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Changes in Biomedical and Physical Correlates in Behavioral Weight Loss with Retarded Youths

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ABSTRACT: Seventeen trainable mentally retarded youths were assigned to either a behavior therapy (N = 6), an obese wait-list control group (N = 5) or a normal weight control group (N = 6). The behavior therapy subjects lost significantly more weight than the two control groups who gained weight. The behavior therapy subjects achieved significant reductions in tricep skinfold thickness, abdominal circumferences, and diastolic blood pressure measures by the end of the 21-week treatment program. The advantages of using multiple dependent measures is discussed.

The behavioral treatment of obesity among the retarded has to a large extent followed the course of treatment of the nonretarded (Rotatori, Switzky, & Fox, 1983). The success of behavioral procedures with the obese retarded have been reported with increasing frequency in the past ten years (Altman, Bandy, and Hirsch 1978; Buford, 1975; Foreyt and Parks, 1975; Gumaer and Simon, 1979; Heiman, 1978; Jackson and Thorbecke, 1982; Rotatori and Fox, 1980; Rotatori, Fox, and Switzky, 1979; Rotatori, Fox, and Switzky, 1980; Rotatori, Parrish, and Freagon, 1979; Rotatori and Switzky, 1979). Positively, mental retardation researchers are broadening the area of investigation as demonstrated by the development of streamlined programs (Fox, Haniotes, and Rotatori, 1984), the study of the prevalence of obesity among the retarded (Fox and Rotatori, 1982), the study of the positive effects of parents active participation in weight reduction programs (Fox, Rosenberg, and Rotatori, 1985), the study of personality characteristics and physical fitness of obese retarded (Fox,

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Burkhart, and Rotatori, 1984), the comparison of measurement procedures to assess obesity in the retarded (Fox, Burkhart, and Rotatori, 1983), a comparison of procedures to measure skinfold loss in the retarded (Mehta, Rotatori, Fox, and Baker, in press), and the study of the differences in eating style of the obese retarded (Fox, Burkhart, and Rotatori, 1982). The present study continues the above trend by assessing the changes in biomedical (Stunkard, Craighead, and O'Brien, 1980; Tuck, Sowers, Dornfield, Kledzik, and Maxwell, 1981) and physical (Franzini and Grimes, 1976; Grimes and Franzini, 1977; Seltzer and Mayer, 1965; Weil, 1977) correlates in weight reduction research with normal obese subjects. Thus this study investigated changes in (1) body weight, (2) skinfold thickness, (3) blood pressure, (4) pulse, and (5) body circumferences for retarded subjects who participated in a 21-week behavioral weight reduction program.

METHOD

Subjects

Eleven overweight and six normal weight subjects who were attending a public school for trainable mentally retarded students participated in the study. All students were living with their families. The overweight students were randomly assigned to an experimental behavior therapy group or a wait-list control group. The six normal weight students were assigned to a no-treatment control group. The experimental obese group included six subjects, three females and three males (mean age = 18.0 years, sd = 2.2; mean percent overweight = 69.3, sd = 12.7). The wait-list control obese group included five subjects, three females and two males (mean age = 17.2 years, sd = 1.9; mean percent overweight = 30.1, sd = 4.07). The control nonobese group included six subjects, two females and four males (mean age = 16.3 years, sd = 3.3; mean percent overweight = −.05, sd = 4.23). An analysis of variance computed for the age variable revealed no significant differences between the three groups.

PROCEDURE

Behavior Therapy: (21 weeks)

The behavior therapy subjects were exposed to a multicomponent behavioral self-control weight program specifically designed for the mentally retarded (Rotatori and Fox, 1981). The program which was directed by the school nurse involved group instruction in the following procedures: self-monitoring techniques (e.g., recording daily weight, food intake, and eating habit change), food-cue elimination techniques (e.g., eating in one place, taking only one helping, using a complete place setting at each meal),

changing the act of eating (e.g., eating slower, chewing food completely, putting utensils down on the table between bites, leaving some food at each meal), the use of exercise to increase energy expenditure (e.g., engage in daily calisthenic period, use stairs rather than an elevator), engaging in alternative activities to eating (e.g., going for a walk rather than snacking) and changing snack habits (e.g., substituting low calorie snack, delaying the daily time period for snacks). The procedures were first verbally described by the school nurse. A rationale for each procedure was reviewed as well as specific ways for implementing it. Then the school nurse demonstrated the techniques in a simulated scene. After this demonstration period the subjects practiced the procedures with feedback being provided by the school nurse. The subjects were provided instruction on the procedures three times a week.

The subjects received school and home reinforcement for completion of daily self-monitoring records and weight loss. The subjects were also instructed in self-reinforcement techniques for using the procedure trained. Each day the subjects rated their utilization of the procedures. Points were assigned to each rating and total points earned lead to a grade. The grade then was exchanged for an envelope which contained activity and covert awards. Each activity reward was individualized to fit the subject's preference as to what was reinforcing for that subject (e.g., calling a friend on the telephone in the early evening). Covert rewards consisted of the subject praising themselves for utilizing the procedures trained (e.g., I'm doing great on my diet).

Communication with Parents

Three inservice meetings were held for the parents of the Behavior Therapy subjects during the beginning, middle and end of the 21-week program. The meetings were led by a home-school parent coordinator. At the initial meeting a model of the treatment program and the procedures to be trained were delineated. At this time, parents were informed of their role, namely assisting their child in carrying out the procedures, supervising of self-monitoring recording forms and administering the home reinforcement for weight loss each week. At the second meeting, parents were asked to share any concerns or problems that were occurring regarding the management of the program. The third meeting provided the parents with information regarding the composition of a nutritious daily food menu, procedures to prepare and cook food which reduced the number of calories present and ways to exchange foods from the basic four food groups to reduce total calories consumed. All parents were encouraged to write weekly progress notes to the coordinator to ensure utilization of newly-acquired skills. The coordinator telephoned the parents once every three weeks to discuss the child's progress in the program as well as concerns the parents might have. Lastly, the coordinator made one home visit to observe the subject in the home and offer feedback regarding the subject's utilization of the procedures taught.

Wait-list Obese Control

The control subjects were informed that the weight reduction program was already filled out but another program would be started. The wait-list control group subjects were encouraged to lose weight on their own.

Normal Weight Control

The control subjects were informed that the experimenters were checking their weights and other bodily measures to ensure that their weight remained at appropriate levels.

Follow-up

Four months following the conclusion of the behavior therapy program the body weights of all subjects were obtained. No formal treatment was in effect during this time.

Dependent Measures

As recommended by Brownell (1981, 1982) and Rogers, Mahoney, Mahoney, Straw, and Kenigsberg (1980) a number of dependent measures were used to assess the effectiveness of the weight reduction program. They included (1) two measures of body weight loss, namely, number of pounds lost and percentage of relative weight lost; (2) three biomedical measures, namely, systolic blood pressure, diastolic blood pressure and pulse; and (3) two measures of physical changes, namely, tricep skinfold thickness and abdominal circumference.

RESULTS

The data obtained during pre-treatment, post-treatment and follow-up are shown by group in Table 1. Each dependent variable was analyzed using a multiple analysis of variance (MANOVA) with repeated measures (Dixon, 1981).

Groups (obese experimental, obese control, normal control) served as the between factor; measurement phases (pre-treatment, post-treatment, follow-up) were the within factor. For MANOVAs with significant interaction effects, a simple effects analysis was computed (Dixon, 1981). Since the number of subjects in each group was not identical, Scheffe's test was chosen to determine the source of significance. An example of a significant interaction for the relative weight variable is shown in Figure 1. The analysis of each dependent variable follows.

Weight

A 3×3 MANOVA with repeated measures for the body weight variable indicated a significant interaction effect [$F(4,26) = 3.84, p < .01$]. An analysis of the simple effects indicated the significant weight changes occurred for the obese experimental group [$F(2,13) = 12.64$,

Table 1
Means (X) and standard deviations (SD) for subjects' pre-, post- and follow-up treatment measures by group

Groups	Pretreatment Weight (in pounds) $\bar{X}$	SD	Posttreatment Weight (in pounds) $\bar{X}$	SD	Followup Weight (in pounds) $\bar{X}$	SD
Experimental Obese (EO)	194.9	35.7	175.5	34.2	178.7	29.9
Control Obese (CO)	143.3	24.3	149.0	26.7	151.8	28.9
Control Normal (CN)	107.7	25.8	111.9	24.8	115.9	27.9

	Pretreatment Relative Weight (%) $\bar{X}$	SD	Posttreatment Relative Weight (%) $\bar{X}$	SD	Followup Relative Weight (%) $\bar{X}$	SD
EO	69.3	31.1	53.1	32.9	55.9	31.4
CO	30.1	9.1	35.2	11.6	37.7	14.3
CN	-5.0	10.1	-1.0	9.9	2.4	12.7

	Pretreatment Tricep Skinfold (in mm) $\bar{X}$	SD	Posttreatment Tricep Skinfold (in mm) $\bar{X}$	SD
EO	31.8	7.3	24.1	8.1
CO	26.1	7.6	28.5	7.7
CN	9.1	4.1	9.4	5.6

	Pretreatment Circumference (in mm) $\bar{X}$	SD	Posttreatment Circumference (in mm) $\bar{X}$	SD	Pretreatment Systolic Blood Pressure $\bar{X}$	SD	Postreatment Systolic Blood Pressure $\bar{X}$	SD
EO	79.3	14.8	72.0	15.6	117.7	9.8	110.7	6.3
CO	65.5	10.5	64.1	7.2	114.8	14.4	119.6	10.7
CN	49.9	6.9	50.7	6.5	117.0	9.9	116.7	14.9

	Pretreatment Diastolic Blood pressure $\bar{X}$	SD	Posttreatment Diastolic Blood pressure $\bar{X}$	SD	Pulse Rate (per min.) Pretreatment $\bar{X}$	SD	Pulse Rate (per min.) Posttreatment $\bar{X}$	SD
EO	75.5	9.0	65.7	12.6	85.3	16.0	67.3	6.9
CO	74.0	8.1	66.0	5.8	84.8	11.1	87.2	15.4
CN	68.3	5.1	61.0	12.5	78.7	8.3	74.7	12.8

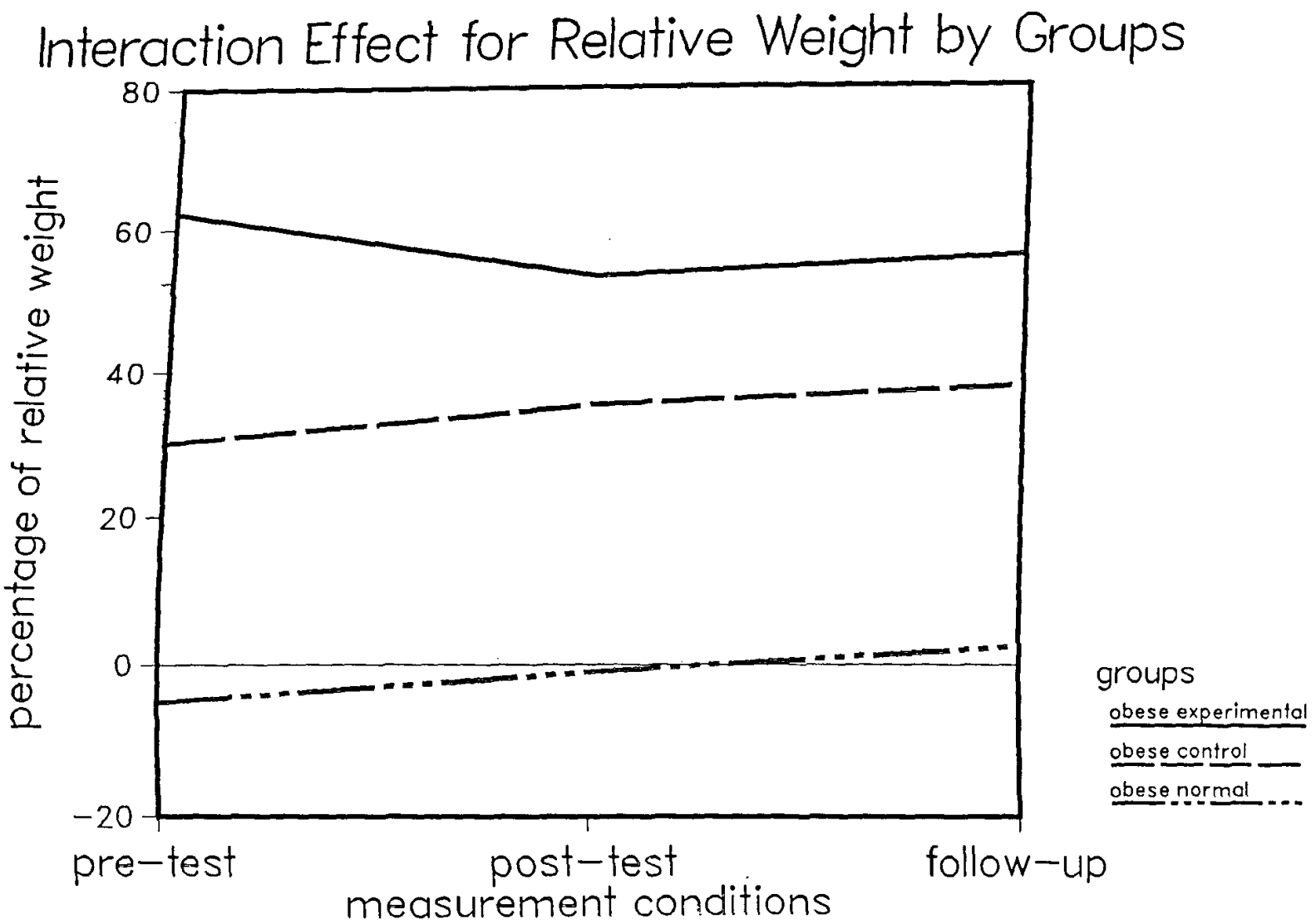

FIGURE 1. Sample significant interaction effect based on MANOVA with repeated measures for relative weight.

$p < .001$] but not for the obese control or normal control groups. Scheffe's test indicated that for the obese experimental group, significant weight change occurred between pre-treatment and post-treatment measures (X = 19.2 pounds) and between pre-treatment and follow-up measures (X = 16.2 pounds) but not between post-treatment and follow-up. The obese control group gained an average of 8.5 pounds between the pre-treatment and the follow-up period; the normal control group gained an average of 8.2 pounds during the same period.

Relative weight

Subjects weights obtained during each measurement condition of the study were converted to relative weights using the following formula:

$$\% \text{ relative weight} = \frac{\text{present weight} - \text{desirable weight}}{\text{desirable weight}} \times 100$$

Desirable weights for subject heights were determined from the Fogarty Center Table (Bray, 1979), which was adapted from the Metropolitan Life Insurance Table. A 3×3 MANOVA with repeated measures revealed a significant interaction effect for the relative weight variable [$F(4,26) = 4.68$, $p < .005$]. The analysis for simple effects indicated that the significant interaction was due to relative weight changes for the obese experimental group only [$F(2,13) = 15.12$, $p < .001$]. Scheffe's test showed that significant relative weight change occurred for the obese experimental group between pre-treatment and post-treatment measures (X = 16.2%) and between pre-treatment and follow-up measures (X = 13.4%). The obese control and normal control groups gained relative weight across the measurement conditions.

Tricep Skinfold Thickness

A 2×3 MANOVA for the repeated Tricep measure indicated a significant interaction effect [$F(2,14) = 18.37$, $p < .001$]. A simple effects analysis found significant skinfold thicknesses changes occurring only in the obese experimental group [$F(1,14) = 40.39$, $p < .001$] between pre-treatment and post-treatment measures (X change = 7.70 mm); the obese control and normal groups skinfold thickness did not change significantly.

Circumference

A significant interaction was found through a 2×3 MANOVA for the repeated variable [$F(2,14) = 8.45, p < .003$]. Again, the significant interaction was due to changes in the obese experimental group only [$F(1,14) = 26.11, p < .001$] and not the two control groups. These obese group members reduced their circumference significantly from pre- to post-treatment (X change = 7.3).

Blood pressure and pulse rate

A 2×3 MANOVA for the diastolic blood pressure measure revealed a significant within measures effect $F(1,14) = 6.20, p < .03$. This finding indicates the subjects in all three groups reduced their diastolic blood pressure between pre-treatment and post-treatment (X change = 8.41). MANOVAs computed for the systolic blood pressure and the pulse rate measures revealed no significant main effects or interaction effects for either variable.

DISCUSSION

For the obese experimental group, subjects lost significant amounts of weight and relative weight between pre-treatment and post-treatment. These significant changes were maintained at follow-up. These findings were comparable to those of Jackson and Thorbecke (1982), Rotatori and Fox (1980), and Rotatori, Fox, and Switzky (1979, 1980) and consistent with the studies with normal subjects (Brownell, 1982). As was reported in a review of behavioral weight reduction studies with retarded youth (Fox, Switzky, Rotatori, and Vitkins, 1982) there is a tendency for control subjects to gain weight if not treated. This latter factor could be partially attributed to the fact that the subjects are still in a growing period and weight gain would be expected.

Previously, Rotatori (1978) had suggested that the longer the active treatment period, the greater is the weight loss for diet participants. This was quite evident in the present study as the typical 14-week treatment period recommended by Rotatori and Fox (1981) was increased to 21 weeks. The study's findings revealed an average weight loss of about 20 pounds whereas the average weight loss for the 14-week program was about 10 pounds (Rotatori and Fox, 1980; Rotatori, Fox and Switzky, 1979; Rotatori and Switzky, 1979). The value of this finding stresses the need for weight reduction treatment

leaders to plan a program which is long enough for the subjects to reach goal maintenance weights before phasing out active treatment procedures.

The obese experimental group showed significant reductions in tricep skinfold thickness and abdominal circumference measures. These findings are comparable to physical changes reported in the literature with normal subjects (Franzini and Grimes, 1976; Mahoney, Rogers, Straw and Mahoney, 1977; Weil, 1977). In contrast the control groups did not change significantly in either skinfold thickness or abdominal circumference. These physical changes in the obese experimental group were significant enough to make the subjects look trimmer. This was supported by anecdotal comments from both parents and teachers. Also for a number of subjects the physical changes necessitated the purchase of new wardrobes to fit their trimmer figures. The significant change in skinfold thickness further supports the clinical meaningfulness of the subjects' weight loss as it is one of the best indicators to define obesity independent of height and body frame (Franzini and Grimes, 1976; Pett and Ogilvie, 1956; Seltzer and Mayer, 1965).

The experimental group subjects revealed reductions in systolic, diastolic and pulse measures. However only changes in diastolic blood pressure were significant. This latter finding supports previous studies that indicated reductions in blood pressure occurred for normal obese individuals whose relative body weight changed by at least 10 percent (Reisen, 1978; Stunkard, Craighead, and O'Brien, 1980; Tuck, Sowers, Dornfield, Kledzik, and Maxwell, 1981).

This research study not only adds to the successful finding of literature concerned with weight reduction programs for the retarded (Foreyt and Parks, 1975; Gumaer and Simon, 1979; Jackson and Thorbecke, 1982; Rotatori and Fox, 1980; Rotatori, Fox and Switzky, 1980) but it reflects a new trend in weight reduction research, namely, having multiple dependent measures to assess effectiveness of a weight reduction treatment program (Fox, Rotatori and Burkhart, 1982). Based upon the present findings and the growing literature in the area of weight control for the retarded (Jackson and Thorbecke, 1982; Rotatori, Switzky, and Fox, 1981; Staugaites, 1978), it is the authors' opinion that the zeitgeist for innovative comprehensive research on the sound, psychological, physical, and biomedical variables related to the etiology and treatment of obesity with retarded children is at hand. Such research should produce positive results for the obese retarded who are presently at risk due to medical illnesses (e.g., cardiovascular, diabetes) associated with extended periods of being obese.

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