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Increasing Appropriate Behavior Using Antecedent Physical Exercise in Mentally Retarded Adults

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**INCREASING APPROPRIATE BEHAVIOR USING ANTECEDENT
PHYSICAL EXERCISE IN MENTALLY RETARDED ADULTS**

by

Steven DeGroot

**A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Master of Arts
Department of Psychology**

**Western Michigan University
Kalamazoo, Michigan
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INCREASING APPROPRIATE BEHAVIOR USING ANTECEDENT
PHYSICAL EXERCISE IN MENTALLY RETARDED ADULTS

Steven DeGroot, M.A.

Western Michigan University, 1987

In order to ascertain if aerobic exercise would facilitate task performance, two mentally retarded adults exercised five days a week and performed three discrimination tasks three days a week. Baseline performance was determined for the two subjects on the tasks which involved shape discrimination, picture discrimination, number discrimination, and sequencing. After their baseline performance was determined, the two participants began an exercise program which worked toward increasing their pulse rates to an aerobic level (150% of resting pulse). Subsequently, the subjects performed the discrimination tasks immediately after exercise. After this intervention period, baseline performance was again determined. The results indicated that generally the exercise improved the performance of both subjects.

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TABLE OF CONTENTS

LIST OF FIGURES iii

INTRODUCTION 1

METHOD 4

 Setting and Materials 4

 Procedure 5

 Observer Training 6

 Design 6

 Experimental Conditions 7

 Baseline 7

 Intervention 7

RESULTS 9

DISCUSSION 13

BIBLIOGRAPHY 15

LIST OF FIGURES

1. The Mean Time in Seconds for Discrimination Tasks for All Three Phases for Subject 1 and Subject 2	10
2. The Mean Time in Seconds for All the Discrimination Tasks for All Three Phases for Subjects 1 and 2	11

INTRODUCTION

The reduction of inappropriate behaviors in mentally retarded adults has been shown in numerous studies (Baumeister & MacLean, 1984; Luce, Dequadri, & Hall, 1980). Some have shown aerobic exercise to be instrumental in the reduction of inappropriate behaviors. Bachman and Fuqua (1982) studied the effects of several levels of exercise on inappropriate behaviors of four trainable mentally impaired students. Jogging at various rates and at various distances produced results indicating a decrease in inappropriate behaviors. An inverse relationship was shown between the level of exercise and the amount of inappropriate behavior. Watters and Watters (1980) described decreases in self-stimulatory behavior of five autistic boys during language training sessions which succeeded 8 to 10 minutes of jogging. Allen (1980) reported that by varying the duration of jogging, decreases were produced in outbreaks of disruptive behavior of learning handicapped boys. Breuning, Davis, and Hatton (1979) documented a decrease in the disruptive behavior of institutionalized developmentally disabled women during time periods immediately following an exercise program. Recently, Bachman and Sluyter (1982) also showed antecedent exercise to be a promising technique for behavioral control of developmentally disabled adults.

Although research pairing physical exercise with a decrease in inappropriate behavior is abundant, research pairing physical exercise with an increase in appropriate behaviors is not quite so greatly

common. Folkins and Sime (1981) reviewed the literature that has attempted to relate physical fitness training to improvements on psychological variables with normal subjects, and selected clinical populations. They reported that, "the research suggests that physical fitness leads to improved mood, self-concept, and work behavior" (p. 373). They also reported that the evidence is less clear, however, as to the effect of exercise on cognitive functioning. They say that exercise does appear to bolster cognitive performance during and after physical stress. They point out that, "the literature dealing with the mentally retarded has stressed physical training mainly because many retardates lack proper physical training in their development" (p. 374). Many studies have demonstrated that a comprehensive physical training program can produce significant gains in IQ (Brown, 1977; Corder, 1966; Oliver, 1958). Although Corder (1966) demonstrated that some gains could be attributed to a Hawthorne effect, the physical treatment effect was predominant and very significant.

Stoner (1973) documented the effects of two levels of pretest exercise upon the performance of a gross motor task by educably retarded children, showing higher levels of exercise within a regimented program to correlate with an increase in the gross motor task performance. In a similar study, Tomprowski and Ellis (1985) divided institutionalized severely and profoundly mentally retarded adults into an experimental and control group; the control group continued their normal institutionalized exercise program and showed no significant change in cardiovascular efficiency nor

improvements in psychological or behavioral variables. The experimental group engaged in an 8-month rigorous exercise program which showed great improvement in the cardiovascular efficiency of the subjects involved in this program. Contrary to the authors' hopes, however, no changes in intelligence or adaptive behavior were obtained.

METHOD

This study involved two subjects. The first subject, John, was a 50-year-old male who was in average physical condition and of average health. John's resting pulse was recorded daily for three days and was found to be 88. The second subject, Mary, was a 46-year-old female who was also in average physical condition and of average health. Her average resting pulse for a three-day period was also 88. Both subjects were clients attending a center for developmentally disabled adults for more than five years. Although data were collected for their performance tasks, these same tasks have been used by the center for programming purposes. Both clients, however, showed much room for improvement in the tasks chosen for them. The physical exercise program in which both subjects were engaged was part of an on-going physical exercise procedure already being conducted at the center. John and Mary did not participate in the exercise program until after their baseline performance on the discrimination tasks was ascertained.

Setting and Materials

The physical exercise program was conducted in a typical elementary school gymnasium. Exercise mainly consisted of aerobic types of movement, along with walking and brief periods of running. Occasionally, balls and music were also used to stimulate and facilitate exercise.

The various discrimination tasks included: (1) number forms, in which numbers made of foam rubber had to be correctly placed in their proper forms; (2) a foam rubber card 10" x 10", with 16 shapes, such as a tree or a mushroom, half of the shapes were removed and had to be placed correctly in their holes; (3) the "sorting box," which had five holes in the top of a box (a circle, a square, a rectangle, a thin rectangle, and a triangle), which required that wooden shapes be correctly placed in these holes; and (4) a peg board with 20 holes on one line, which could be used for sequencing tasks.

Task performance was always monitored in a room containing only the subject and the examiner. A single small table, at which the examiner sat across from the subject, was used during task administration and performance.

Procedure

Baseline data were obtained from both John and Mary before they participated in the exercise program. Baseline data were collected at various times of the day between 9:00 a.m. and 2:30 p.m. At least 10 trials on all the tasks the subjects performed were given during baseline. John, the first subject, participated in the peg board, with the varying sequences, the number sequences, and also the foam rubber cards containing 16 shapes. Mary, the second subject, participated in the sorting box, with 5 shapes, the number sequences, and the foam rubber cards with 16 shapes. After baseline performance was determined, both subjects participated in a

physical exercise program, which consisted of aerobic movement, such as toe-touching, done rapidly, arm-swinging, leg-lifting (while standing). Then, as part of the exercise program, the subjects walked and jogged around the gymnasium. The goal of the exercise was to get the subjects' pulses to an aerobic effect, which is 150% of resting pulse. This was 132 for both subjects. The exercise program lasted for about 30 min. before the aerobic effect was achieved. Warm-up and cool-down periods lasting from 5 to 10 min. were always included before and after the more rigorous exercise. Subjects participated in exercise five days a week. Task performance after exercise was measured three days a week on Monday, Wednesday, and Friday. Performance was measured twenty times over a period of approximately seven weeks.

Observer Training

Training consisted primarily of learning to use a stopwatch correctly so as to accurately time subjects on the individual discrimination tasks. Testing and observation were usually done by one of the authors.

Design

An alternating treatments design (Barlow & Hayes, 1979) was used. The procedure consisted of a single intervention of physical exercise which was preceded and followed by baseline phases.

Experimental Conditions

Baseline

Measurements on all the various discrimination tasks, for both subjects, were usually made in the morning after the subjects first arrived at the center. Baseline measurements were usually completed each day before regular programming began at the center, so as not to interfere with the subjects' other tasks and activities at the center.

Intervention

Both subjects engaged in physical exercise with 16 other developmentally disabled adults. During this intervention phase the subjects participated in physical exercise daily, Monday through Friday. The various exercises were modeled and prompted by two or more staff members of the center who were experienced in physical exercise training. Each exercise session consisted of a warm-up phase, in which arm twists, back twists, shoulder rolls, toe touches, foot kicks, and clapping were utilized. The, the fast "aerobic" movement phase, in which jumping, vigorous walking, jumping jacks and both jogging in place and around the gym were used. The cool-down phase consisted of walking slowly, foot kicks, hand shaking, arm twisting, clapping and deep breathing. The duration of these three phases was 10, 15, and 10 min., respectively. Pulse rates were measured by pulse-meters for both subjects for the entire exercise session.

Pulse rates of both subjects were closely monitored during the fast "aerobic" movement phase so as to bring the pulse rate to an "aerobic effect" for at least 5 min. during this phase. Monitoring was also done to assure that the pulse rates did not increase by more than 10 points above the particular subject's "aerobic effect" pulse rate.

RESULTS

Figure 1 generally displays the mean time taken for each of the subjects to complete the various discrimination tasks during each phase of the experiment: baseline, intervention, return to baseline. Attention is called to the fact that "Peg Sequencing" is shown as percent correct for Subject 1. From the figure it may be seen that on each task except "Peg Sequencing," exercise produced an effect: performance time decreased during the intervention phase and increased during the return to baseline phase. This is most dramatically shown in Figure 2 which averages together all tasks for each subject. With Subject 1, the baseline is almost recovered. This recovery of the baseline suggests there may be an absence of any practice effect. The baseline was not recovered with Subject 2, but there was a substantial increase during the return to baseline phase over the intervention phase.

If the data from both subjects are averaged together and expressed as a percentage decrease from baseline, then the subjects' performance during intervention was 67% of baseline and rose to 83% of baseline during the return to baseline period. It is very possible that more recovery would have been shown had the return to baseline period been extended.

One can only speculate concerning Subject 1's peculiar performance on "Peg Sequencing." Figure 1 shows that this subject's performance deteriorated over time irrespective of the phase of the

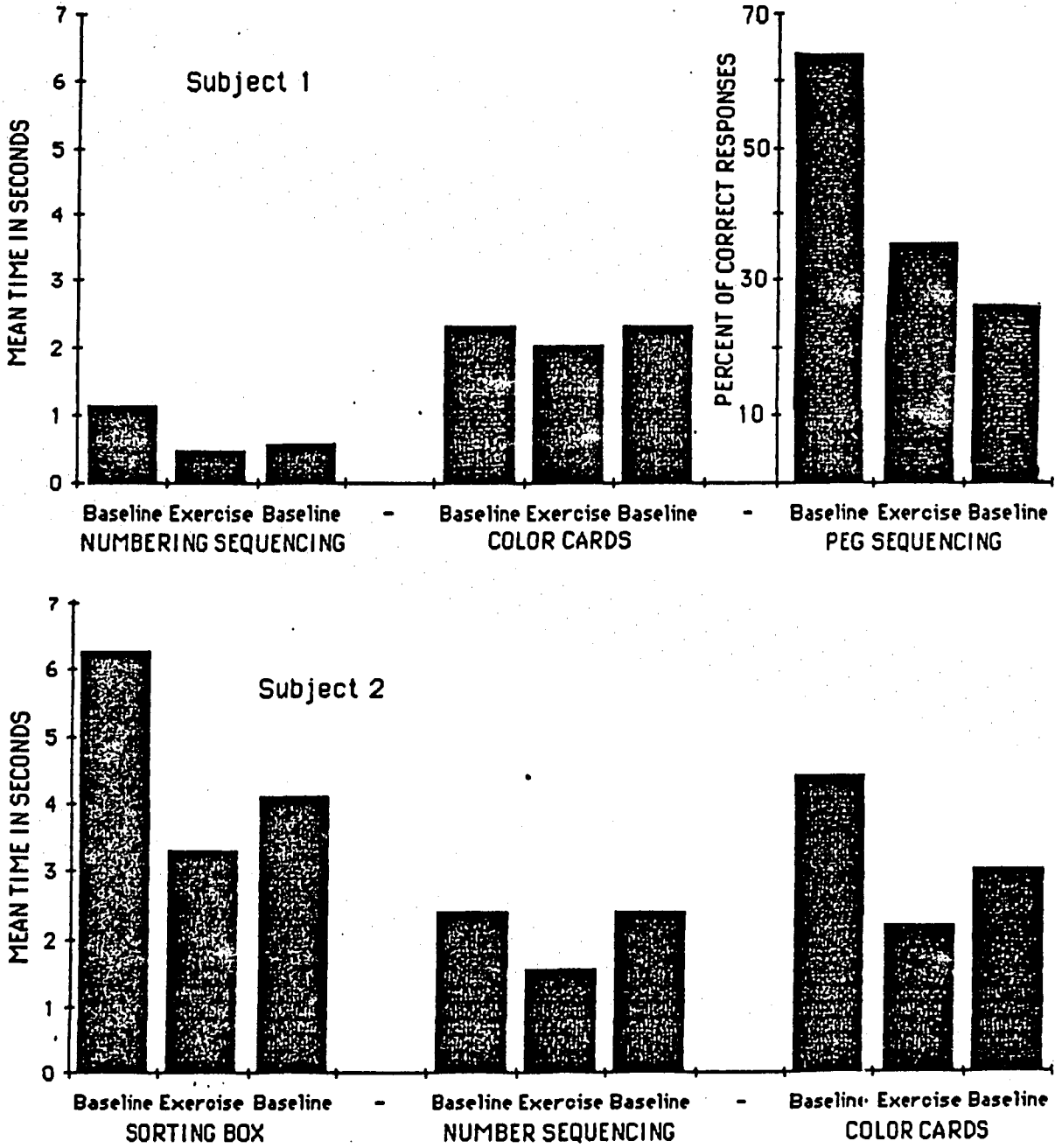


Figure 1. The Mean Time in Seconds for Discrimination Tasks for All Three Phases for Subject 1 and Subject 2.

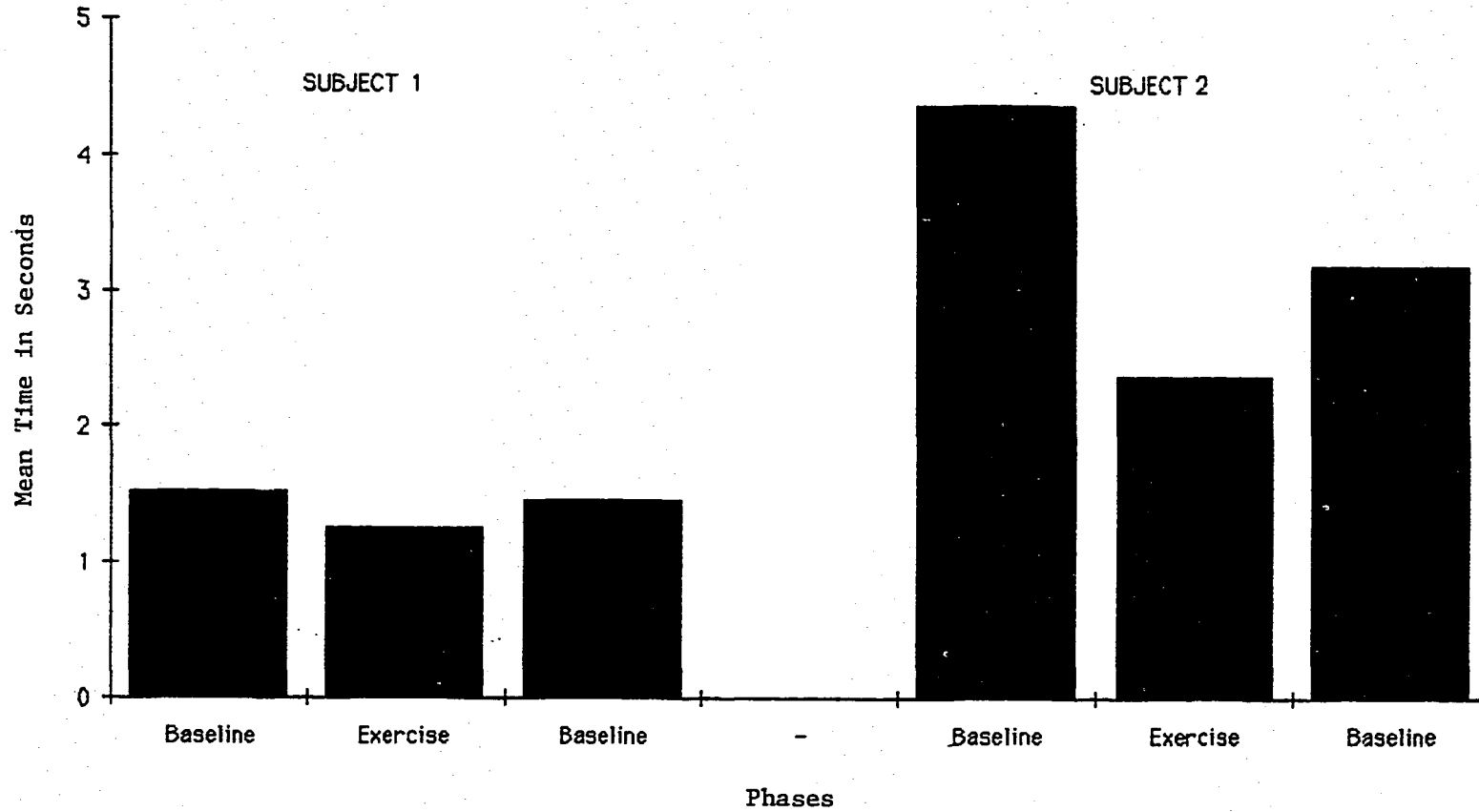


Figure 2. The Mean Time in Seconds for All the Discrimination Tasks for All Three Phases* for Subjects 1 and 2.

*Note: For Subject 1, the Peg Sequencing Phase is not included.

experiment. One possibility is that the task became increasingly aversive.

DISCUSSION

Several studies (Allen, 1980; Bachman & Sluyter, 1982; Baumeister & MacLean, 1984; Kern, Koegel, Dyer, Blew, & Fenton, 1982; Watters & Watters, 1980) have demonstrated the effects of physical or aerobic exercise in reducing inappropriate behavior. Previous studies (Brown, 1977; Corder, 1966; Oliver, 1958; Stoner, 1973; Tomprowski & Ellis, 1985) have also demonstrated the effect of physical exercise on increasing appropriate behavior. A number of issues, however, require further study. The literature has not extensively reported the types of appropriate behaviors or tasks which physical exercise positively affects. Neither has the literature described to what degree physical exercise affects appropriate behavior. The results of this study suggest that physical exercise increases appropriate behavior during some, but not all, tasks. Furthermore, the results of this study show a wide range of improvements in behavior for the two subjects and across the various tasks. To what extent physical exercise increases appropriate behavior is not defined by this study nor in other literature.

In this study, strenuousness of the exercise was not a variable. Kern et al. (1982) put subjects through mildly strenuous jogging for 15-min. periods to produce an increased breathing rate or a flushed face. Baumeister and MacLean (1984) increased their subjects' jogging distance from 1 to 3 miles in a 1-hour period over the course of their study. Bachman and Fuqua (1983) defined vigorous

exertion in terms of an attained pulse rate. This study does not define to what pace exertion or strenuousness physical exercise needs to be done to achieve an increase in appropriate behavior.

Despite all that remains to be studied on the effects of physical exercise on appropriate behavior, antecedent physical exercise appears to be a promising factor in increasing appropriate behavior in developmentally disabled adults. Although exercise has yet to be compared with other behavioral interventions, its use appears more advantageous than some other behavior modification techniques such as punishment because the former does not appear to have some of the undesirable side effects produced by the latter. Physical exercise programs also involve less training of staff and clients than other behavioral programs designed to increase appropriate behavior. Lastly, physical exercise appears to be a constructive, positive behavior, thereby being a tremendous benefit to developmentally disabled individuals who typically lead a sedentary life (Bachman & Sluyter, 1982).

BIBLIOGRAPHY

- Allen, J. I. (1980). Jogging can modify disruptive behaviors. Teaching Exceptional Children, 12, 66-70.
- Bachman, J., & Fuqua, W. (1983). Management of inappropriate behaviors of trainable mentally impaired students using antecedent exercise. Journal of Applied Behavior Analysis, 16, 477-484.
- Bachman, J., & Sluyter, D. (1982). Reducing inappropriate behaviors of developmentally disabled adults using antecedent aerobic dance exercise. Unpublished manuscript.
- Baer, D. M., Wolf, M. M., & Risley, T. R. (1982). Some current dimensions of applied behavior analysis. Journal of Applied Behavior Analysis, 15, 395-398.
- Barlow, D. H., & Hayes, S. C. (1979). Alternating treatments design: One strategy for comparing effects of two treatments in a single subject. Journal of Applied Behavior Analysis, 12, 199-210.
- Baumeister, A. A., & MacLean, W. E. (1984). Deceleration of self-injurious and stereo-typic responding by exercise. Applied Research in Mental Retardation, 5, 385-393.
- Brown, B. J. (1977). The effect of an isometric strength program of the intellectual and social development of trainable retarded males. American Corrective Therapy Journals, 31, 44-48.
- Bruening, S. E., Davis, V. J., & Hatton, J. C. (1979). Strategic time scheduling of physical exercise programs for the retarded: An effective procedure for reducing inappropriate behaviors. Unpublished manuscript.
- Corder, W. W. (1966). Effects of physical education on the intellectual, physical, and social development of educable mentally retarded boys. Exceptional Children, 32, 357-363.
- Folkins, C. H., & Sime, W. E. (1981). Physical fitness training and mental health. American Psychologist, 36(4), 373-389.
- Kern, L., Koegel, R. K., Dyer, K., Blew, P. A., & Fenton, L. R. (1982). The effects of physical exercise on self-stimulation and appropriate responding in autistic children. Journal of Autism and Developmental Disorders, 12, 399-419.

- Luce, S. C., Delquadri, J., & Hall, R. V. (1980). Contingent exercise: A mild but powerful procedure for suppressing inappropriate verbal and aggressive behavior. Journal of Applied Behavior Analysis, 13(4), 583-594.
- Oliver, J. N. (1958). The effects of physical conditioning exercises and activities on the mental characteristics of educationally subnormal boys. British Journal of Educational Psychiatry, 28, 155-165.
- Stoner, J. C. (1973). The effect of two levels of pre-task exercise upon the performance of a gross motor task of educable mentally retarded children. Dissertation Abstracts International, 33, 3360-3361. (University Microfilms No. 73-04, 345)
- Tomprowski, P. D., & Ellis, N. R. (1985). The effects of exercise on the health, intelligence, and adaptive behavior of institutionalized severely and profoundly mentally retarded adults; A systematic replication. Applied Research in Mental Retardation, 6(4), 465-473.
- Watters, R. G., & Watters, W. E. (1980). Decreasing self-stimulatory behavior with physical exercise in a group of autistic boys. Journal of Autism and Developmental Disorders, 4, 387-479.