runners (Little, 1979). Carr, Bullen, Skrinar, Arnold, and Rosenblatt (1981) showed that in women, physical conditioning progressively increased the B-endorphin and B-lipotropin levels. This would impact on the woman's sense of well-being. As further support for the endorphin receptors influencing one's mood, studies have shown that a drug called naloxone attaches to endorphin receptor sites blocking the anticipated feeling of euphoria. Haier, Quaid, and Mills (1981) evaluated the pain threshold of 15 habitual runners, using naloxone doses and found significant mood changes following running. Although, much support has been gained for the endorphin hypothesis, certain studies have not shown support (Morgan, 1982). The problem with making a definitive statement is that there have been no
replications of the studies run nor have any two studies been
designed with identical research strategies. Second, some theories
have focused on how substances released in the body and carried by
the cardio-vascular system affect the brain (Buffone, 1980).
Hormones released from other areas of the body, such as sexual
steroids, can have powerful effects on the brain. Also endogenous,
morphine-like substances have been known to be released from the
pituitary gland and other tissues directly impacting on one's mood
and consequently affecting behaviors (Morgan, 1982).

In summary, the exact mechanisms responsible for exercise's
effects on behavior have not been reliably tested. Many different
explanations have been presented to try to unravel the mystery of
how exercise impacts on the organism. The exact mechanism(s)
responsible have not been conclusively found due to methodological
problems and lack of consistency across studies. The diversity of
theories has created many different types of studies making it
more difficult to support conclusively one group of theories. A
possibility still remains that all of these hypothesized
mechanisms may act in a synergistic manner with one another
(Morgan, 1982).

Exercise as a means of providing positive behavior change,
can lead to many exciting conclusions. The emotionally disturbed-
mentally retarded population with so many unmet needs, have a
resource available that not only addresses problem behaviors, but
simultaneously provides an avenue for learning adaptive skills. In addition, there can be great benefit realized by the individual in increased physical health, less dependence on medications and aversive controls, and successful experiences gained by exerting control and mastering the exercise experience. Exercise is a potentially motivating activity. Exercise seems to affect the human organism in a wide variety of ways, many still not understood. But the unknown provides new and exciting challenges.
CHAPTER III

METHODS AND PROCEDURES

Subjects

Eight adults ranging from mild to severe retardation participated in a study investigating the behavioral results of an exercise treatment and social attention and a social activity treatment and social attention utilizing arts and crafts. They were chosen from the residents at a developmental center in southeastern Ohio. This center is an institution run by the state of Ohio and houses approximately three hundred residents who have a diverse range of mental handicaps and physical disabilities. Subjects were chosen because of a diagnosis of emotional disturbance and mental retardation and/or documentation of multiple behavior problems and social dysfunction over the six months prior to the study. Many of the subjects were on psychotropic medication given for behavior control. There were four male and four female subjects in the study with a mean age of 31 years five months.
Characteristics of both groups as of November, 1988 can be found in Table 1.

All subjects came from the locked areas in Building 6049 (third floor - females; fifth floor - males). The subjects all had participated since April, 1988, in an Environmental Enrichment Program where the residents on both locked behavior areas have access to desired structured activities during their leisure times, as part of their Individual Habilitation Plan. These activities have been offered three times a day contingent on completion of self-care programming, exhibiting socially appropriate behaviors and not displaying maladaptive behaviors. Refreshments and free time off the living area have been rewards for successful daily completion of the activities. This program ran throughout the time of this study and was already part of the daily routine for both living areas for several months prior to the initiation of this study.

Subjects were checked by their physician prior to the initiation of this study for any medical contraindications and signed releases to participate were obtained. Guardians were all notified prior to the exercise treatment by a letter containing the study's purpose, procedure, and specific expectations of the participants. The guardians' "Release to Participate" was obtained. (See Appendix A). Physiological measures (baseline) were taken after the doctor gave approval, to ensure that there was no medical reason each subject should not participate.
# TABLE 1

CHARACTERISTICS OF SUBJECTS

<table>
<thead>
<tr>
<th>Age</th>
<th>Functioning Level</th>
<th>Height</th>
<th>Weight</th>
<th>Medication</th>
<th>Working Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ARTS GROUP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Debbie</td>
<td>31 yr 5 mo</td>
<td>Moderate</td>
<td>65&quot;</td>
<td>127 lb. Elavil, Valium</td>
<td>Generalized anxiety, dysthymic disorder</td>
</tr>
<tr>
<td>Evelyn</td>
<td>44 yr</td>
<td>Moderate</td>
<td>62&quot;</td>
<td>138 lb. Symmetrel, L-Tryptophan, Lithium, Tegretol, Thorazine</td>
<td>Cyclothymic disorder</td>
</tr>
<tr>
<td>Larry</td>
<td>30 yr 7 mo</td>
<td>Mild</td>
<td>69&quot;</td>
<td>190 lb. L-Tryptophan, Tegretol, Haldol, Motrin</td>
<td>Schizophrenia/Undifferentiated type</td>
</tr>
<tr>
<td>Jeff</td>
<td>31 yr 8 mo</td>
<td>Severe</td>
<td>65&quot;</td>
<td>143 lb. Thorazine, Peri-colace, Buspar</td>
<td>Behavior disorder</td>
</tr>
<tr>
<td><strong>EXERCISE GROUP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linda</td>
<td>29 yr</td>
<td>Mild</td>
<td>66&quot;</td>
<td>132 lb Norlestrin,</td>
<td>Behavior disorder</td>
</tr>
<tr>
<td>Katie</td>
<td>21 yr 7 mo</td>
<td>Mild</td>
<td>61&quot;</td>
<td>134 lb Cogentin, Navane</td>
<td>Organic personality with atypical affective disorder</td>
</tr>
<tr>
<td>Bernie</td>
<td>36 yr 5 mo</td>
<td>Mild</td>
<td>68&quot;</td>
<td>138 lb Tegretol</td>
<td>Right eye strabismus, and behavior disorder</td>
</tr>
<tr>
<td>Eugene</td>
<td>26 yr 9 mo</td>
<td>Mild</td>
<td>61&quot;</td>
<td>152 lb Tegretol, Mysoline, Thorazine, Valium, Cogentin</td>
<td>Grand mal seizure disorder and behavior disorder</td>
</tr>
</tbody>
</table>
All the subjects in the exercise group were familiarized and trained on both the equipment and the proper routine prior to the study. This investigator modeled each exercise in a step-by-step manner and gave each subject a chance to attempt each exercise (see Appendix B). If the subject used improper form it was corrected before moving to the next exercise. This was done to better ensure maximum exertion and effort during the exercise program due to task familiarity. The arts and crafts group was also taken through an orientation to learn the rules of the group and how crafts were to be utilized during the study.

It is felt that interest and motivation are essential to obtain maximum effort and the greatest physiological benefits during exercise; motivation is essential to prevent subject attrition due to boredom or discomfort with the exercise. A Likert-type questionnaire, the Exercise Benefits Questionnaire was developed to measure attitudes and perceptions of the subjects toward their exercise experience (See Appendix C - questionnaire and procedure).

This was administered before the exercise treatment and once a week during exercise.

Twelve students from a local college, Rio Grande College, were utilized to help organize and supervise each of the groups' activities. In each group there was a student assigned to a specific
subject to instruct them as well as give them individualized attention and feedback. These students were actively involved throughout the entire treatment period with only one student dropping out. Two new students were added during the second treatment week to help with the arts and crafts group. All students had the opportunity to receive course credit, and also to receive personal recommendations for successful participation in this study.

Pilot Study

The pilot study was conducted for three weeks prior to initiation of the study to test the proposed methodology on eight subjects at GDC who met the criteria for the study. Three subjects went through the exercise routine for one and one-half weeks. This group was then tested in the arts and crafts group for one and one-half weeks with one additional member added. At the same time the exercise group received four new subjects. Thus eight subjects went through the exercise routine and were taught and supervised by the students. The pilot's purpose was to establish a successful exercise routine and determine whether all of the proposed elements of this study were feasible with this most difficult population.

The pilot study made it clear that one-on-one supervision and guidance was necessary with this population to keep them task
oriented, give them a clear model of how to perform each exercise, and to keep their motivation level high. The groups appeared to benefit from this attention and there were few incidents of problem behaviors during the pilot treatment, although most subjects needed continual redirection.

As a result of the pilot study, the exercise routine was slightly modified from the original plan. Several weight exercises were added and several dropped to better meet the developmental needs for exercise with this population (See Appendix B). It was found that heart rates as measured by the Heart Watch could not be elevated on a consistent basis within each resident's training zone by using exercise bikes indoors. Therefore, an exercise course was set up outside and running outside raised the heart rates into the needed training zones. A running course was set up outside the main athletic complex of approximately one and one-half miles in length. By the second week of running most all subjects could continue running for a fifteen minute duration.

The arts and crafts group spent one and one-half weeks experimenting with a variety of crafts to see which crafts functionally would be the most appropriate for this population. They found certain techniques were more beneficial when attempting to manipulate various crafts, i.e. cutting was easier with safety scissors. From these sessions it was decided that each student would be responsible for planning a craft on a given
day and demonstrating it to the group. Any subject disrupting the group was to be put in a time-out chair until they were self-controlled enough to rejoin the group.

During this pilot each student was trained in what to expect from this population and specifically told the behavior problems and developmental needs of each subject. A smooth procedure was developed for recording heart rates and weight lifting repetitions.

Research Design

A single subject design (ABA-ACA, A=baseline, B=exercise program, C=arts and crafts program) was used to assess the effects of an exercise program and social attention and the effects of an arts and crafts program and social attention on social interaction, directed activity, and maladaptive behaviors. Two males and two females were randomly assigned to either the arts and crafts treatment or the exercise treatment using a chart of random numbers. Each treatment program ran simultaneously an hour each day for seven weeks with a baseline period of six days of behavioral observation before treatment and a baseline of fourteen days of behavioral observation following treatment.

Observational data was taken daily, Monday through Friday, for both treatment groups on their respective living areas. The Ecobehavioral Assessment (See Appendix D) was used to rate each
subject's behavior for a twenty minute period one to two hours following treatment.

The intensity of each subject's behavior each day was rated by a direct care staff on a special form, The Behavior Intensity Scale (See Appendix L). This scale was developed to assess whether the subject was having a good day or a bad day in relation to average behavior for that individual. This daily baseline was to show how on any given day specific behavior problems might covary with treatment effects.

Staff progress notes were used to count the frequencies of specific maladaptive behaviors occurring at GDC each day. These data were collected six months before, during treatment, and seven weeks following treatment for purposes of studying behavior change and any generalization effects that could possibly be affected by treatment (See Appendix E).

Baseline Data

Staff progress notes (first and second shifts) were reviewed for all eight subjects to gain a baseline of maladaptive behavior up to six months prior to the treatment groups. These behaviors were categorized using the same operational definitions given in the Ecobehavioral Assessment modified from Rojahn and Schroeder's 1979 instrument (Modified Assessment, Appendix D). Behaviors
were categorized in the areas of Aggression, Opposition, Property Destruction, Self-injury, and Stereotypic Behaviors (See Appendix E for Definitions and Examples). However, for these data Aggression was broken down into Verbal Aggression and Physical Aggression. Baseline was also taken of maladaptive behaviors from the progress notes up to seven weeks following treatment. Thus, all maladaptive behaviors occurring by each subject on GDC grounds was coded before, during and after treatment.

There were six days in which baseline observational data were gathered on seven of the subjects. (See Ecobehavioral Assessment, Appendix D). One subject refused to be observed on one of the baseline days. Each subject's behavior during baseline and throughout the study was observed for a continuous twenty minutes. This twenty minutes was broken down into sixty ten-second observed intervals and sixty ten-second record intervals. The order of observation of the subjects (four on each floor) was randomly chosen each night from a table of random numbers. Two of the female subjects nightly needed to be observed last because of jobs following dinner (dishwashing and table cleaning). To interrupt this routine would have created too many problems.

The procedure of obtaining baseline observations and the time of observations were identical to those done during the treatment period. Each main observer after three consecutive baseline days switched floors, each coding four subjects a night. During the
regular treatment phase, each main observer switched floors weekly. All codes were recorded on the Behavioral Record Form (See Appendix F). Baseline periods for direct behavior observations were done for fourteen days following treatment for each of the eight subjects. However, due to the unavailability of one of the main observers the final baseline week, subjects were observed each night for ten instead of twenty minutes.

Reliability Assessments

Three observers were adequately trained on the ecobehavioral coding system prior to live observational baseline. Two observers were designated as primary coders and one was designated to establish reliability weekly with the primary coders. All were initially trained by viewing a taped segment (ninety minutes) of an extremely behaviorally disturbed eight-year-old autistic boy. In the tape, this boy was attempting to follow directions from an instructor during a sit-down task. The Ecobehavioral Assessment categories and definitions were revised several times during these sessions based on group discussion. The final instrument contained fourteen behavior categories (See Appendix D).

After agreement of at least .80 on all of the categories, several residents were coded on the living area twenty minutes apiece for purposes of establishing reliability using the following formula by Bakeman and Gottman (1986) page 75:
A

\[ A+B+C \times 100 = \text{percent agreement on occurrence} \]

\( A \) = both the observer and the standard record agree on the occurrence of one behavior in one particular time interval.

\( B \) = the master record indicates an occurrence of one behavior during one particular time interval, the observers does not.

\( C \) = the observer scores the occurrence of one behavior in one interval, but not the master record.

The **Ecobehavioral Assessment**, an instrument which measures observations related to specific maladaptive behaviors and specific social interactions was adapted from Rojahn and Schroeder's 1979 instrument for purposes of observing directly on the living areas. The final Ecobehavioral Categories contained the following: Maladaptive Behavior Categories - aggression, destruction, self-injury, stereotypic behavior, opposition; Social Interaction Categories - positive attention subject, positive attention staff, negative attention staff, positive instruction staff, negative instruction staff, compliance, non-compliance; and Directed Activity - goal directed behavior, non-goal directed behavior, and no observation. Each category has its own definition and behavioral examples (See Appendix D). All the codes in the three major categories are all mutually exclusive.
Each week during treatment a third trained observer coded one night with each main observer. These nights were randomly chosen. Each week this observer changed the order that he met with the main observers. Reliability was taken for about 25% of the total observational time each week. Each night the data were taken, reliability was checked and each Ecobehavioral Category coded using the Bakeman and Gottman (1986) formula.

The three observers spent time with each of the subjects each night for one week prior to initiating this study to control for the novelty effect that could be expected due to the raters presence. Each rater during baseline listened to a pre-recorded cassette tape with ten-second intervals of observe and record aided by the use of an ear plug. When subjects approached an observer they were told, "I'll talk to you later. I am busy." Staff were told that observations were being taken to judge whether the daily treatment programs were going to be effective. They were told to go about their routine and ignore the observers.

The staff progress notes were coded for the categories of: Verbal Aggression, Physical Aggression, Opposition, Property Destruction, Self Injury, and Stereotypy before, during, and after treatment. A volunteer was trained on this coding procedure (see Appendix E) to .80 reliability or better on each category. Then 9 of 25 weeks were randomly chosen before the treatment period, all 32 days of treatment, and 4 of 7 weeks after treatment were randomly
chosen for purposes of obtaining reliability. Reliability data was taken after the main coder had finished coding all the progress notes. Jeff's progress notes were missing due to his recent transfer to another development center. Eugene also had two-weeks data missing during treatment. Each behavior category was summed across subjects and the Bakeman and Gottman (1986) formula was used for computing reliability.

Reliability was computed on the Behavior Intensity Scale after the study's completion by having day and night shift rate the behavior intensity of three out of the four men and women who were subjects in the study. Jeff was not rated due to being transferred to another developmental center. Katie was not rated due to being at school all day off-grounds. The behavior intensity scale was filled out each shift on the individuals for two consecutive days. Three direct care staff rated the same subjects each shift except for day number two when both shifts had only two raters. Since there were different raters each day depending on staff requirements, for analysis purposes raters were randomly chosen in three separate columns. The Spearman Rank Order Correlation was computed between each of the three columns to gain an estimate of the reliability of the instrument.
Exercise Treatment Group

Four subjects participated in an exercise program which lasted one hour per day and ran for seven consecutive weeks, Monday through Friday (See Table 1 for subject description). Subjects were properly trained on the use of the exercise equipment and the appropriate routine prior to the exercise training. The Exercise Benefits Questionnaire was administered to the subjects prior to the exercise treatment and once a week during the treatment phase. To allow answers to reflect reliable responses, three wooden blocks were used as concrete examples to anchor the subject's strength of response to each question. The subject gave the experimenter one block if he or she disliked what the question asked, two blocks if he or she had a neutral feeling about what the question asked, and three blocks if he or she liked what the question asked (See Appendix C). This represented a pattern of weekly attitudes for each subject toward their exercise experience. It was of interest to see how a participant viewed his or exercise experience in relation to objective measures of behavior change, as rated by trained observers.

Since body composition, cardiovascular fitness, flexibility, muscular endurance, and muscular strength are the health related components of physical fitness, (Corbin and Lindsey, 1985) an exercise routine similar to the one in Jansma and Combs, (1987) study was utilized. It consisted of a ten-minute warm-up, fifteen
minutes of muscular strength exercises, and twenty-five minutes of cardiovascular training followed by a five-minute cool-down.

The warm-up phase (flexibility training) consisted of neck stretches (side-to-side; forward-to-back), arm-hand-shoulder exercises (side-to-side; overhead), toe-touching exercises (legs together; legs spread), inside leg stretch, knee tuck, thigh stretch, hurdler sit, pike sit, and leg lift (to the side) (See Appendix B for definitions). These warm-up exercises took place in the gymnasium which is adjacent to the weight room. Three sets of ten to twelve repetitions on each exercise was encouraged. This warm-up phase was used to help enhance muscular flexibility. Each subject, during the warm-up, had a volunteer assigned who gave verbal prompts to encourage proper form and physical guidance when necessary.

The muscular strength phase consisted of a routine of horizontal bench press, leg press, lat pull-down, bicep curls, military press, leg extension. Bent leg sit-ups were used as a muscular endurance exercise. (See Appendix B for definitions). A room measuring 40 feet by 20 feet which houses the Universal Unit was used for the muscular strength exercises and the muscular endurance exercise (sit-ups). Subjects were encouraged to perform one set of all the upper body activities with eight to twelve repetitions on each set and also a set of lower body activities with the same number of repetitions. Subjects began each exercise
with enough weight that it took minimal effort to reach eight repetitions and maximum effort to reach twelve repetitions. When a subject reached ten repetitions on an exercise, the weight was increased to the next highest increment to be attempted on the next lifting day. During each exercise session after the completion of a muscular strength activity, the staff recorded the weight and number of repetitions on the individuals progress chart (See Appendix G). Staff gave verbal praise during each exercise on the average of once every fifteen seconds as determined by two days of baseline taken during the pilot study. If the subject could not at least lift six to eight repetitions of a given weight using proper form, the weight was dropped to the next lower plate and re-attempted until the subject could successfully complete twelve repetitions with good form. Repetitions were only counted if the subject proceeded through the entire range of motion for a given repetition. No subject was pushed past the point of comfortable exertion on any given exercise. Proper form was emphasized on each exercise with the aid of the one-on-one supervision. This supervision helped ensure safety and encouraged motivation.

The cardiovascular phase consisted of the subject's running a predetermined one and one-half mile outside course for a period lasting twenty-five minutes. During the first several weeks exertion was encouraged and progress noted. Every four minutes of cardiovascular training heart rates were recorded. Each subject was encouraged to increase the time of cardiovascular exercise
beginning with several minutes at the study's initiation and working up to fifteen minutes by the middle of the second week. Each subject ran directly with a student who gave verbal encouragement and when necessary took the subject's hand to encourage continued movement. Resting was discouraged and when a subject stopped, the student would encourage the subject to keep his or her feet moving.

A (Computerized Instruments Corporation) Heart Watch (Model 8699) was worn by each subject during the cardiovascular portion. This apparatus reliably measures beats per minute on an on-going basis (Leger and Thivierge, 1988). When compared with 13 commercial heart rate monitors, its validity (.95-.97) and stability were rated superior. It was also deemed to be the most functional due to its allowing the subject almost total freedom of movement. The apparatus consists of a rubber belt with a built-in transmitter which attach comfortably around the subject's chest with the aid of an elastic band, and a monitor (light-weight wrist watch) picks up the heart beat by the use of telemetry. The experimenter holds the watch and reads the digital representation of the heart beat within ten feet of the subject. The Heart Watch alerts the experimenter to any danger signals as a result of the exercise/stress as well as to indicate current exercise intensity as represented by the heart beats per minute.
One student would act as a recorder of the heart rates with the help of the stop watch and would alert the other students running with the Heart Watches just prior to the four, eight, twelve, and fifteen-minute running segments (See Appendix H).

A five-minute cool-down which consisted of several of the initial warm-up exercises was performed immediately upon arriving in the gym following running.

Two subjects ran and two subjects lifted weights concurrently and then switched places. The males would run at the same time that the females lifted weights. Each week the order of the presentation was changed for the males and the females.

Other Health Related Fitness Measures

Other health related fitness measures were taken before and throughout the study with the help of a master's level exercise physiologist, Marilyn Shealy, at the development center in southeastern Ohio. A skin-fold test was taken for each subject before the exercise treatment and after seven weeks (Jackson and Pollick, 1978; 1980). In addition to the daily heart rates taken for each subject during running, recovery heart rates were taken at one-minute intervals for three minutes after subject's worked up to fifteen consecutive minutes. The Cooper Walk-Run Test (Cooper, 1972; Corbin and Linsdey, 1985) was administered before the
exercise treatment to subjects in both groups and to the exercise
group after four weeks, and to both groups once again after seven
weeks. A flexibility measure, the Sit and Reach Box (Jansma,
Decker, McCubbin, Combs, and Ersing, 1986), was used to take
flexibility recordings for all subjects before and after treatment
and to the exercise group once a week during training. Thus, the
fitness levels of subjects in both groups could be compared prior to
and after treatment.

**Arts and Crafts Group**

Four subjects participated in this group which met at the
same time as the exercise treatment. The activities were held in
the multi-purpose activity room at the Activities Center at GDC.

Several different types of functional arts and crafts
activities were chosen which could be prepared, worked with and
cleaned up during an hours period. Two or more functional crafts
were selected each week (See Appendix I). These crafts were
purchased with resident funds and became their property upon the
study's completion. These crafts were kept at the location of the
arts and crafts group and subjects were not told that they would
receive the crafts until the end of the study.

Similar amounts of social attention were given each subject
in both treatment groups consisting of instruction and verbal
praise on the average of once every fifteen seconds to keep the subject's attention to task. Both treatment groups were given the same types and amounts of reinforcers (See Reinforcement Levels section). Subjects all worked at a table together in preparing their crafts with one-on-one attention given from a student.

Any behavior incidents occurring in either group which demanded special instructor attention was recorded on the Behavior Non-Compliance Form (See Appendix J). This gave some idea to how much special attention was needed in each group.

Reinforcement Levels

To help motivate subjects in both treatment groups to stay on task and to continue the study, several levels of reinforcers were offered. First, at the end of each treatment session all subjects were offered fresh fruit and juice as a refreshment. Second, following successful completion of all the exercises as recorded on each individual's chart and successful completion of the arts and crafts, each subject earned a star which was given by the instructor and placed on the individual's chart (See Appendix K). These charts were hung each day in view of all the subjects. At the end of the five-day week, if the subjects had earned at least four stars, he or she was given a special prize. These prizes were such things as crayons, drawing paper, hats, cookies, combs, jewelry, model cars and other similar items chosen by this investigator.
based on a prior history of interaction with these subjects. Third, at the end of the study, all subjects who had successfully completed both treatment groups, received a transistor radio with headphones. One male subject wished to have a tobacco pipe in place of the radio. Finally, social attention was given to each subject by verbal feedback on the average of once every fifteen seconds and the presence of one-on-one attention by a student. These four levels of reinforcers provided the needed incentive to gain maximal effort during the treatment phases.
Overview of Chapter

The analysis of data for this study is divided into six sections. The first section analyzes observational data taken in three phases for the two treatment groups: one week prior to treatment, seven weeks during treatment, and two weeks post treatment. There is a graphic representation of the frequencies of social interaction, directed activity, and maladaptive behavior for each individual. These graphs represent an ecobehavioral analysis. Group data is also presented for each treatment group along with the comparison between groups for each ecobehavioral category. These analyses addressed the experimental question: What differential effects do participation in structured physical exercise and social attention vs participation in structured social activities and social attention have on the frequency of social interaction, directed activities, and maladaptive behaviors in individuals with emotional disturbance and mental retardation up to two hours post exercise? The second section presents a data analysis of the frequencies of maladaptive behaviors taken from staff progress notes. These data take into account maladaptive
behaviors during each subject's total waking hours. Individual graphs as well as group comparisons will be presented. These analyses address the second experimental question: Are there any behavioral benefits that generalize to the living environment and a result of either the exercise or Arts treatment groups? A third section will analyze physiological data taken before and during, and after the exercise treatment. A comparison of both treatment groups will be presented and the experimental question in relation to individual heart rates will be addressed: Can the participants in the exercise group keep their heart rates in their specified training zones as measured by the Heart Watch? A fourth section shows correlations of training heart rates and other fitness measures with progress note ratings and behavior observational ratings taken one to two hours post exercise. These analyses will address the experimental question: Does cardiovascular fitness as measured by training heart rate have a significant correlation with behavior changes in individuals with emotional disturbance and mental retardation? A fifth section describes the data concerning reliability and methods used in computing reliability. The data examining the motivation to exercise are also included in this section. These data attempted to address a secondary question raised in the study: How does motivation as measured by the Exercise Benefits Questionnaire relate to changes in maladaptive behaviors, social interaction, and goal directed behaviors? A final section explores how behavior intensity (qualitative) as rated by
the subject's primary service provider relates to changes in behavior (quantitative) as measured by the ecobehavioral observational ratings and staff progress notes during the treatment phase.

**Observational Data Analysis**

Observational data was collected on the living areas daily for each of the eight subjects one to two hours following each treatment session. This data was taken by a trained observer for 20 consecutive minutes per resident. This time represented 60 separate observe intervals and 60 separate record intervals. Each interval lasted ten seconds. Each subject was coded during each record interval using the behavioral codes found in the Ecobehavioral Assessment Instrument (Appendix D). Each code could only be used once per record interval with the exception of Positive and Negative Instructions and Compliance and Non-compliance which were based on the frequency of staff instructions given to the resident. Each night the frequency for each Ecobehavioral code was added across the sixty record intervals (see Appendix F) and divided by ten (number of record minutes) for a representative score for each code. These daily scores were used for purposes of analysis.
Observational data was collected during three separate phases: six days prior to treatment (baseline), 32 days during treatment, and 14 days following treatment. The Mann-Whitney U Test for the difference between two independent samples was used to evaluate the mean differences between the Exercise Group and the Structured Arts Group at each of the three phases. Group mean frequencies were compared for each code of the Ecobehavioral Assessment. For purposes of analysis, $P<.05$ was chosen to test significance.

Several individual codes were combined for purposes of analysis. A Maladaptive Cluster consisted of summing the frequencies of scores for the following categories: Aggression, Self-abuse, Destruction, Stereotypy, Opposition, Non Goal-directed Activity, and Non-compliance Rate. The Non-compliance Rate was calculated by figuring the ratio of the frequency of the subject's non-compliance to the frequencies of both positive and negative staff instructions. The Adaptive Cluster consisted of combining the frequency of codes in the following areas: Positive Attention (subject), Goal-directed Behavior, and Compliance Rate. The Compliance Rate was calculated by finding the ratio of the frequencies of subject compliance to the frequencies of both Positive and Negative Instructions. The Total Staff Contact Cluster consisted of combining the frequency data for the following areas: Positive Attention (staff), Negative Attention,
and Positive and Negative Instructions. Finally, a Social Interaction Cluster consists of the following categories: Positive Attention (staff), and Positive Attention (subject). Group means by code for each of the three phases can be found in Table 2 and 3 for both treatment groups.

For the Baseline Phase, the Mann-Whitney U showed no significant differences between group means on any of the individual codes or clusters. For Phase 2 (Treatment) the Mann-Whitney U approached significant differences in the Adaptive Cluster (U=2, p=.0833) and the Social Interaction Cluster (U=2, p=.0833). For both clusters the Exercise Group exhibited a significantly greater frequency of behavior. There was a significant difference in Non-compliance Rate with the arts group exhibiting a significantly higher rate (U=1, p=.0433).

For Phase 3 (Return to Baseline) the Mann-Whitney U analyzing mean differences between groups revealed that only Negative Attention (staff) approached significance (U=2, p=.0814, corrected for ties). The Exercise Group received more Negative Attention after the treatment ended. The other Ecobehavioral Categories were found to be non-significant. For significant and non-significant analyses, see Table 4 for all three phases.
<table>
<thead>
<tr>
<th></th>
<th>PHASE 1 (Baseline)</th>
<th>PHASE 2 (Treatment)</th>
<th>PHASE 3 (Baseline)</th>
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TABLE 3
ARTS OBSERVATIONAL GROUP DATA:
MEAN & STANDARD DEVIATION BY PHASE

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<th>PHASE 2 (Treatment)</th>
<th>PHASE 3 (Baseline)</th>
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# TABLE 4

MANN-WHITNEY U ANALYSIS OF DIFFERENCE BETWEEN GROUP MEANS:

OBSERVATIONAL DATA PHASES 1-3

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<td>Opposition</td>
<td>U=5.5 (c)</td>
<td>U=7.5</td>
<td>U=6.5 (c)</td>
</tr>
<tr>
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<td>U=6 (c)</td>
<td>U=4</td>
<td>U=8</td>
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<td>U=5</td>
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<tr>
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<td>U=5</td>
<td>U=4</td>
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<td>U=7</td>
<td>U=8 (c)</td>
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<td>U=4</td>
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<tr>
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<td>U=3 (c)</td>
<td>U=2 (c)*</td>
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<td>U=6</td>
</tr>
<tr>
<td>Negative Instructions</td>
<td>U=5.5 (c)</td>
<td>U=5 (c)</td>
<td>U=4 (c)</td>
</tr>
<tr>
<td>Compliance Rate</td>
<td>U=5.5 (c)</td>
<td>U=5</td>
<td>U=5 (c)</td>
</tr>
<tr>
<td>Non-compliance Rate</td>
<td>U=4 (c)</td>
<td>U=1 **</td>
<td>U=5 (c)</td>
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<td>U=4</td>
<td>U=5</td>
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<td>Adaptive Cluster</td>
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<td>U=2 *</td>
<td>U=4</td>
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<tr>
<td>Social Interaction Cluster</td>
<td>U=4</td>
<td>U=2 *</td>
<td>U=6</td>
</tr>
</tbody>
</table>

* = Significant at p < .10
** = Significant at p < .05
(c) = Corrected for ties.
A visual analysis will be presented of each individual using graphic data. Tawney and Gast (1984) state that visual analysis of graphic data represents the most frequently used data analysis strategy employed by applied behavior analysis and permits others to judge for themselves whether an intervention has merit and whether the findings are reliable and have social validity. Graphs were selected for this section if they demonstrated a level of change between adjacent conditions so as to show a degree of experimental control. Tawney and Gast (1984) state that generally if 80% to 90% of the data points of a condition fall within a 15% range of the mean level of all data points of a condition, applied researchers will consider the data stable. However, most data within phases reflected on the graphs to follow are not stable according to this definition. This could possibly be due to the changeable conditions experienced in a developmental center such as unpredictable staffing patterns, sudden routine changes, and problems created on these locked areas due to residents' outbursts. Also, due to the wide range of behaviors sampled by this Ecobehavioral Approach, one would expect the mood changes of an individual from day to day to be reflected in the data. Thus, mean lines will be drawn to represent the mean of each phase and will be used as a stable point of reference. The data will be evaluated by visual inspection for mean changes and upward and downward trends within each phase. A considerable change in mean between Phase 1 and Phase 2 of at least 33% or greater and evidence of a
return toward Baseline are criteria for including a graph in these results. Graphs not showing at least five non-zero data points in Phase 2 will be excluded from this Results Section. Graphs of individuals in both treatment groups which did not meet this criteria for experimental control can be found in Appendix M. From this Ecobehavioral Analysis there were 148 possible categories across the eight subjects in which this criteria was applied. This excluded categories in which no behavior was emitted and also the No Observation category. Of all these categories analyzed, 18% met the criteria for change. Graphs will not be presented in Appendix M unless there were at least five non-zero data points across the three phases.

Means and Standard Deviations for each individual on Ecobehavioral Codes and Clusters can be found in Tables 5-12.

Each individual's Maladaptive Cluster comprising the frequencies of Aggression, Destruction, Stereotypy, Opposition, SIB, Non Goal-directed Behavior, and Non-compliance Rate were correlated with the Adaptive Cluster, Total Contact Cluster and Social Interaction Cluster. The Adaptive Cluster consists of behavior frequencies in the combined areas of Positive Attention (Subject), Goal-directed Behavior, and Compliance Rate. Total Contact Cluster (Staff) consists of frequency data in the combined areas of Positive Attention (Staff), Negative Attention, and
Positive and Negative Instructions. The Social Interaction Cluster consists of frequency data in the combined areas of Positive Attention (Staff) and Positive Attention (Subject). These analyses will show how maladaptive behaviors are related daily to a variety of adaptive behaviors before, during, and following treatment. The Spearman Rank Order Correlation will be used to compare the Clusters at Phase 1, 2, and 3. Those correlations showing statistical significance for an individual only at Phase 2 (treatment) will be emphasized suggesting that the relationship may be due to treatment effects.
Katie

For Means and Standard Deviations by Phase, see Table 5.

There was a mean difference for Stereotypy between Phase 1 (4.42) and Phase 2 (2.79) of -1.63. At Phase 3, there was a return toward Baseline, mean 1.86. The data points showed no specific trends for Phase 2 or Phase 3.

Figure 1

Katie - Stereotypy
<table>
<thead>
<tr>
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<th>PHASE I (Baseline)</th>
<th>PHASE 2 (Treatment)</th>
<th>PHASE 3 (Baseline)</th>
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</thead>
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<td>Mean</td>
<td>Std. Dev.</td>
<td>Mean</td>
</tr>
<tr>
<td>Aggression</td>
<td>0.00</td>
<td>0.00</td>
<td>0.01</td>
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<tr>
<td>Destruction</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>*Stereotypy</td>
<td>4.42</td>
<td>1.74</td>
<td>2.79</td>
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<tr>
<td>Opposition</td>
<td>0.18</td>
<td>0.30</td>
<td>0.07</td>
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<tr>
<td>SIB</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>Pos. Attention</td>
<td>0.86</td>
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<td>0.82</td>
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<tr>
<td>Compliance</td>
<td>0.10</td>
<td>0.11</td>
<td>0.15</td>
</tr>
<tr>
<td>Non-Compliance</td>
<td>0.02</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>Goal-dir. beh.</td>
<td>0.78</td>
<td>0.98</td>
<td>1.83</td>
</tr>
<tr>
<td>Non Goal-dir. beh.</td>
<td>4.15</td>
<td>1.83</td>
<td>3.38</td>
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<td>No observation</td>
<td>0.15</td>
<td>0.21</td>
<td>0.26</td>
</tr>
<tr>
<td>*Pos. Attn. (Staff)</td>
<td>0.61</td>
<td>0.77</td>
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<tr>
<td>Neg. Attn. (Staff)</td>
<td>0.09</td>
<td>0.12</td>
<td>0.02</td>
</tr>
<tr>
<td>*Pos. Instructions</td>
<td>0.09</td>
<td>0.10</td>
<td>0.20</td>
</tr>
<tr>
<td>Negative Instructions</td>
<td>0.07</td>
<td>0.12</td>
<td>0.00</td>
</tr>
<tr>
<td>Maladaptive Cluster</td>
<td>8.79</td>
<td>3.43</td>
<td>6.39</td>
</tr>
<tr>
<td>*Adaptive Cluster</td>
<td>2.16</td>
<td>2.30</td>
<td>3.19</td>
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<tr>
<td>Total Contact Cluster</td>
<td>0.85</td>
<td>0.89</td>
<td>1.38</td>
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<tr>
<td>*Soc. Inter. Clust.</td>
<td>1.47</td>
<td>1.78</td>
<td>1.98</td>
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<tr>
<td>Compliance Rate</td>
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<td>0.76</td>
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<tr>
<td>Non-compliance Rate</td>
<td>0.05</td>
<td>0.1</td>
<td>0.21</td>
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</tbody>
</table>

* Met criteria for visual analysis.
The Positive Instructions Category had a mean difference from Phase 1 (.09) to Phase 2 (.20) of +.11 and a return toward Baseline at .15. There was a downward trend the first half of Phase 2 followed by an upward trend the second half. There was an upward trend the second half of Phase 3.

Figure 2

Katie - Instruction, Positive
The Positive Attention (Staff) Category had a mean difference from Phase 1 (.61) to Phase 2 (1.16) of .55. At Phase 3, there was a return toward Baseline at mean .64. There was a steep increase in Positive Attention during the second half of Phase 2 and a sharp drop back toward Baseline at Phase 3.

Figure 3

Katie - Positive Attention - Staff
The Adaptive Cluster had a mean difference from Phase 1 (2.16) to Phase 2 (3.19) of +1.03. At Phase 3, there was a return toward Baseline at mean 2.59. Within Phase 2 there was a steady increase throughout the phase, with a steady drop within Phase 3.

Figure 4

Katie - Adaptive Cluster
The Social Interaction Cluster had a mean difference from Phase 1 (1.47) to Phase 2 (1.98) of +.51. At Phase 3, there was a mean drop to 1.01. There was a steady increase in social interaction the second half of Phase 2. There were no other noteworthy trends.

Figure 5

Katie - Social Interaction Cluster
Means and Standard Deviations by Phase can be found in Table 6.

Non Goal-directed Behavior had a mean difference from Phase 1 (.5) to Phase 2 (.81) of +.31. At Phase 3 there was a return close to Baseline of mean .57. The second half of Phase 2, there was a gradual trend toward greater Non Goal-Directed Behavior, with a steady decrease within Phase 3.

Figure 6

Linda - Non Goal Directed
<table>
<thead>
<tr>
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<th>PHASE 1 (Baseline)</th>
<th>PHASE 2 (Treatment)</th>
<th>PHASE 3 (Baseline)</th>
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<td>Destruction</td>
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<td>0.06</td>
</tr>
<tr>
<td>Stereotypy</td>
<td>0.02</td>
<td>0.04</td>
<td>0.01</td>
</tr>
<tr>
<td>Opposition</td>
<td>2.07</td>
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<td>2.67</td>
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<td>0.12</td>
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<td>0.04</td>
</tr>
<tr>
<td>Pos. Attention</td>
<td>2.07</td>
<td>1.22</td>
<td>0.02</td>
</tr>
<tr>
<td>Compliance</td>
<td>0.12</td>
<td>0.20</td>
<td>3.79</td>
</tr>
<tr>
<td>Non-Compliance</td>
<td>0.02</td>
<td>0.04</td>
<td>0.02</td>
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<td>Goal-dir. beh.</td>
<td>4.53</td>
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<td>3.79</td>
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<td>0.81</td>
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<td>1.10</td>
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<td>Social Inter. Cluster</td>
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<td>3.70</td>
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<td>0.33</td>
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*Met criteria for visual analysis
- Only one data point
Eugene

Means and Standard Deviations by Phase can be found in Table 7.

Eugene showed a significant inverse correlation between his Maladaptive Cluster and her Adaptive Cluster at Phases 2 and 3. His Maladaptive Cluster was significantly inversely correlated with his Total Contact Cluster (Rho c=-.438, p=.0147) and Social Interaction Cluster (Rho c=-.604, p=.0008) only at Phase 2 suggesting the relationships could have been due to treatment effects (See Table 8).
<table>
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<tr>
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<th>PHASE 1 (Baseline)</th>
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<td>0.11</td>
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<tr>
<td>Destruction</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Stereotypy</td>
<td>0.00</td>
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<td>0.02</td>
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<tr>
<td>Opposition</td>
<td>0.00</td>
<td>0.00</td>
<td>0.04</td>
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<tr>
<td>SIB</td>
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<td>Non-Compliance</td>
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<td>0.07</td>
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<tr>
<td>Negative Instructions</td>
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<td>0.00</td>
<td>0.01</td>
</tr>
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<td>Malad. Cluster</td>
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<td>Adap. Cluster</td>
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<td>Total Contact Cluster</td>
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<tr>
<td>*Non-Compl. Rate</td>
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</table>

* Met criteria for visual analysis
**TABLE 8**

**MALADAPTIVE CLUSTER CORRELATIONS WITH POSITIVE CLUSTERS** -

**ANALYSIS BY PHASE AND INDIVIDUAL**

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<td>Phase 2</td>
<td>Phase 3</td>
</tr>
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<td>Rho=-.943</td>
<td>Rho c=-.777</td>
<td>Rho c=-.777</td>
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<tr>
<td></td>
<td>p=.035</td>
<td>p=.0001</td>
<td>p=.0051</td>
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<td>Malad Cl / Soc Int Cl</td>
<td>Rho=-.829</td>
<td>Rho c=-.356</td>
<td>Rho c=-.202</td>
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<tr>
<td></td>
<td>p=.0639</td>
<td>p=.0477</td>
<td>p=.0051</td>
</tr>
<tr>
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<td>Rho c=-.203</td>
<td>Rho c=-.151</td>
<td>Rho c=.218</td>
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<tr>
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<td>p=.4006</td>
<td>p=.4322</td>
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<table>
<thead>
<tr>
<th>EUGENE</th>
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<tr>
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<td>Phase 3</td>
</tr>
<tr>
<td>Malad Cl / Adaptive Cl</td>
<td>Rho c=-.794</td>
<td>Rho c=-.913</td>
<td>Rho c=-.902</td>
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<td>p=.0018</td>
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<td>Rho=-.314</td>
<td>Rho c=-.604</td>
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<tr>
<td></td>
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<td>Phase 1</td>
<td>Phase 2</td>
<td>Phase 3</td>
</tr>
<tr>
<td>Malad Cl / Adaptive Cl</td>
<td>Rho c=.118</td>
<td>Rho c=.706</td>
<td>Rho c=.877</td>
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<tr>
<td></td>
<td>p=.7925</td>
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<td>p=.0016</td>
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<td>p=.5988</td>
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* = Correlation only significant during treatment
**TABLE 8 (Contd)**

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<td></td>
<td></td>
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<td>Rho c=-.947</td>
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<td>p=.0022</td>
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<td>p=.035</td>
<td>p=.0004</td>
<td>p=.215</td>
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<td>Malad Cl/ Tot Cont Cl</td>
<td>Rho=-.771</td>
<td>Rho c=-.696</td>
<td>Rho c=-.413</td>
</tr>
<tr>
<td></td>
<td>p=.0845</td>
<td>p=.0002</td>
<td>p=.1362</td>
</tr>
<tr>
<td><strong>DEBBIE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malad Cl/ Adaptive Cl</td>
<td>Rho=-.943</td>
<td>Rho c=-.922</td>
<td>Rho=-.947</td>
</tr>
<tr>
<td></td>
<td>p=.035</td>
<td>p=.0001</td>
<td>p=.0006</td>
</tr>
<tr>
<td>Malad Cl/ Soc Int Cl</td>
<td>Rho=-.371</td>
<td>Rho c=-.614</td>
<td>Rho c=-.5</td>
</tr>
<tr>
<td></td>
<td>p=.4062</td>
<td>p=.0008</td>
<td>p=.0714</td>
</tr>
<tr>
<td>Malad Cl/ Tot Cont Cl</td>
<td>Rho c=-.464</td>
<td>Rho c=-.292</td>
<td>Rho c=-.178</td>
</tr>
<tr>
<td></td>
<td>p=.2997</td>
<td>p=.2461</td>
<td>p=.5205</td>
</tr>
<tr>
<td><strong>EVELYN</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malad Cl/ Adaptive Cl</td>
<td>Rho=-.9</td>
<td>Rho c=-.969</td>
<td>Rho=-.868</td>
</tr>
<tr>
<td></td>
<td>p=.0719</td>
<td>p=.0001</td>
<td>p=.0017</td>
</tr>
<tr>
<td>Malad Cl/ Soc Int Cl</td>
<td>Rho=-.5</td>
<td>Rho c=-.552</td>
<td>Rho c=.13</td>
</tr>
<tr>
<td></td>
<td>p=.3173</td>
<td>p=.0025</td>
<td>p=.639</td>
</tr>
<tr>
<td>Malad Cl/ Tot Cont Cl</td>
<td>Rho=-.6</td>
<td>Rho c=-.597</td>
<td>Rho c=.165</td>
</tr>
<tr>
<td></td>
<td>p=.2301</td>
<td>p=.0011</td>
<td>p=.5514</td>
</tr>
</tbody>
</table>

* Correlation only significant during treatment
### TABLE 8 (Contd)

<table>
<thead>
<tr>
<th></th>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>JEFF</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malad Cl /</td>
<td>Rho = -.6</td>
<td>Rho c = -.896</td>
<td>Rho c = -.868</td>
</tr>
<tr>
<td>Adaptive Cl</td>
<td>$p = .1797$</td>
<td>$p = .0001$</td>
<td>$p = .0017$</td>
</tr>
<tr>
<td>Malad Cl /</td>
<td>Rho c = -.486</td>
<td>Rho c = -.561</td>
<td>Rho c = -.635</td>
</tr>
<tr>
<td>Soc Int Cl</td>
<td>$p = .2774$</td>
<td>$p = .0036$</td>
<td>$p = .022$</td>
</tr>
<tr>
<td>Malad Cl /</td>
<td>Rho c = -.2</td>
<td>Rho c = -.283</td>
<td>Rho c = -.201</td>
</tr>
<tr>
<td>Tot Cont Cl</td>
<td>$p = .6547$</td>
<td>$p = .1419$</td>
<td>$p = .4684$</td>
</tr>
<tr>
<td><strong>LARRY</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malad Cl /</td>
<td>Rho c = -.812</td>
<td>Rho c = -.93</td>
<td>Rho c = -.881</td>
</tr>
<tr>
<td>Adaptive Cl</td>
<td>$p = .0695$</td>
<td>$p = .0001$</td>
<td>$p = .0015$</td>
</tr>
<tr>
<td>*Malad Cl</td>
<td>Rho c = -.348</td>
<td>Rho c = -.563</td>
<td>Rho c = -.194</td>
</tr>
<tr>
<td>Soc Int Cl</td>
<td>$p = .4367$</td>
<td>$p = .0024$</td>
<td>$p = .4841$</td>
</tr>
<tr>
<td>*Malad Cl</td>
<td>Rho c = -.29</td>
<td>Rho c = -.477</td>
<td>Rho c = .142</td>
</tr>
<tr>
<td>Tot Cont Cl</td>
<td>$p = .5169$</td>
<td>$p = .0102$</td>
<td>$p = .6095$</td>
</tr>
</tbody>
</table>

* = Correlation only significant during treatment
The Positive Instructions Category had a mean difference from Phase 1 (.13) to Phase 2 (.07) of -.06 and a return past Baseline to mean .15 at Phase 3. There was a sharp increase in Phase 1. Phase 2 had a gradual increase the first half of the phase and Phase 3 had isolated spurts throughout the phase.

Figure 7

Eugene - Instruction, Positive
The Non-compliance Rate Category had a mean difference from Phase 1 (0) to Phase 2 (.25) of +.25 and a return to Baseline at mean 0. For Phase 2, there were several isolated days of sharp increases in Non-compliance Rate with no obvious trends observed in Phase 3.

Figure 8

Eugene - Non-compliance Rate
Bernie

Means and Standard Deviations by Phase can be found in Table 9.

The Positive Instructions Category had a mean difference from Phase 1 (.04) to Phase 2 (.11) of +.07 and a return toward Baseline at mean .07. There was a sharp increase the first half of Phase 2 which returned to near Baseline level, followed by another sharp increase toward the end of the phase. There was a sharp decrease the first part of Phase 3 stabilizing to 0.

![Bernie - Instructions, Pos.](image)

Figure 9

Bernie - Instruction, Positive
<table>
<thead>
<tr>
<th></th>
<th>PHASE 1 (Baseline)</th>
<th>PHASE 2 (Treatment)</th>
<th>PHASE 3 (Baseline)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Dev.</td>
<td>Mean</td>
</tr>
<tr>
<td>Aggression</td>
<td>0.11</td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td>Destruction</td>
<td>0.02</td>
<td>0.05</td>
<td>0.00</td>
</tr>
<tr>
<td>Stereotypy</td>
<td>0.19</td>
<td>0.40</td>
<td>0.22</td>
</tr>
<tr>
<td>Opposition</td>
<td>0.02</td>
<td>0.05</td>
<td>0.01</td>
</tr>
<tr>
<td>SIB</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Pos. Attention</td>
<td>1.88</td>
<td>1.80</td>
<td>2.91</td>
</tr>
<tr>
<td>Compliance</td>
<td>0.02</td>
<td>0.05</td>
<td>0.09</td>
</tr>
<tr>
<td>Non-Compliance</td>
<td>0.02</td>
<td>0.05</td>
<td>0.03</td>
</tr>
<tr>
<td>Goal-dir.beh.</td>
<td>2.89</td>
<td>1.66</td>
<td>2.75</td>
</tr>
<tr>
<td>Non-goal dir.beh.</td>
<td>1.88</td>
<td>2.02</td>
<td>1.26</td>
</tr>
<tr>
<td>No observation</td>
<td>0.50</td>
<td>0.42</td>
<td>0.37</td>
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<td>Pos. Attn. (Staff)</td>
<td>0.53</td>
<td>1.13</td>
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<tr>
<td>Neg. Attn. (Staff)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.09</td>
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<tr>
<td>*Pos. Instructions</td>
<td>0.04</td>
<td>0.06</td>
<td>0.11</td>
</tr>
<tr>
<td>Negative Instructions</td>
<td>0.00</td>
<td>0.00</td>
<td>0.01</td>
</tr>
<tr>
<td>Malad. Cluster</td>
<td>2.36</td>
<td>2.43</td>
<td>1.73</td>
</tr>
<tr>
<td>Adap. Cluster</td>
<td>4.94</td>
<td>2.83</td>
<td>6.04</td>
</tr>
<tr>
<td>*Total Cont. Cluster</td>
<td>0.56</td>
<td>1.17</td>
<td>1.07</td>
</tr>
<tr>
<td>*Social Inter. Cluster</td>
<td>2.40</td>
<td>2.76</td>
<td>3.77</td>
</tr>
<tr>
<td>Compliance Rate</td>
<td>0.50</td>
<td>0.71</td>
<td>0.82</td>
</tr>
<tr>
<td>Non-compliance Rate</td>
<td>0.5</td>
<td>0.71</td>
<td>0.19</td>
</tr>
</tbody>
</table>

*Met criteria for visual analysis.
There was a mean difference for the Total Contact Cluster between Phase 1 (.56) and Phase 2 (1.07) of +.51. At Phase 3, there was a return toward Baseline at mean .85. There was a gradual increase in staff contact the last third of Phase 2, and a steady drop in staff contact in Phase 3.

Figure 10

Bernie - Total Contact Cluster
There was a mean difference for the Social Interaction Cluster between Phase 1 (2.4) and Phase 2 (3.77) of +1.37. At Phase 3, there was a return toward Baseline at mean 2.89. There were no evident trends within Phase 2 or Phase 3.

Figure 11

Bernie - Social Interaction Cluster
Means and Standard Deviations by Phase can be found in Table 10.

There was a mean difference for Stereotypy between Phase 1 (.17) and Phase 2 (.76) of +.59. At Phase 3, there was a return to Baseline at mean .22. There was an increase trend within the second half of Phase 2 with only an occasional exhibition of Stereotypy in Phase 3.

---

**Figure 12**

Jeff - Stereotypy
<table>
<thead>
<tr>
<th></th>
<th>PHASE 1 (Baseline)</th>
<th>PHASE 2 (Treatment)</th>
<th>PHASE 3 (Baseline)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Dev.</td>
<td>Mean</td>
</tr>
<tr>
<td>Aggression</td>
<td>0.08</td>
<td>0.1</td>
<td>0.11</td>
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<tr>
<td>Destruction</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Stereotypy</td>
<td>0.17</td>
<td>0.16</td>
<td>0.76</td>
</tr>
<tr>
<td>Opposition</td>
<td>0.00</td>
<td>0.00</td>
<td>0.02</td>
</tr>
<tr>
<td>SIB</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Pos. Attention</td>
<td>1.18</td>
<td>0.47</td>
<td>1.61</td>
</tr>
<tr>
<td>Compliance</td>
<td>0.04</td>
<td>0.06</td>
<td>0.04</td>
</tr>
<tr>
<td>Non-Compliance</td>
<td>0.00</td>
<td>0.00</td>
<td>0.06</td>
</tr>
<tr>
<td>Goal-dir Beh</td>
<td>0.43</td>
<td>0.47</td>
<td>1.11</td>
</tr>
<tr>
<td>Non-goal dir. beh.</td>
<td>4.32</td>
<td>0.71</td>
<td>3.37</td>
</tr>
<tr>
<td>No observation</td>
<td>0.32</td>
<td>0.39</td>
<td>0.40</td>
</tr>
<tr>
<td>Pos Attn (Staff)</td>
<td>0.19</td>
<td>0.26</td>
<td>0.43</td>
</tr>
<tr>
<td>Neg. Attn. (Staff)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.02</td>
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<tr>
<td>Pos. Instructions</td>
<td>0.03</td>
<td>0.08</td>
<td>0.05</td>
</tr>
<tr>
<td>Negative Instructions</td>
<td>0.02</td>
<td>0.05</td>
<td>0.00</td>
</tr>
<tr>
<td>Malad. Cluster</td>
<td>4.58</td>
<td>0.60</td>
<td>4.33</td>
</tr>
<tr>
<td>Adap Cluster</td>
<td>1.86</td>
<td>0.59</td>
<td>2.90</td>
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<tr>
<td>Total Cont. Clus.</td>
<td>0.24</td>
<td>0.33</td>
<td>0.50</td>
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<tr>
<td>Soc Inter Clus.</td>
<td>1.37</td>
<td>0.59</td>
<td>2.04</td>
</tr>
<tr>
<td>Compliance Rate</td>
<td>0.75</td>
<td>0.35</td>
<td>0.63</td>
</tr>
<tr>
<td>Non-compl. Rate</td>
<td>0.00</td>
<td>0.00</td>
<td>0.25</td>
</tr>
</tbody>
</table>

* Met criteria for visual analysis.
There was a mean difference for Positive Attention (Staff) between Phase 1 (.19) and Phase 2 (.43) of +.24. At Phase 3, there was a return toward Baseline at mean .30. There was a gradual decline in staff attention throughout Phase 2 and a consistent decline observed in Phase 3.

Figure 13

Jeff - Positive Attention - Staff
There was a mean difference for Goal-directed Behavior between Phase 1 (.43) and Phase 2 (1.11) of +.68. At Phase 3, there was a return toward Baseline at mean .67. There was a steep drop in Goal-directed Behavior the first third of Phase 2 with a steady increase during the last two-thirds of Phase 2. There was a downward trend observed in Phase 3.

Figure 14

Jeff - Goal Directed
The Social Interaction Cluster had a mean difference from Phase 1 (1.37) to Phase 2 (2.04) of +.67. At Phase 3, there was a return toward Baseline at mean 1.89. There was no observable trend within Phase 2 or Phase 3.

Figure 15

Jeff - Social Interaction Cluster
The Adaptive Cluster had a mean difference from Phase 1 (1.86) to Phase 2 (2.90) of +1.04. At Phase 3, there was a return toward Baseline at mean 2.4. There was no trend observed in Phase 2 but a gradual positive trend was observed within Phase 3.

Figure 16

Jeff - Adaptive Cluster
The Total Contact Cluster had a mean difference from Phase 1 (.24) to Phase 2 (.50) of +.26 and a return toward Baseline at mean .35. There was a decreasing trend the second half of Phase 2 with no observable trends in Phase 3.

Figure 17

Jeff - Total Contact Cluster
Larry

Means and Standard Deviations by Phase can be found in Table 11.

Larry showed significant inverse correlations between Maladaptive Cluster and his Adaptive Cluster at Phases 2 and 3. However, Maladaptive Cluster showed significant inverse correlations with his Total Contact Cluster (Rho c=-.477, p=.0102) and his Social Interaction Cluster (Rho c=-.563, p=.0024) only at Phase 2 suggesting the relationships could have been due to treatment effects (See Table 8).
### TABLE 11

**ECOBEHAVIORAL ANALYSIS: LARRY**

|                          | PHASE 1  
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Baseline)</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Aggression</td>
<td>0.03</td>
</tr>
<tr>
<td>Destruction</td>
<td>0.00</td>
</tr>
<tr>
<td>Stereotypy</td>
<td>0.77</td>
</tr>
<tr>
<td>Opposition</td>
<td>0.00</td>
</tr>
<tr>
<td>SIB</td>
<td>0.00</td>
</tr>
<tr>
<td>Pos. Attention</td>
<td>1.18</td>
</tr>
<tr>
<td>Compliance</td>
<td>0.00</td>
</tr>
<tr>
<td>Non-Compliance</td>
<td>0.00</td>
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<tr>
<td>Goal-dir.beh.</td>
<td>1.97</td>
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<tr>
<td>Non-goal dir.beh.</td>
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<tr>
<td>Neg. Attn. (Staff)</td>
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</tr>
<tr>
<td>Pos. Instructions</td>
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<tr>
<td>Negative Instructions</td>
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<tr>
<td>Malad. Cluster</td>
<td>3.73</td>
</tr>
<tr>
<td>Adap. Cluster</td>
<td>3.15</td>
</tr>
<tr>
<td>Total Contact Cluster</td>
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</tr>
<tr>
<td>Social Inter. Cluster</td>
<td>1.80</td>
</tr>
<tr>
<td>Compliance Rate</td>
<td>0.00</td>
</tr>
<tr>
<td>Non-compliance Rate</td>
<td>0.00</td>
</tr>
</tbody>
</table>

* Met criteria for visual analysis.

- Only one data point
Stereotypy had a mean difference from Phase 1 (.77) to Phase 2 (.26) of -.51. At Phase 3, there was a slight return toward Baseline at mean .33. There were no definitive trends in Phase 2 but a sharp increase was observed the first half of Phase 3.
Evelyn

Means and Standard Deviations by Phase can be found in Table 12.

Aggression had a mean difference from Phase 1 (.58) to Phase 2 (.19) of -.39. At Phase 3, there was a slight increase toward Baseline at mean .29. There were no definitive trends in Phase 2 and there was a steady increase half-way into Phase 3 with an abrupt drop at the end of that phase.

Figure 19

Evelyn - Aggression
<table>
<thead>
<tr>
<th></th>
<th>PHASE 1 (Baseline)</th>
<th>PHASE 2 (Treatment)</th>
<th>PHASE 3 (Baseline)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Dev.</td>
<td>Mean</td>
</tr>
<tr>
<td>*Aggression</td>
<td>0.58</td>
<td>0.88</td>
<td>0.19</td>
</tr>
<tr>
<td>Destruction</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Stereotypy</td>
<td>0.02</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Opposition</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>SIB</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>*Pos Attention</td>
<td>0.62</td>
<td>0.30</td>
<td>0.88</td>
</tr>
<tr>
<td>Compliance</td>
<td>0.10</td>
<td>0.12</td>
<td>0.05</td>
</tr>
<tr>
<td>Non-Compliance</td>
<td>0.00</td>
<td>0.00</td>
<td>0.02</td>
</tr>
<tr>
<td>Goal-dir.beh.</td>
<td>3.52</td>
<td>1.51</td>
<td>3.53</td>
</tr>
<tr>
<td>Non-goal dir.beh.</td>
<td>1.74</td>
<td>0.98</td>
<td>1.80</td>
</tr>
<tr>
<td>No observation</td>
<td>0.76</td>
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<td>0.11</td>
</tr>
<tr>
<td>*Pos Attn (Staff)</td>
<td>0.48</td>
<td>0.66</td>
<td>1.03</td>
</tr>
<tr>
<td>Neg. Attn. (Staff)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Pos. Instructions</td>
<td>0.04</td>
<td>0.06</td>
<td>0.07</td>
</tr>
<tr>
<td>Negative Instructions</td>
<td>0.06</td>
<td>0.13</td>
<td>0.00</td>
</tr>
<tr>
<td>Malad. Cluster</td>
<td>2.34</td>
<td>1.65</td>
<td>2.08</td>
</tr>
<tr>
<td>Adap. Cluster</td>
<td>4.74</td>
<td>1.42</td>
<td>4.62</td>
</tr>
<tr>
<td>*Total Cont Clus</td>
<td>0.58</td>
<td>0.60</td>
<td>1.10</td>
</tr>
<tr>
<td>*Soc Inter Clus</td>
<td>1.10</td>
<td>0.88</td>
<td>1.91</td>
</tr>
<tr>
<td>Compliance Rate</td>
<td>1.00</td>
<td>0.00</td>
<td>0.82</td>
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<tr>
<td>Non-Comp Rate</td>
<td>0.00</td>
<td>0.00</td>
<td>0.19</td>
</tr>
</tbody>
</table>

*Met criteria for visual analysis.
Positive Attention (Subject) had a mean difference from Phase 1 (.62) to Phase 2 (.88) of +.26. At Phase 3, there was a return toward Baseline at mean .74. There was an initial upward trend in the beginning of Phase 2, a downward trend in the middle, and a steep increase toward the end of the phase. Phase 3 had a beginning downward trend, followed by an upward trend and ended with a downward trend.

Figure 20

Evelyn - Positive Attention
Positive Attention (Staff) had a mean difference from Phase 1 (.48) to Phase 2 (1.03) of +.55. At Phase 3, there was a return toward Baseline at mean .59. There were no distinct trends in Phase 2 and an upward trend was observed throughout Phase 3.

Figure 21

Evelyn - Positive Attention - Staff
The Social Interaction Cluster had a mean difference from Phase 1 (1.1) to Phase 2 (1.91) of +.81. At Phase 3, there was a return toward Baseline at mean 1.33. There was an increasing trend throughout Phase 2, with an initial decrease the first half of Phase 3 followed by an upward trend the last half.

Figure 22

Evelyn - Social Interaction Cluster
The Total Contact Cluster had a mean difference from Phase 1 (.58) to Phase 2 (1.1) of +.52. At Phase 3, there was a return toward Baseline of mean .63. There was an increasing trend throughout Phase 2, with an initial decrease followed by an increase in trend throughout Phase 3.

Figure 23

Evelyn - Total Contact Cluster
Means and Standard Deviations by Phase can be found in Table 13.

Aggression had a mean difference from Phase 1 (.13) to Phase 2 (.28) of +.15. At Phase 3, there was a sharp decrease below Baseline of mean .05. Within Phase 2, there were occasional spikes of aggression and at Phase 3 there were no trends observed.

Figure 24

Debbie - Aggression
<table>
<thead>
<tr>
<th></th>
<th>PHASE 1 (Baseline)</th>
<th>PHASE 2 (Treatment)</th>
<th>PHASE 3 (Baseline)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Dev.</td>
<td>Mean</td>
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<tr>
<td><strong>Aggression</strong></td>
<td>0.13</td>
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<td>0.28</td>
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<tr>
<td>Destruction</td>
<td>0.00</td>
<td>0.00</td>
<td>0.01</td>
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<tr>
<td><strong>Stereotypy</strong></td>
<td>1.38</td>
<td>1.73</td>
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</tr>
<tr>
<td>Opposition</td>
<td>0.20</td>
<td>0.31</td>
<td>0.18</td>
</tr>
<tr>
<td>SIB</td>
<td>0.10</td>
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<td>0.03</td>
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<td>Pos. Attention</td>
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<td>2.15</td>
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<tr>
<td>Compliance</td>
<td>0.25</td>
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<td>0.13</td>
<td>0.24</td>
<td>0.12</td>
</tr>
<tr>
<td>Goal-dir. Beh.</td>
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<td>1.79</td>
<td>2.48</td>
</tr>
<tr>
<td>Non-goal dir. beh.</td>
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<td>1.21</td>
<td>1.61</td>
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<tr>
<td>No observation</td>
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<td>0.21</td>
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<tr>
<td>Non-compliance rate</td>
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<td>0.31</td>
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</table>

*Met criteria for visual analysis.
Stereotypy had a mean difference from Phase 1 (1.38) to Phase 2 (.54) of -.84. At Phase 3, there was an increase toward Baseline at mean 1. There was a slight downward trend the first half of Phase 2, followed by a gradual increase the second half. There was a steady increase throughout Phase 3.

Figure 25
Data Analysis of Staff Progress Notes

Direct Care Staff Progress Notes for each subject were analyzed daily using specific criteria to judge the frequencies of various maladaptive behaviors (See Appendix E). When applicable, the same definitions were used from the Ecobehavioral Assessment. The following analyses give a perspective of the frequencies of maladaptive behaviors during the subjects total waking hours. Progress notes were analyzed for each resident 25 weeks prior to the study (Phase I), during the six full weeks of the study (Phase 2), and seven weeks following the study (Phase 3). The week of August 29 through September 4, 1988 was excluded from the analysis due to the subjects' absences off the living areas for a camping trip. Data for the week of October 17 through the 23rd was excluded from analysis because it was a week of transition between baseline measures and the study's initiation. Also excluded was the week of December 5 through the 11th due to the transition between final physiological testing, a final prize day and a break from the routine of the study. Linda (Exercise Group) had only 16 weeks analyzed for her initial baseline because of a nine-week transfer to a different living area.

The Mann-Whitney U for independent samples was used to analyze the group means at each phase between the Exercise Group and the Structured Arts Group. Means were analyzed in the areas of
Property Destruction, Verbal Aggression, Physical Aggression, SIB, Stereotypy, and Opposition. The Mann-Whitney U analysis for each group by phase is found in Table 14. At each phase, no significant differences were found between groups using a criteria of $p < .05$ of significance:

**Individual Graphs/Staff Progress Notes**

Visual analysis using the before mentioned criteria (Tawney and Gast, 1984) was used in looking at each behavioral category for each individual across the three phases. Frequency counts were taken in the areas of Physical Aggression, Verbal Aggression, Property Destruction, SIB, Stereotypy, and Opposition. There needed to be a mean difference between Phases 1 and 2 of greater than 33%, followed by a return in Phase 3 toward the mean baseline for graphs to be included in this section. Mean lines were drawn on each graph to help with visual analysis. There were a possible 40 categories in which to apply this analysis. If no behaviors were omitted in a category, it was excluded. From these analyses, 23% met the criteria for change. Individual graphs not meeting the criteria for further analysis can be found in Appendix N. No graphs
**TABLE 14**

**MANN/WHITNEY U ANALYSIS OF DIFFERENCE BETWEEN GROUP DATA:**

**PROGRESS NOTES, PHASES 1 - 3**

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<td>U=7.5 (c)</td>
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<td>U=7 (c)</td>
<td>U=8 (c)</td>
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<td>Physical Aggression</td>
<td>U=8</td>
<td>U=7 (c)</td>
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<td>SIB</td>
<td>U=7</td>
<td>U=7.5 (c)</td>
<td>U=7 (c)</td>
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<tr>
<td>Stereotypy</td>
<td>U=6 (c)</td>
<td>U=8</td>
<td>U=8</td>
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<tr>
<td>Opposition</td>
<td>U=7</td>
<td>U=6.5 (c)</td>
<td>U=7.5 (c)</td>
</tr>
</tbody>
</table>

(c) = Corrected for ties in ranks.
will be shown for categories in which no behaviors were exhibited during all three phases.

**Exercise Group Graphs**

**Bernie**

Bernie had no categories that met the criteria for visual analysis (See Appendix N).
Eugene showed a mean decrease in SIB from Phase 1 (.4) to Phase 2 (0) and an increase toward Baseline at Phase 3 of mean .2. Eugene showed a mean decrease in Opposition from Phase 1 (.6) to Phase 2 (.17) of -.43 and a return toward Baseline at Phase 3 of mean .4.

Figure 26

Eugene - SIB
Figure 27

Eugene - Opposition
Katie showed a mean decrease in Verbal Aggression from Phase 1 (.28) to Phase 2 (0) of -.28 and a return toward Baseline at Phase 3 of mean .14.

Figure 28

Katie - Verbal Aggression
Linda

Linda showed a mean decrease in Physical Aggression from Phase 1 (1) to Phase 2 (.67) of -.33 and a return to Baseline at Phase 3 of mean 1.00. Linda showed a mean decrease in Verbal Aggression from Phase 1 (2.25) to Phase 2 (1.33) of -.92 and a return to Baseline at Phase 3 of mean 2.29. Linda showed an increase in SIB from Phase 1 (.5) to Phase 2 (.83) of +.33 and a return past initial Baseline at Phase 3 of mean .43.

Figure 29

Linda - Physical Aggression
Figure 30

Linda - Verbal Aggression

Figure 31

Linda - SIB
Arts Group's Graphs

Evelyn

No category met criteria for visual analysis.

Debbie

Debbie showed a mean decrease in Property Destruction from Phase 1 (.52) to Phase 2 (.33) of -.19 and a return toward Baseline at Phase 3 of mean .43.

Figure 32

Debbie - Property Destruction
Jeff showed a mean decrease in Verbal Aggression from Phase 1 (1.48) to Phase 2 (0) and a return toward Baseline to Phase 3 of mean .86.

Figure 33

Jeff - Verbal Aggression
Larry showed a mean increase in Opposition from Phase 1 (.39) to Phase 2 (1.5) of +1.11 and a return toward Baseline at Phase 3 of mean .86.

Figure 34

Larry - Opposition
Analysis of Health Related Fitness Measures

Both groups (Exercise and Structured Arts) were compared before and after treatment for purposes of assessing the conditioning differences between groups. During the Cooper Walk-Run Test heart rates were taken to assess physiological conditioning at the 4, 8, 12, minute marks and at Recovery 1, Recovery 2, and Recovery 3 (the first three minutes following running). The distance traveled also was recorded. The Mann-Whitney U Test, used to test any differences between groups, found no differences between the groups before treatment. During the exercise phase, decreases in heart rate approached significance for the Exercise Group at the 8 minute HR (U=2, p=.0833, corrected) and at the Recovery 3 HR (U=2, p=.0814, corrected). The 12 minute HR was significantly lower for the Exercise Group (U=1, p=.0421, corrected). Other measures revealed no significant differences between groups from the Mann-Whitney analysis. Although, there were no significant differences between treatment groups in the distance traveled from the Cooper Walk-Run Test, the differences in heart rates suggest physiological change. For Mann-Whitney U Analysis, see Table 15.
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<tr>
<td>4-Minute HR</td>
<td>U=6</td>
<td>U=4  (c)</td>
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<tr>
<td>8-Minute HR</td>
<td>U=5</td>
<td>U = 2 *</td>
</tr>
<tr>
<td>12-Minute HR</td>
<td>U=6</td>
<td>U=1  (c)</td>
</tr>
<tr>
<td>Recovery 1 HR</td>
<td>U=6</td>
<td>U=3</td>
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<td>Recovery 3 HR</td>
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<td>U=2  (c)*</td>
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<tr>
<td>Distance Traveled</td>
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<td>U=7  (c)</td>
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</tbody>
</table>

(c) = Corrected for ties in ranks.

* = Significant at p < .10.

** = Significant at p < .05.
Skin Caliper Measurements were taken of the triceps, the thighs, and the superiliac for subjects in both groups before and after treatment. The readings were analyzed using formulas given by Jackson and Pollick (1978, 1980) for finding the lean body weight, fat body weight, and percent body weight based on age and each subject's present weight. There were no considerable differences found between groups. The means for lean body weight per group: Arts = -.6 lb.; Exercise = -.99 lb. The means for fat body weight per group were: Arts = +1.98 lbs., Exercise = +2.11 lbs. The means for percent body fat per group were: Arts = +1.34%, Exercise = +1.42%.

Sit and Reach data was taken before and after treatment and statistically analyzed by the Mann/Whitney U revealed no significant differences between either group before or after treatment (pre-treatment: U=4.5, (c), p=.3094 and post treatment: U=6, p=.5637).

Each individual's training heart rate zone was figured using the procedure given in Corbin and Lindsey (1985, pg 40):

1. 220-Age (years) = Maximal Heart Rate
2. Maximal Heart Rate - Resting Heart Rate = Working Rate
3. Working Heart Rate x .60 + Resting Heart Rate = Lower Training Limit
4. Working Heart Rate x .80 + Resting Heart Rate = Upper Training Limit

Group analysis revealed overall individuals stayed within their training zones 61% of the time. At the 4-minute mark, individuals kept their heart rate in their training zone 56% of the time, at 8 minutes 54% of the time, at 12 minutes 62% of the time, and at 15 minutes 71% of the time. Individual analyses showed Eugene overall stayed in his training zone (149-171 beats per minute) 84% of the time. At 4 minutes, he was in his training zone 77% of the time, at 8 minutes 73% of the time, at 12 minutes 88% of the time and at 15 minutes 96% of the time. Linda overall stayed in her training zone (143-167 beats per minute) 70% of the time. At 4 minutes, she stayed in her training zone 68% of the time, at 8 minutes 56% of the time, at 12 minutes 68% of the time and at 15 minutes 88% of the time. Bernie overall stayed in his training zone (134-159 beats per minute) 67% of the time. At 4 minutes Bernie stayed in his training zone 60% of the time, at 8 minutes 72% of the time, at 12 minutes 68% of the time, and at 15 minutes 68% of the time. Katie overall stayed in her training zone (154-176 beats per minute) 20% of the time. At 4 minutes Katie stayed in her training zone 17% of the time, at 8 minutes 13% of the time, at 12 minutes 21% of the time, and at 15 minutes 20% of the time.
Health Related Fitness Measures - Relationship to Behavior Data

Each of the exercise group subjects' Ecobehavioral Categories and the Maladaptive Progress Note Ratings during treatment were correlated with each of the health related fitness measures comprising the areas of cardiovascular endurance, muscular strength, and muscular flexibility. For analysis, cardiovascular categories used for comparisons were the 4-minute heart rate (HR), the 8-minute HR, the 12-minute HR, the 15-minute HR, and Recovery 1 HR, Recovery 2 HR, and Recovery 3 HR. For analysis, the muscular strength categories were collapsed into an Upper Body Cluster, Lower Body Cluster and Total Weight Cluster. The Upper Body Cluster consisted of combined totals for repetitions times weight lifted on the Bench Press, Lat Pull Down, Military Press, and Biscep Curls. The Lower Body Cluster consisted of combined totals of repetitions times weight lifted for the Leg Press and Leg Extensions. The Total Weight Cluster consisted of the combined totals for the Upper Body Cluster and the Lower Body Cluster. Sit-ups were kept as a separate category for analysis. Muscular flexibility scores used for analysis consisted of an average of three flexibility ratings taken from weekly trials on the Sit and Reach Box. There were seven such flexibility testing sessions during treatment.
First, each subject's Ecobehavioral Categories (See Appendix D) were correlated with each of the aforementioned physiological categories using the Spearman Rank-Order Correlation Coefficient. Only those p values of < .05 will be reported in the results. Rho corrected "c" means corrected for ties in the ranks. The cardiovascular portion for purposes of correlational importance represented 46% of the total exercise time. The muscular strength and warm-up portions represented 27% of the total exercise time. Out of 532 correlational analyses performed with data of four exercise subjects between Ecobehavioral Categories and cardiovascular data, only 3% of the analyses were significant. Out of 304 correlational analyses between Ecobehavioral Categories and Muscular Strength Categories, 8% were significant. Out of 76 correlational analyses between Ecobehavioral Categories and Sit and Reach Data, 9% were significant.

The Progress Note Categories (Physical Aggression, Verbal Aggression, Stereotypy, SIB, Property Destruction, Opposition) across the four exercise subjects were correlated with all the before mentioned physiological categories. Categories where no behavior was omitted were excluded. Of the 336 possible correlational analyses between cardiovascular data and progress note categories, only 1% were significant. From 64 possible correlational analyses between Muscular Strength Categories and Progress Note Categories, 19% were significant. Of 16 possible
correlational analyses between Sit and Reach Data and Progress Note Data, no analyses were significant.

Bernie

Bernie's 4-minute Heart Rate (HR) correlated positively with Positive Attention (Rho "c"=.397, p=.0393). Bernie's 8-minute HR correlated positively with Non Goal-Directed Behavior (Rho "c"=.397, p=.0389) and Maladaptive Cluster (Rho "c"=.452, p=.0188). Recovery 1 HR, Recovery 2 HR and Recovery 3 HR were found to negatively correlate with Oppositional Behavior (Rec. 1 HR, Rho "c"=-.408, p=.0455; Rec. 2 HR, Rho "c"=-.406, p=.0467; Rec. 3 HR, Rho "c"=-.459, p=.0244). For the 32 treatment days, there were only two non-zero data points for Oppositional Behavior.

The progress note data showed behavior problems exhibited in the areas of Property Destruction, Physical Aggression, Verbal Aggression, and Opposition. None of these were found to correlate significantly with any of the physiological data.

The seven days of Sit and Reach data correlated positively with Positive Attention (staff) (Rho=.929, p=.0229). Total Contact Cluster (Rho=.75, p=.0662) approached significance.
For the Muscular Strength Exercises, sit-ups correlated positively with Positive Attention (subject) (Rho "c"=.473, p=.0159). Upper Body Cluster correlated positively with Positive Attention (subject) (Rho=.469, p=.0167), and the Social Interaction Cluster (Rho "c"=.499, p=.0109). Adaptive Cluster (Rho=.353, p=.072) approached significance. Upper Body Cluster approached significance in correlating negatively with Negative Attention (staff) (Rho "c"=-.349, p=.0751). Lower Body Cluster correlated negatively with Negative Attention (staff) (Rho "c"=-.427, p=.0296). Total Weight Cluster correlated positively with the Social Interaction Cluster (Rho "c"=.382, p=.0515) and negatively with Negative Attention (staff) (Rho "c"=-.428, p=.0289).

Eugene

No cardiovascular measures approached significance.

For six data points of the Sit and Reach Data, there were positive correlations with Non Goal-Directed Behavior (Rho=.821, p=.0442), Maladaptive Cluster (Rho=.786, p=.0543) and Social Interaction Cluster (Rho=.857, p=.0358). There were negative correlations with Positive Attention (staff) (Rho=-.857, p=.0358), Adaptive Cluster (Rho=-.821, p=.0442) and Total Contact Cluster (Rho=-.821, p=.0442).
For the Muscular Strength Exercises, Sit-ups correlated positively with Non Goal-directed Behavior (Rho = .463, p = .0127), Maladaptive Cluster (Rho "c" = .383, p = .039) and negatively with Positive Attention (subject) (Rho "c" = -.397, p = .0325), Adaptive Cluster (Rho "c" = -.44, p = .0178), Total Contact Cluster (Rho "c" = -.36, p = .0526), and Social Interaction Cluster (Rho "c" = -.42, p = .0238). Positive Attention (staff) (Rho "c" = -.344, p = .064) approached significance. The Lower Body Cluster is correlated negatively with Aggression (Rho "c" = -.438, p = .0182). Total Weight Cluster is correlated negative with Aggression (Rho "c" = -.358, p = .0537).

The progress notes for Eugene from 11/16 to 12/5 were found missing thus no correlational analysis was attempted.

Linda

Linda's cardiovascular correlations with Observational Behavior Ratings showed the 4-minute Heart Rate (HR) correlated positively with Aggression (Rho "c" = .412, p = .0357) and her 15-minute HR correlated positively with Non Goal-directed Behavior (Rho "c" = .405, p = .0475).

Sit and Reach Data (7 data points) correlated positively with Aggression approaching significance (Rho "c" = .728, p = .0745).
The progress note data showed problems in the areas of Verbal Aggression, Physical Aggression, Property Destruction, and Opposition. Linda's Verbal Aggression showed significant negative correlations with Upper Body (Rho c=-.358, p=.05), Lower Body (Rho c=-.405, p=.0291), and Total Weight (Rho c=-.374, p=.0441). Linda's Physical Aggression (only three non-zero data points) showed significant negative correlations with Upper Body (Rho c=-.399, p=.0317), Lower Body (Rho c=-.474, p=.0108), Total Weight (Rho c=-.461, p=.013) and it was positively correlated with the 12-minute Heart Rate (Rho c=.436, p=.0262). Property Destruction showed significant negative correlations with Upper Body (Rho c=-.379, p=.0411), Lower Body (Rho c=-.404, p=.0294), Total Weight (Rho c=-.404, p=.0296), and it was positively correlated with the 12-minute Heart Rate (Rho c=.436, p=.0262). Opposition showed significant negative correlations with Upper Body (Rho c=-.393, p=.0345), Lower Body (Rho c=.446, p=.0162), and Total Weight (Rho c=-.418, p=.0244).

Katie

At the 4-minute Heart Rate (HR) there were positive correlations with Non Goal-directed Behavior (Rho "c"=.385, p=.0499). At the 4-minute HR, there were negative correlations with Opposition (Rho "c"=-.402, p=.0403), Positive Attention (staff) (Rho "c"=-.372, p=.0576), Total Contact Cluster (Rho "c"=-.436,
p=.0264) and Social Interaction Cluster (Rho "c"=-.398, p=.0425). There was only two non-zero data points for Opposition.

No Sit and Reach Data were significantly correlated with the Observational Behavior Data.

The only Muscular Strength Exercise to correlate with Observational Behavior Data was Sit-ups. It was positively correlated with Stereotypy (Rho "c"=.485, p=.0117), Non Goal-directed Behavior (Rho "c"=.426, p=.0268), and Maladaptive Cluster (Rho "c"=.426, p=.0268). Sit-ups were negatively correlated with Goal-directed Behavior (Rho "c"=-.412, p=.0323), Positive Attention (staff) (Rho "c"=-.386, p=.0447), Total Contact Cluster (Rho "c"=-.387, p=.0443), and Social Interaction Cluster (Rho "c"=-.357, p=.0633) and Adaptive Cluster (Rho "c"=-.363, p=.059) approached significance.

The progress notes showed problems in the areas of Physical Aggression and Opposition. There were no significant correlations with any of the health related fitness measures.

**Reliability Analysis**

Reliability on observational ratings was tested twice a week by a third trained observer with each of the primary observers.
Observation time, in order to check reliability, represented 25% of the total observation time each week. Reliability on each of the Ecobehavioral Assessment Codes was figured by using the following formula (Bakeman and Gottman, 1986, page 75):

\[
\frac{A}{A+B+C}
\]

\(A\) = Number of times both the observer and the master record agree on the occurrence of target behavior.

\(B\) = Number of times the master record indicates occurrence of the target behavior while the observer does not.

\(C\) = Number of times observer indicates a target behavior but not the master record.

Reliability was found to be consistently .80 or above on all categories except for Aggression, Opposition, Negative Attention, and Positive and Negative Instruction whose frequency was very low and was occasionally missed by an observer (see Table 16) impacting considerably on reliability. When reliability was less than .80 for any of these categories, the frequency of behavior was
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<th>Directed Activity</th>
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</table>
usually less than ten times for the 240 record intervals for all four subjects combined.

Reliability was taken for the progress note data. Frequency counts in each category were summed across all the subjects to obtain reliability scores for each category per phase (See Table 17). The same formula previously given for obtaining reliability was utilized (Bakeman and Gottman, 1986).

The Behavior Intensity Scale was given a reliability check by having eight different direct care staff fill out the scale on six different residents. Results showed that two of the three groups of raters’ scales correlated .70 or greater. However, one set of scales correlated only .50 (See Table 18).

A behavior intensity score was obtained during each treatment day by having the primary service provider for each subject fill out the Behavior Intensity Scale (see Appendix L). Marks were placed on each of the five areas of the scale and these five points were measured to within 1/16 of an inch and then converted into a decimal point. A mean was taken to get a single behavior intensity score. Each subject's scores during treatment were then correlated with the frequency scores in the observational categories of the Maladaptive Cluster, Non-compliance Rate, Aggression, Destruction, Stereotypy, Opposition,
Table 17

PROGRESS NOTE RELIABILITY BY PHASE

<table>
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<th></th>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
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<tr>
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<td>Stereotypy</td>
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<tr>
<td>Opposition</td>
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* = No behaviors charted
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<tr>
<th></th>
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<tr>
<td>Ratings 3</td>
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and SIB. The intensity scores were also correlated with the progress note categories of Physical Aggression, Verbal Aggression, Property Destruction, SIB, Stereotypy, and Opposition. There needed to be at least two non-zero data points in order to run an analysis.

No analyses could be run on how motivational data and observational change data relate due to the lack of variability found in the subject's response to the Exercise Benefits Questionnaire (See Appendix C). Three of the four subjects answered "good" to each question for seven consecutive weeks of the study. Only Bernie answered "OK" or "bad" to any of the questions over the seven weeks. His answers to the questions were as follows:

Question 1: "Good" 5 times, "OK" 1 time, "Bad" 1 time
Question 2: "Good" 4 times, "OK" 3 times
Question 3: "Good" 3 times, "OK" 3 times, "Bad" 1 time
Question 4: "Good" 6 times, "Bad" 1 time
Question 5: "Good" 6 times, "OK" 1 time
Question 6: "Good" 7 times
Eugene

There were no significant correlations between behavior intensity and observational categories. There was missing progress note data, no analysis was run.

Bernie

There were no significant correlations between behavior intensity and observational categories. Bernie exhibited Property Destruction, Verbal Aggression, Physical Aggression, and Opposition according to progress note data but there were no significant correlations.

Katie

There were no significant correlations between behavior intensity and any observational or progress note category. Katie exhibited behaviors in the areas of Physical Aggression and Opposition.

Linda

There were no significant correlations between behavior intensity and any observational category. Linda's progress note
data showed her Verbal Aggression negatively correlating with behavior intensity (Rho c=-.718, p=.0096) and Opposition negatively correlating with behavior intensity (Rho c=-.729, p=.0086).

**Evelyn**

Behavior intensity showed a significant negative correlation with Stereotypy (Rho c=-.677, p=.0146, four non-zero data points) in the observational categories. There were no significant correlations found with progress note data.

**Jeff**

Behavior intensity showed a significant negative correlation with Aggression (Rho c=-.432, p=.0478) in the observational categories. There were no significant correlations found with the progress note data.

**Larry**

Behavior intensity showed a significant negative correlation with Stereotypy (Rho c=-2.534, p=.0113) in the observational categories. There were no significant correlations found with the progress note data.
Debbie

There were no significant correlations between behavior intensity and any observational or progress note categories.
CHAPTER V

DISCUSSION

Exercise as Treatment for Severe Behavior Problems

Exercise programs have become popular as legitimate interventions for those with mental retardation and severe behavior problems. Physical fitness opportunities are as important for the mentally retarded adult as for the non-handicapped. Several studies have shown exercise to decrease stereotyped behaviors, self-injurious behaviors, and anti-social behavior in the mentally retarded (Lewis, 1981; Watters and Watters, 1980; and Jansma and Combs, 1987). A large group of studies also support exercise as an effective means to reduce stress and anxiety (Bahrke and Morgan, 1978). The literature supports exercise as a means of increasing adaptive behaviors. In the mentally retarded, exercise has been shown to increase work productivity (Beasley, 1982) self-concept (Allen, 1980), and an increased interest in other non-athletic productive activities (Schurrer, Weltman, and Brammell, 1985).
This exercise study ran for seven weeks with one-hour training sessions including components of cardiovascular fitness, muscular strength, and muscular flexibility. During the cardiovascular portion, heart rates were taken daily on each subject to assess physiological changes and to correlate with behavior change. Weights lifted and Sit and Reach data were also taken to compare with behavior change. An Arts and Crafts Group ran during the same hour each day as a comparison for treatment effects. There were four EDMR subjects in each group. They all received one-on-one attention throughout each session and several levels of reinforcers. An ABA research design was used for assessing treatment effects.

**Behavior Problems During Treatment**

Behavior problems during treatment were recorded on the Behavior Non-compliance Form (Appendix J) by the Rio Grande students whenever a subject refused any aspect of treatment or needed special attention due to problem behavior. Across the four subjects in the Arts and Crafts Group only six days were missed due to problem behaviors. Jeff missed five of these six days. Jeff would complain of his stomach hurting and if taken to the group he would refuse to participate and then usually threw crafts before being escorted back to his living area. Across the four subjects in the Exercise Group, only one day was missed by one subject due to
behavior problems. During the study there were 32 treatment days. However, within the daily running of each group, the Arts and Crafts Group had fewer problems. They did not have to use the time-out chair once because of a behavior problem. They kept the subjects focused on the art's craft of the day and continuously redirected them back to task. It was felt for the Exercise Group that the transition periods between warm-up and lifting, between lifting and running, and between running and warm-down allowed some idle time which occasionally the subjects exhibited problem behaviors.

Behavior problems in the Exercise Group were kept at a minimum because the students kept a constant eye on the subjects giving them frequent verbal feedback. There was an indepth orientation on each subject's problem behaviors before either group started which allowed the students during treatment to attempt to prevent problems from occurring. The groups were well structured with minimum down times and one student assigned to one subject each day.

Several residents in the Exercise Group displayed verbal aggression during the lifting time (Linda, Bernie). Linda on three separate occasions cursed at the student assigned to her using vulgar language and complaining about each lifting exercise. The student ignored the vulgar words, encouraged Linda, and redirected her
back to task. Linda was also reminded of the weekly prize she would earn if she participated. Although Linda continued cursing, she completed all three of these work-outs. Bernie often hurriedly attempted each lifting exercise and resented being slowed down. He wanted to get back to the living area to smoke his pipe. The student working with him kept modeling the correct form of each exercise and when Bernie refused to do the exercise in the appropriate manner, he would be reminded of the weekly prize that could be forfeited. During running, Linda twice refused to run, once striking the student when she encouraged Linda to continue. The student was determined not to give up on Linda and after this author supervised Linda the following five days, the student continued to supervise Linda successfully for the remainder of the study. Each student's dedication to his or her subject kept the most difficult subjects motivated.

Eugene was the ideal participant exhibiting no problem behaviors during treatment and was always motivated to give maximum effort on each exercise.

The need for close supervision became very apparent early in the study when the student assigned to Katie turned her back for one minute. Katie went into the bathroom, stripped her clothes, flushed them down the toilet, smeared her hair with BM, and began running naked off grounds. Katie on one other occasion ran several
miles off grounds when the student simply turned her back for several minutes.

In summary, it is felt the key to success in both treatment groups was due to several factors. First, the students were well prepared with the thorough history of problem behaviors for each subject. Second, little down time was given during the treatment hour where the subjects had the time to exhibit poor behavior. Third, the close supervision of the students seemed very reinforcing to the subjects and kept them actively engaged in treatment. Finally, verbal reminders to the subjects of refreshments that could be earned at the end of each session and the prize that could be earned at the end of the week were effective in discouraging problem behaviors.

**Behavior Effects of Treatments**

The first experimental question asked, "What are the differential effects of participation in structured physical exercise and social attention vs structured art's activities and social attention on the frequency of social interaction, directed activities, and maladaptive behavior in the dually diagnosed up to two hours following treatment?"
A group analysis revealed no differences between the two treatment groups before treatment. During treatment, results showed what appeared to be greater frequencies in the Adaptive Cluster and Social Interaction Cluster for the exercise group, although this difference between groups only approached statistical significance. It suggests that subjects of the Exercise Group as a whole following treatment engaged in more social interactions with staff, had a higher Compliance Rate to staff instructions, and performed more Goal-directed Activities. This could have been due to the exercise calming the individuals thus allowing more productive interactions and/or to the reinforcers giving the individuals positive incentive for behavior change. The Exercise Group may have benefitted from running outside each day while the Arts Group stayed inside at the same table. The Arts Group showed significantly more Non-compliance than the Exercise Group during the treatment phase, further suggesting that a sit-down activity may have some negative effects up to two hours following treatment. Most nights following treatment, subjects in both groups were involved in an Environmental Enrichment Program consisting of choices of structured activities on the living area. The Exercise Group seemed more enthusiastic in involving themselves in these activities with staff, based on anecdotal observation.

The second baseline period following the end of the treatment groups, showed the Exercise Group appeared to receive more
Negative Attention from staff than the Arts Group. Although the difference between groups only approached significance, it suggests that the abrupt end of the exercise treatment may have been difficult for staff adjustment. The habit of increased activity formed by the Exercise Group and possibly the excess energy channeled into maladaptive behaviors invited Negative Attention from staff. This is supported also by several subjects in the Exercise Group showing increased maladaptive behaviors immediately following the end of treatment. This Negative Attention code must be viewed with caution since the average reliability coefficient across the sessions was only .44 (See Table 16).

In terms of individual responses, Katie who normally exhibits high rates of Stereotypy (i.e. finger flicking, body rocking) exhibited considerably less on the living area during the exercise phase. Katie is typically a very anxious person but appeared more relaxed. Usually her anxious habits are a deterrent to others who might socially interact with her, but as her Stereotypy decreased, the Positive Attention she received from staff increased, as evidenced in both an increase in Positive Attention (staff) and her Social Interaction Cluster. Her Adaptive Cluster was also significantly higher at the treatment phase, showing that she was also more Goal-directed and Compliant. Many positive Social Interactions
were observed such as staff asking Katie about her day and Katie making positive social advances toward staff.

Linda, during the Exercise Treatment, showed more Non Goal-directed activity on the living area. This was the only Ecobehavioral Code that met the criteria for change. Linda appeared very fatigued following exercise and was less amenable to involving herself in structured activities. She would verbally converse with others but was not task oriented.

Eugene was extremely hard-working in the Exercise Group, and exercised so intensely that he would be visibly exhausted at night. During Phase 2, staff gave fewer Positive Instructions to Eugene but his Non-compliance Rate increased. He was not belligerent toward staff but simply ignored them preferring to rest. No other codes met the criteria for acceptance. Eugene's Maladaptive Cluster was found to significantly correlate negatively with his Social Interaction Cluster and Total Contact Cluster only during the exercise phase, suggesting that on days he had fewer behavior problems he socially interacted more with staff and staff overall gave him more total contact. This is supported by documentation in the progress notes of fewer behavior problems during the exercise phase.
Bernie, during exercise phase, seemed very hyperactive at night running back and forth among staff, physically performing exercises he had learned, and verbally repeating phrases. This was supported by Bernie's Social Interaction Cluster showing change as well as staff giving him more total contact (Total Contact Cluster) and more Positive Instructions. Although this increased social interaction was viewed as positive, Bernie would at times irritate staff with his overabundance of energy.

Jeff, following the Arts Group, showed increased Stereotypy on the living area. This may have been due to nervous energy from sitting throughout class. This change, however, did not have detrimental effects on other adaptive behaviors. Jeff showed more Goal-directed Behavior on the living area, and had an increase in his Adaptive Cluster. He also received more positive attention from staff both in his social interactions and his total contact. Jeff’s responsiveness to his environment, and staff’s responsiveness to Jeff seemed improved throughout the arts treatment.

Larry, during the Arts Treatment phase, showed a reduction in stereotypy on the living area. Other Ecobehavioral Codes were not affected. On days Larry's Maladaptive Cluster increased, his Social Interaction Cluster and Total Contact Cluster decreased. These negative correlations were only significant at Phase 2 suggesting the Arts Treatment was partially responsible. This
relationship is supported by Larry's heightened Opposition found in the progress notes during this period. Larry often sat in the living area when being observed and refused to interact with anyone. He at times seemed very paranoid about being observed.

During the Arts Treatment phase, Evelyn showed significant reductions in Aggression on the living area. This is possibly due to Evelyn's responding very positively to extra one-on-one attention and structured crafts both of which have been noted to be her most preferred reinforcers in the past. Evelyn, also during this phase, gave others more positive attention and received more positive attention from staff. Her Social Interaction Cluster and Total Contact Clusters showed significant increases further substantiating improved social behaviors.

During the Arts Treatment phase, Debbie showed increased Aggression and decreased Stereotypy on the living area. No other Ecobehavioral Codes were significantly changed. Debbie's decreased Stereotypy was partially due to her increased participation in structured activities on the living area. Debbie's increased Aggression was usually preceded by a jealousy of her favorite staff attending to other residents. She usually withdrew to the end of the hall cursing, disrobing, and throwing objects.
In summary, both treatments showed beneficial effects with specific individuals, however, each profile within groups and between groups showed distinct behavior change patterns. It was of interest in the Exercise Group how specific individuals either had less energy following the exercise or became more hyperactive. Both Katie and Bernie who normally exhibit many compulsive behaviors and obsessive thoughts became more socially interactive for up to two hours following exercise while Eugene and Linda who normally exhibit hyperactive behaviors seemed calm, subdued, and less interactive for up to two hours following exercise. This seemed to be a substantial finding as further supported by anecdotal records, but it is possible that the significant effects partially represent a regression to the mean resulting from initially high or low baselines. Both treatment groups had individual examples of where a Maladaptive Behavior was being significantly reduced and at the same time several social behavior codes were showing improvement. This presents the possibility that improvements in behavior problems could allow more positive social interactions to take place. But one or two examples also showed that as some behavior problems improved, some can also deteriorate, suggesting the need to tailor individual treatment to specific needs and prioritized behavior problems.

It needs to be emphasized that although both treatments showed beneficial results, social attention was given for both
treatments to keep subjects on task. Methodologically, with this most difficult population, social attention is necessary as evidenced in the pilot study for this project for both purposes of redirection to task as well as the reinforcement necessary to encourage maximum effort. In this study, the amounts and kinds of social reinforcers were kept constant across groups. The lack of differences found between groups on the Ecobehavioral Codes suggest that social attention may play a crucial role in the results of treatment with individuals with mental retardation and emotional disturbance.

Behavior Generalization

Staff progress notes across three phases were analyzed to address the experimental question, "Are there any behavioral benefits that generalize to the living area throughout the day as a result of either treatment group?" No significant changes were found between the two groups before, during, or after treatment on any of the five maladaptive categories taken from the progress notes. However, in each group specific individuals evidenced improvements during the treatment phase. Although many uncontrolled variable conceivably could have influenced these changes, the data suggests that both the treatments and the social attention had an impact on individuals in both groups.
None of Bernie's maladaptive categories changed significantly during treatment.

During the Exercise Treatment phase, Eugene's Self-abuse totally subsided and his Opposition in the form of screaming and refusing programs markedly decreased. Eugene frequently becomes upset when he cannot get attention immediately from desired staff and quickly becomes angry. He then screams, hits himself, hits staff, and will destroy property. The positive changes away from this behavior pattern during the exercise phase could have been due to exercise since many of the staff reported that he was generally calmer since starting the group. Also, Eugene frequently discussed many of the positive social attentions he was receiving in the exercise group with direct care staff.

During the Exercise Treatment phase, Katie's Verbal Aggression decreased to no occurrences. Katie usually becomes very nervous about upcoming events and verbally harasses staff, especially pertaining to repetitive questions regarding the fear of losing privileges to special events. This decrease in Verbal Aggression was possibly due to her decrease in agitation supported by decreases in Stereotypy found during the Ecobehavioral Assessment.
Linda decreased both her Verbal Aggression and Physical Aggression during the Exercise Treatment phase. Linda often becomes upset screaming obscenities, striking out at others, and self-abusing when important requests are denied (i.e. seeing her boyfriend) or when she is in unstructured situations. The improvements in her behavior possibly were due to the increased structure offered by the program and consistent levels of reinforcement. Although, her SIB showed mean increases during treatment, this significance may be due to the smaller N in the treatment phase rather than to significant treatment effects.

Evelyn had no category of inappropriate behavior which met criteria for change.

Debbie's Property Destruction decreased during the Arts Treatment phase. Debbie often becomes visibly upset when one of her favorite staff attends to another resident. She then pouts, rips her clothes, and hits walls and other objects. Since most of her maladaptive behavior appears to be related to attention-seeking, her decrease in Property Destruction was probably due to the increase social attention given to her in treatment.

Jeff's Verbal Aggression decreased significantly during the Arts Treatment Group. Based upon observation of functional relationships, Jeff's Verbal Aggression usually manifests itself as
part of a tantrum brought on by high noise levels and/or teasing from other residents on the living area. His decrease in Verbal Aggression could be partially due to increases in attention from staff and his own involvement in Goal-directed activities shown in the Ecobehavioral Assessment.

Larry's Opposition increased during the Arts Treatment phase. Larry is a loner who is frequently argumentative with authority figures and often makes demands on others threatening retaliation if he does not get his way. His Opposition probably increased due to his worry that he might no get the reinforcers promised, and his reluctance in being observed on the living area. To keep Larry active in his treatment group, a special contract was signed by him stating the benefits and obligations of remaining in the program. This represented a fifth level of reinforcement for Larry.

In summary, there were positive behavior benefits that generalized during the day for specific subjects from both groups. The specific maladaptive behaviors affected were unique to each individual. One subject became worse in one behavior category, suggesting that no single treatment benefits everyone's maladaptive behavior. These overall behavior changes suggest that both an Arts Treatment and an Exercise Treatment along with high levels of reinforcers can be associated with behavior improvements throughout the day with specific individuals. However, there is
very little evidence for recommending one intervention over the other solely on behavior change data.

**Physiological Change**

The next experimental question asked was, "Can the participants in the Exercise Group keep their heart rates in their specified training zones as measured by the Heart Watch?" The results answer this question with a convincing, "Yes." Overall three of the four subjects in the Exercise Group stayed in their training zones over 70% of the time. This is impressive if one considers that a fourth of these heart rates were taken at the 4-minute mark which is very early in the exercise period to expect heightened heart rates. Only one subject, Katie, was unable to consistently keep her heart rate in her training zone (only 20% of time overall). Subjects kept their heart rates elevated within their training zones a greater percentage of the time proportionately with each increasing 4-minute mark; this would suggest cardiovascular conditioning was likely to have occurred in three of the four subjects. This is further supported by the pre- to post-treatment differences in the heart rates found between the two groups at the 12-minute heart rate and data approaching significance at the 8-minute heart rate and Recovery 3 heart rate. The Heart Watch, due to its proven validity, is seen as a convenient method to get
accurate readings of heart rate changes when working with mental retardation and emotional disorders.

The ability for the majority of subjects to keep their heart rates in their training zone was felt to be in large part due to the one-on-one attention given by the Rio Grande students during running. They often took the subject by the hand encouraging maximum effort. This one-on-one attention was vital due to the sedentary condition of the subjects prior to the beginning of the study. There were few complaints of soreness or fatigue throughout the seven weeks of running.

Physical Fitness Measures Relationship to Behavior Change

The question was asked, "Does cardiovascular fitness as measured by training heart rate have a significant correlation with behavior changes in individuals with emotional disturbance and mental retardation?" The cardiovascular training represented 46% of the total exercise time each day. Although in three of the four subjects, cardiovascular changes as measured by the Heartwatch correlated with certain Ecobehavioral Categories, these results must be viewed with caution since they represented only 3% of the total number of analyses conducted. Therefore, the risk of a Type 1 error exists. The same caution must be taken in interpreting the
relationships between cardiovascular change and maladaptive behavior change as viewed in the progress note data. These significant correlations represented only 1% of this set of analyses. However, the possibility still exists that behavior change is related to training heart rate. It is of interest that many of the significant correlations occurred with the 4-minute heart rate measure. The exact meaning of these correlations is not readily apparent, but may be connected to the explanation that when beginning a run, a comfortable pace is set on a "good" day, or a runner may completely overdo or become lethargic when in a bad mood or burdened with problems on a "bad" day. In two of the three individuals showing significant correlations the heart rate was positively correlated with maladaptive responses. Later significant heart rates at 8 and 15 minutes also were positively correlated with maladaptive responses. This suggests that as heart rate increases, maladaptive behavior increases and as heart rate decreases, it decreases. From day to day a reduction in heart rate could be due either to effects of conditioning or a lack of effort by the subject, although in this study there is evidence that cardiovascular conditioning took place.

Weight lifting represented 27% of the total exercise time each day. The significant correlations between Ecobehavioral Categories and Muscular Strength Categories is more encouraging since these represent 8% of this total set of analyses. Two exercise subjects (Bernie and Eugene) showed significant correlations. Their Upper
and Lower Body Exercises showed positive correlations with adaptive behaviors and negative correlations with maladaptive behavior (i.e. Negative Attention from staff, and Aggression) supporting behavioral benefits associated with weight lifting. It appears that as weight lifted increased, social interaction increased, and aggression and negative attention from staff decreased. Both males increased their weight lifted on both the Upper and Lower Body exercises throughout treatment. It needs to be further explored if EDMR males get more benefit from weight lifting than the females. Sit-ups, interestingly, in two of the subjects, (Eugene and Katie) showed positive correlations with maladaptive behaviors and negative correlations with adaptive behaviors, suggesting that performing more sit-ups was an indicator of a problem day. A visual analysis of the data supports this interpretation. The exact reason for this phenomenon is unknown, but could have to do with an over-abundance of energy expressed on these days being related to problem behavior.

Sit and Reach data showed 9% of this set of correlational analyses to be significant and also represented 27% of the total treatment time. In one subject (Eugene) the Sit and Reach data was positively correlated with maladaptive behaviors and negatively correlated with adaptive behaviors. In another subject, Bernie's Sit and Reach Data was positively correlated with Positive Attention from Staff. These results suggest that reaching further (flexibility)
may have a motivational basis that can be affected by either a "good" day or a "bad" day for a subject and is not necessarily associated with behavior gains.

Only 1% of the analyses between the progress note data and the cardiovascular data was significant. None of the analyses between progress note data and Sit and Reach data was significant. However, 19% of the analyses between muscular strength categories and progress note categories were significant. All of the significant analyses were with the data from Linda. There were negative correlations between the amount she lifted in her Upper Body, Lower Body, and Total Weight lifted and her Verbal Aggression, Physical Aggression, Property Destruction, and Opposition. From visual analysis, as Linda lifted more weight, her maladaptive behavior during the day decreased. Weight lifting seems to be a very effective treatment with Linda.

In summary, the relationship between cardiovascular fitness and behavior change does not appear to be a strong relationship, however, there is some evidence that as heart rate drops during cardiovascular exercise, there is an association with behavior improvement. The relationships between muscular flexibility and behavior change and weight lifting and behavior change warrant further exploration due to the number of significant analyses,
however, the unique contribution of the specific exercise cannot be determined from these data.

Exercise Motivation and Behavior Change

A secondary question was addressed asking, "How does motivation as measured by the Exercise Benefits Questionnaire relate to changes in maladaptive behaviors, social interaction, and goal directed behaviors?" This secondary question could not be adequately answered due to the lack of sufficient variability within the answers given on the motivation questionnaire. The question of the relationship between motivation and behavior change remains an important one but a better instrument is needed to measure exercise motivation before this can be answered.

Behavior Intensity and Behavior Frequency

The relationship between behavior intensity and behavior frequency is important due to both dimensions affecting the inappropriate nature of a maladaptive response. However, the results of these analyses must be viewed with caution since the Behavior Intensity Scale was found to have only marginal reliability (See Table 18). Three of the four subjects in the Arts Treatment Group showed significant negative correlations between behavior intensity data and maladaptive behaviors (Stereotypy and
Aggression) measured with the Ecobehavioral Assessment. For example, on days direct care staff view Larry's overall behavior patterns as disruptive, his Stereotypy might be non-existent and on days Jeff's overall behavior pattern is viewed in a positive light, he might have isolated periods of Aggression. Thus, isolated incidents might not always reflect the quality of behavior a subject is having on a given day. This suggests the need for future research to evaluate the relationship between both behavior intensity and behavior frequency when assessing the true impact of a treatment program.

Implications of Study

Several implications can be drawn from this study:

1. Both Exercise Treatment and Arts Treatment in combination with high levels of reinforcers and social attention may be beneficial treatments for individuals with mental retardation and emotional disturbance. Based on this study's results, exercise may be more beneficial in gaining compliance to staff instructions and encouraging social interactions between participants and direct care staff, however, there appears to be little difference between these two interventions in terms of outcome.
2. The specific types of adaptive and maladaptive behavior affected by an Art's Treatment and an Exercise Treatment, according to this study, are highly individualized, and support the need for single subject design when assessing treatment effects. The same adaptive skill changes associated with treatment were not observed in each subject. For example, most of Katie's social response categories changed positively during treatment, while the only change for Linda was an increase in her Non Goal-directed Activity. The treatments did not affect behavior problems in the same way across individuals. For example, Katie significantly reduced her Stereotypy during treatment while Jeff showed significant increases.

3. The Heartwatch was found to be a functionally useful way to collect heart rate reading in this study, and may be a valuable tool when attempting to get heart rate data in disturbed MR populations.

4. One-on-one instruction and social attention was necessary in this study to keep subjects in both treatment groups properly motivated and to prevent behavior outbursts, and may be needed with other persons classified as EDMR when attempting treatments that demand concentrated attention and effort.
5. There were fewer behavior problems throughout the subjects' day as a result of an Exercise Treatment and social attention and an Art's Treatment and social attention. This suggests that structured treatments in combination with reinforcement may have behavioral benefits that generalize past the immediate time following the structured treatment.

6. The positive response to both treatments exhibited by direct care staff behavior (Social Interaction, Positive Attention) suggest that intensive treatments occurring off the living area may have beneficial impacts on the subjects' interaction with living area staff.

7. Overall in this study, based upon the Ecobehavioral Assessment, as maladaptive categories decreased, there frequently was concurrent increases in adaptive categories. This indicates a reciprocal relationship between maladaptive behavior and adaptive behavior as a result of the Exercise and Art's Treatments. This is very important because today psychologists are looking for non-aversive treatments that can both decrease inappropriate behavior while finding appropriate behaviors to compete with the inappropriate responses. The treatments in this study seemed to fit nicely into this framework.
Stability of Measured Results

The assessment instruments used in this study were being field tested for their utility with this population and their measures of reliability. The only exceptions were the Heartwatch which has been tested previously and shown to have good validity and stability (Leger and Thivierge, 1988) and the Sit and Reach Box which has been used successfully in past research (Jansma, Ersing, and McCubbin, 1986).

Several instruments were found to be very useful and reliable. The Ecobehavioral Assessment adapted from Rojahn and Schroeder's (1979) instrument was well suited for measuring both adaptive and maladaptive behaviors simultaneously. The live observation took place on a large, noisy, and crowded area. The social interactions between both staff and subjects were reliably coded. It was felt that the coders were as unobtrusive as possible and that the documentation system allowed for accurate recording of abrupt changes in behaviors. A few maladaptive codes could have been more reliable, but due to their low frequency an occasional miss by the coder influenced the reliability substantially. The findings of individual increases in adaptive behaviors and decreases in maladaptive behaviors are felt with confidence to be represented by the Ecobehavioral Assessment. Behavioral codes and the documentation system were well defined before the
original baseline was collected (see Appendix D). Likewise the Progress Note Recording Procedure (see Appendix E) was found to be very reliable. The instrument was well defined with specific examples of categories obtained from sample progress notes, prior to the initial baseline. Definitions for maladaptive behaviors were taken from those on the Ecobehavioral Assessment. It was felt this assessment instrument gave direction in coding poorly worded phrases and inconsistently documented information. Thus the author feels with confidence that the maladaptive behaviors in many of the subjects did improve throughout the day during treatment. It needs to be emphasized that local colloquialisms and broad phrases needed to be categorically defined prior to taking baseline.

Due to the reliability found in the behavior recording procedures it is felt that the correlations found between behavior measures and health related measures represent valid relationships which warrant further investigation. It is not known which factors influenced these relationships, but the relationships have direct implications for the behavioral outcome of an exercise treatment.

Several assessment instruments used in this study were not found to be reliable or useful. The Behavior Intensity Scale was inconsistently filled out by staff and was found to be reliable in only two of the three groups. This lack of reliability was possibly
due to differences in perceptions by the direct care staff on what constituted an average day for a subject and staff spending unequal amounts of time with the subjects rated. Therefore, the inverse correlations found between behavior frequency and behavior intensity of the social activity subjects must be approached with caution. The Exercise Benefits Questionnaire had too little variability in response to allow a correlational analysis. All subjects responded extremely favorably to the exercise but there was no response competing for the ceiling on each subject's motivation. This instrument needs to be revised further to better measure the ceiling on a subject's motivation.

Limitations of the Study

There were several limitations of this study which need explanation. First, the initial baseline period taken of the Ecobehavioral Assessment could have been longer to allow more data for comparing the effects of the two treatments. However, when initial baseline was taken, an A-B-A-B design had been proposed and an initial baseline of shorter length was appropriate. However, due to the Christmas holiday disruptions and the approach of cold weather, there were not enough weeks to follow an A-B-A-B design adequately. Thus, the treatment period was extended to seven weeks, and an A-B-A design followed. If the study would have been followed as originally designed, the
continuity of the study would have been disrupted and the cold weather would have made completion of the study tenuous.

Second, the Exercise Benefits Questionnaire did not accurately measure the ceiling on each subject's motivation and thus the data did not show enough variability to be used for analysis. Originally it was felt that soreness from exercising and the novelty effect wearing off would be reflected on answers on this questionnaire. But, the one-on-one attention received each day from Rio Grande students and prizes earned kept a high level of motivation by each subject throughout the study. This program was contrasted by the rigorous daily routine that each subject experienced by living on a behavior area. The Exercise Benefits Questionnaire needs revision. Ways need to be found of having other positive life experiences compete with the motivation to exercise in order to find a ceiling level on each subject's motivation.

Third, the low number of subjects in each treatment group make it difficult to generalize to the whole dually diagnosed population. A group design or a single subject design with more subjects in the Exercise Group would help in generalizing to this population.

Fourth, during the Ecobehavioral Assessment there was a low incidence of maladaptive behavior exhibited across all three phases
making it hard to detect significant behavior change. This low incidence occurred because behaviors were sampled during the same two-hour period each night (6:30 to 8:30). This was necessary because it was the only time of day the residents remained on the living area and was the only time trained observers could routinely come to the Developmental Center. Future studies should attempt to observe subjects at pre-determined times when baseline reveals the majority of behavior problems in each subject.

Fifth, no maintenance period of exercise was attempted to see if behavior improvements would persist. This would be important due to the need in developmental centers for organized programs but not always having staff to supervise daily programs. Maybe, the subjects could exercise effectively without one-on-one supervision after a rigorous exercise procedure was learned. In this study, there was not enough time to test maintenance and also to return to baseline.

Finally, subjects were randomly assigned to either the Exercise Group or Arts Group. The pool of original subjects were individuals with enough frequent problem behaviors to warrant being included in this study. By random assignment more individuals with mild retardation were selected to the Exercise Group and more individuals with moderate retardation were selected to the Arts Group (see Table 1). This may somewhat bias
each group if the skills learned could be directly related to the functioning levels in each group. Future studies should try to balance functioning levels in treatment groups.

Future Research

This study points to several areas where future research could make contributions to how exercise affects an individual with both mental retardation and emotional disturbance. First, similar types of exercise programs should be tried with groups of subjects representing specific clinical populations (obsessive-compulsive, schizophrenia, hyperactivity) to see if there may be different behavior effects that could be expected from exercise and social attention. This might give some direction as to which diagnosis would be associated with which behavior benefits. It might reveal that certain mental conditions could be detrimentally affected by exercise.

Second, this present study showed that often with individuals as maladaptive behavior decreased, adaptive behavior increased. Further research needs to better qualify this relationship. If maladaptive behaviors decrease, under what conditions will adaptive behaviors increase? It could be due to levels of reinforcement, physiological change, or to possibly change in staff perceptions affecting social interaction. Defining the relationship
between these two variables could greatly aid in the understanding of how and when exercise treatments could be applied. More clarity could also greatly enhance the popularity of exercise treatment as being legitimate with dually diagnosed individuals.

Third, future research could help explore more carefully how the components of exercise differentially affect behavior. For instance, a treatment study could have one group run, another lift weights, and another just do stretching exercises, and then measure how these treatments affect resulting behaviors. It would be interesting to see any differences in how direct care staff's behaviors toward these individuals might be affected by treatment.

Fourth, studies with a larger number of subjects are needed to be better able to generalize to the total population. Approaches in effectively instructing and motivating larger groups needs to be found due to this population's easy distractability and the severe behavior problems that can easily interfere with treatment. Maybe only certain types of exercise would be feasible with a larger group.

Finally, exercise studies which show the potential behavior benefits of different maintenance levels of exercise following rigorous treatments are needed. In our study, all the subjects repeatedly asked when the class would resume months following treatment. It seems that if exercise could be slowly weaned back
from every day to several times a week, hopefully behavioral benefits could be maintained and negative effects from discontinuing exercise could be avoided.
REFERENCES


Menolascino, F. J. (1986). Mental illness in the mentally retarded. University of Nebraska Medical Center.


APPENDIX A

CONSENT FORM FOR PARTICIPATION
CONSENT TO INVESTIGATIONAL TREATMENT OR PROCEDURE

I, ______________________________, hereby authorize or direct Randall K. Shively, M.A., or associates or assistants of his choosing, to perform the following treatment or procedure (describe in general terms): A supervised exercise routine consisting of stretching, weight lifting, and cardiovascular exercise that includes stationary bike, run/walk, and rowing machine exercise.

A supervised arts and crafts routine will also be provided. Each participant will get chosen either to the exercise routine or the arts and crafts routine for five (5) weeks and then will switch to the other treatment.

The experimental (research) portion of the treatment or procedure is: To demonstrate what effects exercise and arts & crafts have on behaviors displayed in the living area and any generalized effects in work production in an educational setting.

This is done as part of an investigation entitled: Effects of Exercise, Social Activities, and Reinforcement on Pro-Social and Maladaptive Behaviors of Institutionalized, Mentally Retarded/Emotionally Disturbed Adults: An Ecobehavioral Perspective.

1. Purpose of the procedure or treatment: To find effective ways of treating behavior problems without over-medicating or using procedures which are painful or unpleasant to the person.

2. Possible appropriate alternative methods of treatment: Not to participate in the study.

3. Discomforts and risks reasonably to be expected: The normal aches experienced when one begins using muscles not previously worked. Also, there exists for anyone participating in exercise the risk of injuries to the muscles, tendons, and/or ligaments. The possibility of a medical concern will be closely monitored by daily readings from a Heart Watch attached to each person while performing cardiovascular exercise. A trained supervisor
will monitor the muscular endurance exercises to insure the safety of all participants.

4. Possible benefits for subject/society: Subjects could profits from the release of energy through the exercise and all the levels of reinforcers given during the program. Future participants could benefit from enhancements developed during this study.

5. Anticipated duration of subject's participation: Thirteen weeks - five (5) weeks for the exercise, five (5) weeks for the arts and crafts, and three (3) weeks of baseline gathering (Monday through Friday) for one (1) hour.

I hereby acknowledge that Randall K. Shively, M.A., QMRP, has provided information about the procedure described above, about my rights as a subject, and he answered all questions to my satisfaction. I understand that I may contact him should I have additional questions. He has explained the risks described above and I understand them; he has also offered to explain all possible risks or complications.

I understand that, where appropriate, the U.S. Food and Drug Administration may inspect records pertaining to this study. I understand further that records obtained during my participation in this study may be made available to the sponsor of this study and that the records will not contain my name or other personal identifiers. Beyond this, I understand that my participation will remain confidential.

I understand that I am free to withdraw my consent and participation in this project at any time after notifying the project director without prejudicing future care. No guarantee has been given to me concerning this treatment or procedure.

In the unlikely event of injury resulting from participation in this study, I understand that immediate medical treatment is available at Gallipolis Developmental Center and its local hospital. I also understand that the costs of such treatment will be at my expense and that financial compensation is not available.
Questions about this should be directed to the Human Subjects Review Office at 292-9046.

I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date:__________Time _____ pm Signed:_____________________

Subject

Witness(es)_________________________ _________________________ if Required (Person Authorized to Consent for Subject (if required)

____________________________
(Person Authorized to Consent for Subject (if required)

I certify that I have personally completed all blanks in this form and explained them to the subject or his/her representative before requesting the subject or his/her representative to sign it.

Signed: ______________________________

(Signature of Project Director or his/her Authorized Representative)
APPENDIX B

TASK ANALYSIS OF EXERCISES
TASK ANALYSIS OF PHYSICAL FITNESS ACTIVITIES
TO BE USED IN STUDY

A. Warm-Up and Flexibility

1. Neck Stretches (Side to Side)
   a. Stand erect with feet a comfortable distance apart and arms straight down to sides in a relaxed position.
   b. Move head side to side, touching right ear to right shoulder and left ear to left shoulder.
   c. Repeat.

2. Neck Stretches (Forward to Back)
   a. Stand erect with feet a comfortable distance apart and arms straight down to sides in a relaxed position.
   b. Move head forward until chin tucks into chest.
   c. Move head backwards as far as possible.
   d. Repeat.

3. Arm-Hand-Shoulder Exercises (Side to Side)
   a. Stand erect with feet a comfortable distance apart.
   b. Interlock fingers and turn palms away from body.
   c. Straighten arms to position parallel to floor.
   d. Swing arms to one side, permitting only lead arm to bend and without bending at hips.
   e. Return to position in Step b.
   f. Swing arms to opposite side, permitting only lead arm to bend and without bending at hips.
   g. Return to position in Step b.
   h. Repeat Steps d. through g.
4. Arm-Hand-Shoulder Exercises (Overhead)
   a. Stand erect with feet a comfortable distance apart.
   b. Interlock fingers and turn palms away from body.
   c. Straighten arms to position parallel to floor.
   d. Lower arms to position in front of lower thighs with arms in a locked position.
   e. Swing arms overhead as high as possible and then swing back down to Step d. position.
   f. Repeat Steps d. and e. in a smooth pattern.

5. Toe Touching (Legs Together)
   a. Stand erect with legs together and knees slightly bent.
   b. Bend down and try to touch hands to toes on floor without totally bending knees.
   c. Hold in this position for three to five seconds.
   d. Return to position in Step a.
   e. Repeat Steps b. to d.
   f. With demonstrated training, eventually lock knees throughout the entire exercise.

6. Toe Touching (Legs Spread)
   a. Stand erect with legs two to three feet apart.
   b. Bend down from waist and grasp leg at ankle with both hands (or simply try to touch floor on right side in front of foot).
   c. Hold this position for three seconds.
   d. Return to position in Step a.
   e. Bend down from waist to touch front of body and try to touch floor with both hands.
   f. Hold in this position for three seconds.
   g. Return to position in Step a.
   h. Bend down from waist and grab left leg at ankle with both hands (or simply try to touch floor on right side in front of foot).
   i. Hold in this position for three seconds.
   j. Return to position in Step a.
   k. Repeat Steps b. through j.
7. Inside Leg Stretch
   a. Sit on floor.
   b. Bring the bottoms of your feet together while sitting.
   c. Push gently down on the insides of your legs with both arms simultaneously.
   d. Hold for a five count.
   e. Repeat.

8. Knee Tuck
   a. Lie on back with feet straight out.
   b. Bring one leg up so knee is bent against chest while other leg is flat out.
   c. Hold for five count.
   d. Repeat with other leg.
   e. After five repetitions on each leg, bring both legs up to chest. Repeat three times.

9. Thigh Stretch
   a. Stand on one foot and hold an upright support. (The wall)
   b. Bring other foot up toward the buttocks until ankle can be grasped.
   c. Pull ankle toward buttocks and hold for thirty seconds.
   d. Repeat with alternating leg.

10. Hurdler's Sit
    a. Sit on floor and bring one leg bent in front of body so that the foot is resting against the other leg which is extended straight in front of body.
    b. Reach forward by bending at waist and grab ankle of extended leg with both hands.
    c. Hold position in Step b. three to five seconds.
    d. Return to position in Step a.
    e. Repeat Steps b. through d.
f. Switch positions such that extended leg is bent in front of body and the bent leg is extended in front of body.
g. Repeat Steps b. through f.

11. Pike Sit

a. Sit on floor and extend legs straight in front in locked position with toes pointed forward.
b. Grab ankles or lower calves on outside of legs.
c. Bend forward at waist and try to bring head down to touch legs.
d. Hold Step c. for three to five seconds.
e. Return to position in Step b.
f. Repeat Steps c. through e.

12. Leg-Lift (To the side)

a. Lie on left side, up on left elbow, palms flat on floor.
b. Extend both legs straight out on a line with upper body.
c. With toes pointed, lift right leg up.
d. Lower right leg.
e. Repeat 15 times.
f. Lie on right side, up on right elbow.
g. Repeat steps b. through e.

B. Muscular Endurance

1. Horizontal Bench Press

a. Assume a back/lying position with bar directly over mid-chest.
b. Grasp the bar with hands shoulder-width apart.
c. Lift bar directly over the chest, fully extending the arms.
d. Lower the bar to starting position.
e. Repeat.
2. Leg Press
   a. Sit in seat and bend knees toward chest resting feet on exercise pedals.
   b. Push on pedals until legs fully extend.
   c. Return legs to starting position.
   d. Repeat.

3. Pull Down
   a. Stand squared off to weight machine.
   b. Reach up and grab bar straight overhead.
   c. With trunk straight, pull weight down until the bar is even with arm pits.
   d. Slowly let weight back easily overhead.
   e. Repeat a. through d.

4. Curls
   a. Pick up bar keeping elbows close into sides and feet facing machine, shoulder width apart.
   b. Curl bar up to chest without shifting body weight.
   c. Straighten arms still keeping elbows close to sides.
   d. Repeat.

5. Military Press
   a. Stand facing the bar with feet shoulder-width apart.
   b. Reach up and grab bar with body leaning forward.
   c. Lift bar overhead until arms are fully extended.
   d. Return bar to standing position.
   e. Repeat.

6. Leg Extension
   a. Sit in seat with both legs resting comfortably.
   b. Hook ankles under the lifting cushions of the leg apparatus.
c. Bring both legs forward and up until both legs are straight forward at 90 degrees to the torso.
d. Hold weight momentarily.
e. Return until the legs are in a resting position.
f. Repeat.

7. Bent Leg Sit Up

a. Sit on floor, knees flexed, feet flat, anchored 12 to 18 inches from buttocks.
b. Cross arms over chest, reclining to lying position.
c. Raise torso to original sitting position.
d. Repeat as many repetitions as possible.

C. Cardiovascular Endurance

1. Run/Walk exercise

a. Run at comfortable pace with arms at side up to ten minutes.
b. While running, shoulders should be leaning forward.
c. Slow down to walk when body becomes fatigued. Keep legs moving.

D. Cool-Down Stretching

1. Repeat several of the Warm-up Exercises previously mentioned to exercise all large muscle groups.
APPENDIX C

THE EXERCISE BENEFITS QUESTIONNAIRE
THE EXERCISE BENEFITS QUESTIONNAIRE

Name ______________________
Date ______________________

Directions: The experimenter shows the subject three blocks and tells the subject to give him all the blocks if his answer to the question asked is "good." The experimenter then shows him two blocks and tells the subject to hand him two if he thinks the answer to the question is "OK." He then shows the subject one block and tells him to give him one block if the answer to the question is "not good." The experimenter quizzes the subject twice to make sure he understands the number of blocks representing good, OK, and not good. The experimenter proceeds when the subject gives the correct answer to the number of blocks twice, each time presented in the opposite order. When actually asking the following questions, the experimenter will give the three choices in reverse order on every other question.

1. How do you feel after exercise?
   Good    OK    Not good

2. How do you feel during exercising?
   Good    OK    Not good

3. How do you look after you exercise?
   Good    OK    Not good

4. How do you act after exercising?
   Good    OK    Not good
. How do you sleep each night after exercising?

   Good       OK       Not good

6. How much would you like to continue exercising?

   Much Don't care Not Much
APPENDIX D

REVISED ECOBEHAVIORAL ASSESSMENT
ECOBEHAVIORAL ASSESSMENT

OPERATIONAL DEFINITIONS AND CODING PROCEDURE

Maladaptive Behavior Categories

1. **Aggression (AG)** - This category is scored for physical assault and/or an attempt to physically harm another person and/or verbal aggression defined by negative content or quality which appears hostile toward the recipient. Instructions given from a subject to another resident will be scored as aggression, since on the living area only the staff are allowed to give instructions.

2. **Destruction (D)** - This category is scored for any instance of object misuse in an inappropriate manner, such that damage occurs or could be expected - the potential for damage must exist.

3. **Self-Injury (IN)** - This category is scored for behaviors which appear to be hostile/aggressive acts directed toward self. Duration and severity are not important as long as the intent to harm self was apparent.

4. **Stereotypy (ST)** - This category is scored for any instance of the subject's repetitive motor movements that do not serve any apparent purpose. A motor movement is defined as repetitive if it continues for three or more essentially identical occurrences during six consecutive seconds. Behaviors are not scored as stereotypies if they occur as a component during Goal Directed Activity.

5. **Opposition (O)** - This category is scored for the initiation of a prohibited activity. Opposition to standard rules of the current setting are scored, i.e. stealing, stripping, pica, crying. Opposition to rules that change on a consistent basis will not be scored unless the subject exhibits a blatant behavior that could universally be viewed as inappropriate. This category will include maladaptive behaviors not subsumed under the previous maladaptive categories.
Social Interaction Categories

1. **Positive Attention (PA)** - This category is scored for any verbal or physical prompt originating with the subject or the staff which could be viewed as a positive gesture, defined as no hostile or aggressive intent. Excluded from this category are both positive instructions and compliance to instructions. Any instructions given by the subject to another resident will be viewed as Aggression. Examples of verbal prompts under Positive Attention are compliments, praises, or questions which do not directly imply instruction. Examples of physical contact are a pat on the back, a hug, or any other positive contact. Non-verbal gestures by staff should be categorized as Positive or Negative Instruction. However, undivided non-verbal attention from the staff to the subject should be scored as Positive Attention as long as this attention lasts at least two consecutive seconds.

2. **Negative Attention (NA)** - Any verbal or physical attention by staff directed to the subject which could be viewed as aggressive or hostile in nature. This could be negative verbal content, voice quality, or physical action. This category excludes Negative Instructions. Negative subject behaviors will not be scored from this category but will be scored under Maladaptive Behavior Categories.

3. **Compliance (C)** - This category is scored for any instance of compliance with an explicit verbal or non-verbal instruction by a staff member given within five seconds of the request.

4. **Non-Compliance (NC)** - Obvious refusal to comply with verbal or non-verbal instructions or rules by staff within five seconds of request.

5. **Positive Instructions (I+)** - This category is scored for direct verbal commands (i.e. orders, suggestions, questions, contingencies, or rules) by staff to which a motoric or verbal response by the subject is expected. Any question asked by staff that is phrased in an attempt to get the subject to respond should
be scored. If more than one positive instruction is given in any one ten-second interval, only score once. If the subject complies with any of these positive instructions, score the interval as Compliance. If an instruction is given at the end of an observe interval, allow five seconds into the next record interval before scoring the subject's behavior as Compliance or Non-compliance.

6. **Negative Instructions (I-)** - This category is scored for direct verbal negative commands (i.e. orders, suggestions, questions, contingencies, or rules) to which a motoric or verbal response by the subject is expected. If more than one negative instruction is given in any ten-second observe interval, only score once. If the subject complies with any of these negative instructions, score the interval as Compliance. The subject should have five seconds to respond before recording as Compliance or Non-compliance. Negative is characterized by the verbal content, the assertive behavior or the speaker, or the voice quality of the speaker. This will be scored if the staff tells, suggests, or otherwise informs a subject to stop an undesirable behavior. If there is any doubt whether behavior should be scored as positive or negative, score as Positive Instruction.

**Directed Activities Categories**

1. **Goal-Directed Behavior (G)** - This category is scored for an interval of six consecutive seconds of either work- or play-related activity. The subject must continue movement for the six seconds in order to score this category. Work is defined as task either desirable to the staff or chosen by the staff (i.e. chores) or items chosen to be played with for a specific purpose. If subjects manipulate an object for a specific purpose or goal, score this category, as long as the subject's attention is on the object. This category also includes play as defined as interaction with toys, games, that the staff have not directly assigned. Routine tasks chosen by the subject (i.e. drinking from a glass, taking medicine) should be scored as Goal-Directed Behavior. Social interaction codes and maladaptive codes can be scored during this interval as long as the work or play is continued for six consecutive seconds. If a subject repetitively plays with an appropriate object, score as Goal-Directed Behavior, not Stereotypy. Watching television
would be scored under this category. If a subject is smoking or eating, they must be presently in the act or attending to the task in order to score Goal-Directed Behavior.

2. Non Goal Directed Behavior (NG) - Behavior engaged in by the subject without any apparent purpose or goal in mind for a full interval (10 seconds). If at anytime during the interval, the subject talks to another resident or staff and/or physically communicates with another, do not score this category. If a subject is given an instruction and fails to respond, score Non-Compliance, not this category. Examples of this category are: looking around the room, staring at people or objects, or sitting quietly with eyes closed. A subject pacing the floor without socializing, interacting with others, or showing purposeful activity would be scored in this category. If a subject walks across the living area to obtain an object or talk to a person, score Goal Directed Behavior, not this category. If a subject is very close to an object or an activity in which he or she is intent upon watching (i.e. observing staff, reading a book) score as Goal Directed Behavior, not this category.

3. Slash (/) - This category is scored for any instance in which the observer's visual contact with the subject is interrupted for more than three seconds. This scoring of the slash category precludes the scoring of any other response category. Slash intervals will be dropped from analysis. If the resident leaves the viewing area up to three Slashes will be recorded before discontinuing recording. At this time the recorder will be stopped and staff asked to urge the subject to return to the main living area. Any attention given directly to the observers/raters by the subjects will be discouraged and will not be coded. Subjects will be told that the observers are busy and do not want to be bothered. The subject going to his room or entering the staff office will be considered leaving the area. If the subject leaves the area for any part of the observation interval, a Slash will be recorded.

Note: If scoring is interrupted at any time due to an emergency on the floor, a bold vertical line will be drawn through the last interval scored and an explanation for the interruption will be written at the bottom of the scoring sheet.
APPENDIX E

PROGRESS NOTES RECORDING PROCEDURE
PROGRESS NOTE BEHAVIOR RECORDING PROCEDURE

A progress note as common procedure is written by the direct care staff about a resident's behavior only if something mentionable happened out of the ordinary such as a severe behavior problem. The following rules were used when reviewing progress notes.

1. Only behaviors reported as occurring on grounds were included in the data.

2. Several maladaptive codes could be used for the same behavioral incident. Each new entry by time or date would be independently tallied as a separate incident.

3. Each behavior type could be counted only once per entry even if the subject exhibited several different maladaptive behaviors subsumed under that type.

Definitions and Examples

The following definitions were taken from those given in the Ecobehavioral Assessment. The examples are taken directly from sample incidents read in the progress notes.
1. **Verbal Aggression** - Negative verbalizations defined by the content or voice quality which appears to be hostile toward the recipient.

   Examples: Cursing, arguing with another, demanding items, being mouthy, and teasing others.

2. **Physical Aggression** - A physical assault and/or an attempt to physically harm another person.

   Examples: Kicking, hitting, biting, spitting at another, and/or attempting to do the above.

3. **Property Destruction** - Any instance of object misuse in an inappropriate manner such that damage occurs or could be expected. The potential for damage must exist.

   Examples: Throwing large items (chairs, trash cans), knocking over furniture, slamming doors, tearing up public or private property, banging on walls and/or tables.

4. **Self-injury** - Behaviors which appear to be hostile/aggressive. acts toward oneself. Duration and severity are not as important as long as the intent to harm self is apparent.
Examples: Beating head on wall, biting self, digging eyes, slapping self.

5. **Stereotypy** - Any instance of a subject's repetitive motor movements that do not serve any apparent purpose.

Examples: Rocking body, flicking fingers.

6. **Opposition** - Any instance of initiating an activity which goes against either implicit or explicit rules. Opposition to rules that change on a consistent basis will not be scored unless the subject exhibits a blatant behavior that could be universally viewed as inappropriate.

Examples: Crying, yelling, screaming, refusing a program, throwing a small item (not at a person), refusing to eat, urinating in clothes or on floor when upset, disturbing others, public masturbation, stealing from someone else, returning to the living area late, excessive talking, and badgering another.
APPENDIX F

BEHAVIOR RECORD FORM
### Behavioral Record Sheet

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### Behaviors

**Maladaptive**
- AG - aggression
- D - destruction
- IN - self-injury
- ST - stereotypy
- O - opposition

**Social Interaction**
- PA - positive attention
- NA - negative attention
- PI - positive instruction
- NI - negative instruction
- C - compliance
- NC - non-compliance

**Directed Activity**
- G - goal directed behavior
- NG - non-goal directed behavior
- / - not observable
APPENDIX G

WEIGHT PROGRESS CHART
<table>
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<tr>
<th>Name</th>
<th>Date</th>
<th>Bench Press</th>
<th>Date</th>
<th>Leg Press</th>
<th>Date</th>
<th>Lat Pull-Down</th>
<th>Date</th>
<th>Curls</th>
<th>Date</th>
<th>Military Press</th>
<th>Date</th>
<th>Leg Extension</th>
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Date
Start
4 min
8 min
12 min
15 min
Rec 1
Rec 2
Rec 3
APPENDIX I

FUNCTIONAL CRAFTS FOR ARTS TREATMENT GROUP

217
Appendix I

1. Macaroni Picture Art
2. Airplane Glider Kit
3. Hand Puppets Kit
4. Frisbee Decorating
5. Clothespin Animals
6. Change Purse Kit
7. Frog Note Holders
8. Decorative Pillows
9. Paint and Swirl
10. Country Tin Punch
11. Foil Art
12. Rub On Art (Small containers)
13. Indian Art (Sandpainting)
14. Decoupage Pictures
15. Run On Art (Large containers)
16. Foam Magnets
17. Skill Sticks Constructions
18. Color Wearable Stickers
19. Construction Paper Art
APPENDIX J

BEHAVIOR NON-COMPLIANCE FORM
<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>OBSERVER</th>
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BEHAVIORAL NON-COMPLIANCE RECORD

<table>
<thead>
<tr>
<th>Date</th>
<th>For What Behavior?</th>
<th>Length of Time Interacting</th>
<th>Result in Subject's Performance</th>
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APPENDIX K

STAR CHART
STAR CHART

Name__________________________________________

MONDAY                                   - - - - - GOOD JOB!

TUESDAY                                  - - - - - KEEP TRYING!

WEDNESDAY                                - - - - - EXCELLENT!

THURSDAY                                 - - - - - ALMOST THERE!

FRIDAY                                   - - - - - YOU MADE IT!
APPENDIX L

BEHAVIOR INTENSITY SCALE
Subject:____________________________________
Informant:__________________________________
Date:________________________

Put a mark on the scale from "worst" to "best" compared to this resident's usual behavior on any given day. "Best" means good behavior in the area stated. "Worst" means poor behavior in the area stated.

Put marks on the following:

1. Opposition to Rules
/________________________________________/____________________________________/
worst opposition average compliance best compliance

2. Behavior Outbursts
/________________________________________/____________________________________/
worst outbursts average behavior best behavior

3. Compliance with Directions
/________________________________________/____________________________________/
worst compliance average compliance best compliance

4. Out of Control Behavior Patterns
/________________________________________/____________________________________/
worst patterns average control best behavior

5. Irritability
/________________________________________/____________________________________/
worst Irritability average mood best mood

Approximately how many hours did the resident sleep last night?
APPENDIX M

OBSERVATIONAL DATA:

NON-SIGNIFICANT GRAPHS
Katie - Positive Attention

Katie - Goal Directed
Katie - Total Cont. Clus.

Katie - Neg. Attn.
Linda - Positive Attention

Linda - Goal Directed
**Linda - Instructions, Pos.**

Treatment

- B-line

**Linda - Non-Comp. Rate**

Treatment

- B-line

- N-Comp....
Eugene - Soc. Inter. Cluster

Eugene - Opposition
Eugene - Negative Attention

Treatment

NA vs. DAY

B-line

0 10 20 30 40 50

D A Y
Bernie - Positive Attention

Bernie - Goal Directed
Bernie - Positive Staff Attent.

Bernie - Non Comp. Rate
Larry - Goal Directed

Larry - Non Goal Directed
Evelyn - Stereotypy

Evelyn - Goal Dir. Beh.
Evelyn - Non Goal Dir. Beh.

Evelyn - No Observation
Evelyn - Positive Instructions

Evelyn - Malad. Cluster
Evelyn-Adap. Cluster

Adap. Cl.

0 1 2 3 4 5 6 7 8

DAY

0 10 20 30 40 50

B-line Treatment B-line Adap. Cl.
Debbie - Positive Attention

Treatment

Debbie - Goal Directed

Treatment
Debbie - Non Comp. Rate

Debbie - Malad. Cluster
Debbie - Neg. Attent.
Treatment

B-line

NA

D-1ine

0.35

0.3

0.25

0.2

0.15

0.1

0.05

0.05

0

10

20

30

40

50

DAY
APPENDIX N

PROGRESS NOTE DATA:

NON-SIGNIFICANT GRAPHS
Katie - Opposition

B-line

Treatment

B-line

Opposition

Week
Property Destruction

Eugene-Prop. Destr.
B-line

Property De...

B-line

Physical Agg...

Week
Verbal Aggression

Week

Eugene - Verbal Aggression
Treatm. - B-line
Bernie - Opposition

B-line

Opposition

Week

Treatm.

B-line
Jeff - Property Destruction
B-line Treatm. B-line

Jeff - Physical Aggression
B-line Treatm. B-line
Larry - Phys. Aggression

Physical Aggression

B-line

Treatm.

B-line

Physical Agg...

Week
Evelyn - Physical Aggr.

B-line

Week

Evelyn - SIB

B-line

Week
Debbie - SIB

Debbie - Opposition