EXERCISE ADHERENCE IN OBESE WOMEN: EVALUATION OF TWO INTERVENTION STRATEGIES

By

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Abstract

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The purpose of this study was to examine the effectiveness of behavioural self-control and relapse prevention strategies for increasing adherence in obese women during a 12 week supervised walking programme and in a six month unsupervised maintenance period.

Fifty female volunteers aged 18-60 years who were inactive during the previous six months were matched on the variables of age and oxygen pulse and assigned to one of three groups. Each group participated in a 12 week supervised walking programme at the University of Victoria. Group one ($\underline{n}=16$) was exposed to the Behavioural Self-Control intervention (BSC). Group two ($\underline{n}=17$) was exposed to the Relapse Prevention intervention (RP). The control group (C, $\underline{n}=17$) received no intervention.

The participants were expected to attend a minimum of three supervised sessions per week at which attendance was recorded and then participate in an unsupervised "4th Day Walk". Adherence to the 4th day walk was self-reported, as was adherence during the maintenance period. Fitness was evaluated three times during the study: 1) pre-intervention, 2) post intervention (3 months), and 3) post maintenance (6 months). Each fitness assessment included anthropometry and a submaximal treadmill aerobic fitness test to evaluate fitness changes and provide confirmation of self-reported adherence.

Average adherence to the walking during the supervised programme was 75.38%, with 80% of the subjects completing the programme. Adherence to

walking during maintenance declined from 73.17% in the first month to 50.87% in the sixth, with 60% of the individuals remaining involved at 9 months.

No significant differences in overall program adherence or number and distribution of drop-outs were found. Significant differences were found when the final six weeks of the supervised programme were analysed separately, $F(2,27) = 4.60$, $p < .02$. The BSC group had significantly higher adherence than the RP group during this period. Overall adherence during maintenance was significantly different among groups, $F(2,27) = 4.85$, $p < .02$. The BSC group had significantly greater adherence than the C group. Physiological measures demonstrated that fitness increased during the programme and was maintained during the maintenance period for all groups.

Rates of adherence, measured as either attendance or drop-out, were comparable to those reported for normal weight populations. The BSC intervention in an educational skill-based setting appeared to be an effective means of maintaining exercise behaviour over nine months. The RP intervention was no more effective than no intervention. The high levels of adherence obtained during this programme support the increasing use of exercise in the treatment of obesity.

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Table of Contents

List of Tables

List of Figures

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Dedication

For those who seek the joy of movement

Movement is not a special condition of the machine,

it is the essence of the machine.

Author Unknown

Chapter 1

INTRODUCTION

Obesity has been recognized as among the most prevalent of all health conditions in the western world. In Canada, for example, it was reported that 23.7% of the population were classified as obese, and 15.9% as overweight (Canada Health and Welfare, 1988a). Research in the U.S.A. indicated that approximately 34 million American adults aged 20-74 were also affected by this disease (Surgeon General's Report, 1988). Obesity has been associated with several medical problems including non-insulin dependent diabetes mellitus, hypertension, coronary heart disease, and some types of cancer and gall bladder disease (Surgeon General's Report, 1988). In addition to these situations, Bray (1985) reported that obesity contributed to compromised function, notably, chronic obstructive pulmonary disease and osteoarthritis of the hips, spine or knees.

Although genetic factors predispose individuals to becoming overweight, the Nutrition Recommendations of Health and Welfare Canada (1990) concluded that "in spite of normal or low energy intakes, a large number of Canadians are overweight, presumably because they are too sedentary"(p. 25). Similarly, the United States Surgeon General's report (1988) emphasized that "patterns of dietary caloric intake and energy expenditure play a key role." (p. 12).

The role of exercise in both the physiology and psychology of weight reduction and weight loss maintenance is complex. Brownell (1982) has identified five primary physiological reasons why exercise is important to weight loss:

exercise may increase total energy expenditure; contribute to the suppression of appetite; counteract the negative health effects of obesity; increase the basal metabolic rate and minimise the loss of lean tissue during dieting. While the means by which exercise impacts upon weight loss physiologically still remains controversial (Pacy, Webster, & Garrow, 1986; Segal & Pi-Sunyer, 1989), it has been demonstrated that exercise is effective both as a means of obtaining greater initial weight loss (Harris & Hallbauer, 1973; Stalonas, Johnson, & Christ, 1978) and in maintaining weight loss (Jordan, Canavan, & Steer, 1987; Van dale, Saris, & Ten Hoor, 1990).

The importance of exercise in weight control has been accepted by the public. Despite this acceptance, many people will never begin and approximately 50% of those who do embark upon an exercise regime will have abandoned it entirely within six months to a year after initiation (Dishman, 1986). Of those individuals who continue to exercise, many will not comply with the prescribed frequency, intensity or duration (Oldridge, 1982).

The concern for adherence has produced two directions in this area of research. These are first, the measurement and modification of entry variables that predict drop-out and second, the application of existing theories and techniques for changing behaviors in the exercise setting. Unfortunately entry characteristics or personal attributes that correlate with adoption and early adherence do not accurately predict long term adherence (Ward and Morgan, 1984).

Among the important entry variables is body weight (Dishman, 1990). The overweight are less likely to maintain a fitness regime (Epstein, Wing, & Thompson, 1978), less likely to respond to public health promotions (Brownell,

Stunkard, & Albaum, 1980) but do respond better to moderate activity such as walking (Epstein, Wing, & Thompson, 1978; Gwinup, 1975). In addition their 6 - 12 month drop out rates are typically higher than that observed for normal weight individuals (Dishman, 1990).

The use of exercise in behavioral treatment programs for the obese has become more common (Hoerr, Nelson, & Essex-Sorlie, 1988; Perri, Mcallister, Gange, Jordan, McAdoo, & Nezu, 1988). The assumption that differences in body fatness are caused by differences in eating and exercise behavior is consistent with the behavioral conception of obesity (Jeffery, 1987). The author emphasized that "individuals who are obese have learned inappropriate eating and exercise behaviours, which once acquired are maintained by an environment that includes excessive exposure to foods with high abuse potential, inappropriate social models and direct reinforcement of maladaptive behaviour" (p. 20). Further, as obese individuals are considered less likely to initiate exercise, and are at higher risk for dropping out, the use of exercise as partial treatment becomes particularly problematic. King & Tribble (1991) emphasized the need for good programs to facilitate long term adherence.

A number of programs using behavioural techniques have been developed to encourage long term exercise adherence. These include feedback and praise, goal setting, lottery reinforcement, decision balance-sheets, social support, contracting for activity points, and increasing cues to exercise. An emphasis on therapist/researcher control is common in the research.

An alternative approach to therapist controlled behavior modification has been to introduce techniques to improve personal self-management in weight control

programs (Hall, 1972; Harris, 1969; Harris & Bruner, 1971; McReynolds, Green, & Fisher, 1983; Stuart, 1967; Wollersheim, 1970). The focus of these programs was to teach the subjects how to use behaviour modification techniques which would enable them to maintain control over the long term (Harris & Bruner, 1971). Several researchers have emphasized the appropriateness of self-directed behavior change in the establishment and maintenance of an exercise habit, and studies which have used the self-control model to increase exercise behavior have been reported (Kau & Fischer, 1974; Keefe & Blumenthal, 1980; Noland, 1989). However, Lee & Owen (1986) discussed the limitations of attempting to completely control the incentives to exercise in the natural setting. Lee and Owen argued that cognitive change may be necessary for the maintenance of behavioural change and emphasized the importance of using techniques derived from both cognitive behavioural and social learning approaches to alter exercise behaviour. Relapse prevention is one such technique.

Relapse prevention has been used in weight maintenance and exercise adherence research (Belisle, Roskies, & Levesque, 1987; Marcus, 1988; Martin et al, 1984). The strategies are derived from Marlatt's model of the phenomenon of relapse (Marlatt & Gordon, 1985) and combine both cognitive and behavioral strategies to aid individuals with maintenance of behavioral change (preventing relapse). At present, evidence of the effectiveness of this strategy in the maintenance of exercise behaviors is inconclusive (Belisle, Roskies & Levesque, 1987; Martin et al. 1984).

The purpose of this study was to examine the effectiveness of the strategies of behavioral self-control and relapse prevention for increasing adherence over a

three month supervised walking program and a six month unsupervised maintenance period for medically obese women who are considered to be a high health risk population.

Chapter 2

REVIEW OF RELATED LITERATURE

The review of literature will discuss the benefits of exercise in the treatment of obesity and address factors associated with the adoption and maintenance of an exercise program. Following this discussion, research pertaining to intervention strategies that have been used to encourage adherence to exercise programs will be reviewed.

2.1 THE PHYSIOLOGICAL BENEFITS OF EXERCISE

As noted previously, it has become widely accepted that low levels of energy expenditure play a key role in the development of obesity (Nutrition Recommendations of Health and Welfare Canada, 1990; Surgeon General's Report, 1988). Consequently it is assumed that reductions in energy consumption and increases in energy expenditure through physical activity and exercise would help individuals achieve and maintain a desirable body weight. However, the physiological processes involved in both the development and the treatment of obesity remain controversial.

Inadequate energy expenditure and defects in energy metabolism have both been proposed as underlying factors in the onset and persistence of human obesity. Segal and Pi-Sunyer (1989) have suggested that reduced total energy expenditure (EE) in the obese could be the result of low resting metabolic rates (RMR), limited

thermogenic responses, lower levels of voluntary activity or reduced metabolic responses to activity. However, researchers have demonstrated that both RMR and 24 hour EE are greater in the obese as a result of greater amounts of lean body mass (Pacy, Webster, & Garrow, 1986; Segal & Pi-Sunyer, 1989). As well, Segal and Pi-Sunyer (1989) found that the energy cost of activities such as running and cycling did not differ per kg of lean body mass between lean and obese subjects. They concluded that energy expenditure during exercise was not different in the obese, but suggested that less activity during the day may have an effect.

Support for the assumption that the obese individual is less active than a lean counterpart and therefore has a reduced total energy expenditure has also been inconclusive. A review of studies conducted on spontaneous movement in obese children, adolescents and adults found equivocal results (Bray, 1990). Measurement problems and the complications of greater energy expenditure for movement in the obese has made interpretation of the studies difficult. Nevertheless, Bray (1990) concluded that obese subjects may be "either as active or less active than are the lean ones but that they are not more active." (p.499)

There has been some evidence however, to support the concept of blunted thermogenic response to a meal or a combination of meal and exercise in the obese individual. Although there are discrepancies in the research findings regarding an increased thermogenic response following a meal with exercise (Bray, Whipp, & Koyal, 1974; Dallosso & James, 1984), researchers have found that the thermic effect of food was significantly greater for lean subjects in comparison with obese on a variety of submaximal workloads (Segal & Gutin, 1983; Segal, Presta, & Gutin, 1984) In addition, several studies have investigated the impact of prior

exercise on the thermic effect of food and demonstrated significant differences between the lean and obese which favoured the lean individual (Bielinski, Shultz, & Jequier, 1985; Segal, Gutin, Albu, & Pi-Sunyer, 1987; Segal, Gutin, & Nyman 1985). These findings may represent "a subtle metabolic defect in the obese that favours the conservation of energy". (Segal & Pi-Sunyer, 1989).

Post exercise oxygen consumption (EPOC) has also been suggested as a mechanism for increasing total energy expenditure in the obese (Franklin, 1984). Poehlman, Melby, and Goran (1991) suggested that "in addition to the direct energy cost of physical activity, exercise may influence resting energy expenditure in three ways: (a) a prolonged increase in postexercise metabolic rate from an acute exercise challenge; (b) a chronic increase in resting metabolic rate associated with exercise training and (c) a possible increase in energy expenditure during nonexercising time."(p. 78)

Pacy, Webster, and Garrow (1986) reviewed 19 studies that examined the effect of exercise on resting metabolic rate (RMR), as estimated by post exercise oxygen consumption, and concluded that there was "little good evidence supporting the contention that there is a prolonged thermogenic effect of exercise" (p. 104). Nine of the studies that were reviewed, documented a subsequent increase in metabolic rate following the exercise bout, while 10 failed to demonstrate similar findings. Conclusions based on these studies were difficult as a result of variations in the assigned exercise task, lack of standardized procedures employed when establishing post-exercise metabolic rate, and variations in the time at which the measurements were taken making them susceptable to diurnal variations. More recent studies have found evidence both supporting the concept of prolonged

thermogenic effect of exercise (Chad & Wenger, 1988; Chad & Wenger, 1985; Maehlum, Grandmontagne, Newsholme, & Sejersted, 1986) and refuting it (Frechette, Davis, Ward, Sargent, & Dixon, 1991; Sedlock, Fissinger, & Melby, 1989). This lack of consensus is reflected in the results of research into the effect of exercise on RMR.

Several studies have demonstrated a significant positive correlation between RMR and training levels (Nieman, Haig, DeGuia, Dizon, & Register, 1988; Poehlman, Melby, Badylak, & Calles, 1989). Mole, Stern, Schultz, Bernauer, and Holcomb (1989) found that the RMR of subjects on a 500 kcal/day diet decreased during a 2 week diet only period and returned to baseline with the addition of exercise in the following two weeks.

Frey-Hewitt, Vranizan, Dreon, and Wood (1990) studied the effect of diet and exercise on weight loss and RMR in 101 overweight sedentary men and found that the exercise group lost less lean tissue and that the diet only group had a significant decline in RMR compared to the exercisers and controls. These findings were similar to those of Van Dale, Saris, and Ten Hoor (1990) who found that lower sleeping metabolic rates persisted in their diet restriction only groups and that despite a substantial weight loss, exercise restored sleeping metabolic rate to pre-weight loss levels..

Neiman, et al. (1988) found a 6% increase in RMR measured 48 hours post exercise in their exercising group and no difference for their caloric restriction only group. It is important to note that their program was quite intense (5 days/week; 45 minute walk/jog at 60% VO2 max). These findings supported those of Lennon, Nagle, Stratman, Shrago, and Dennis (1985) which suggested that a threshold of

exercise intensity may be necessary to increase RMR. A recent study by Ballor, Katch, Becque, and Marks (1988) demonstrated that muscle strengthening (isotonic exercises) exercises resulted in an increased lean body mass and therefore maintenance of energy expenditure during caloric restriction.

Alternately, several studies have found no difference in RMR for dieters who exercised (Hill, Sparling, Shields, & Heller, 1987; VanDale & Saris, 1989). Both of these studies demonstrated greater fat and weight losses for those individuals combining diet and exercise. However, weight loss beyond what had been predicted directly from the caloric expenditure of the exercise bout was not found.

Belko, Van Loan, Barbieri, and Mayclin (1987) found greater weight losses in their non-exercising group but greater fat loss in their exercising group. They found no significant difference in RMR for either group despite a loss of fat-free weight. Studies by Tremblay, Nadeau, Fournier, and Bouchard (1988) and Hammer, Barrier, Roundy, Bradford, and Fisher, (1989) demonstrated no changes in RMR despite significant losses of body weight. In both of these studies fat-free weight remained relatively constant which partially explained the preservation of RMR despite substantial changes in body weight. In a further study by VanDale, Saris, Schoffelen, and Ten Hoor (1987) both dieters only and dieters and exercisers had significant reductions in RMR although less decline in RMR occurred in the exercisers. Hill et al (1989) demonstrated no effect on RMR but did show greater fat losses and body weight changes for those individuals who exercised while restricting their diet.

Poehlman, Melby, and Goran (1991) cautioned that it was often difficult to

compare differences in body composition and RMR across studies because of different subject populations, exercise protocols, diet composition, and energy deficits for given weight losses. Despite these methodological issues and controversial findings surrounding the metabolic benefits of exercising while restricting diet, it can be concluded that the evidence is more supportive of the position that exercise increases weight loss. A noted exception to this is in those individuals with hyperplastic obesity who tend to be less responsive to exercise (Krotkeiwski, & Bjorntorp, 1986).

2.2 PSYCHOLOGICAL BENEFITS OF EXERCISE

In the past it had been proposed that psychopathology or emotional factors played an important role in the development of obesity (Wadden & Stunkard, 1985). However, several studies have now challenged this notion (Hallstrom & Noppa, 1981; Moore, Stunkard, & Srole, 1962; Silverstone, 1968). Wadden and Stunkard (1985) suggested that psychological disturbances were "more likely to be the consequences than the causes of obesity."(p. 1062)

Although demonstrating no greater disturbances on conventional measures of psychopathology than normal weight individuals, many overweight individuals may suffer from problems specific to the obese (Wadden & Stunkard, 1985). Disparagement of body image and adverse emotional responses to dieting such as depression and nervousness are examples of these problems. Wadden & Stunkard (1985) emphasized that the severely obese were at greater risk for negative emotional reactions and that physical and environmental difficulties can add stress

to their lives.

Sjoberg & Persson (1979) found that during relapse from dietary restriction, subjects reported that negative moods and emotional stress led to a breakdown of control. Foreyt and Goodrick (1991) suggested that decrements in self-control as a result of these negative emotions were to be expected. In fact, a study by Hall, Bass, and Monroe (1978) found that ratings of depression were inversely related to weight loss. Further investigation has found that relapses occurred under negative emotional states such as stress, frustration and rejection (Loro & Orleans, 1982; Schlundt, Sbrocco, & Bell, 1989).

Anxiety, depression and decreases in self-esteem have all been suggested as consequences of relapse (Foreyt & Goodrick, 1991). In addition, they emphasized that dietary restriction generally reduces perceived energy level which may result in less self-control. Indeed, Pekarik, Blodgett, Evans, and Wierzbicki, et al. (1984) found that both low perceived energy level and depression were related to early drop out from a weight loss program.

Exercise has been advocated increasingly as a means to enhance and maintain mental health (Raglin, 1990) and as such, may play an important role in the treatment of obesity; keeping in mind that relapse to sedentary behaviour among the obese is high (Dishman, 1986). Much of the research investigating the influence of exercise on changes in mental health has suffered from methodological weaknessess (Morgan and O'Connor, 1988) and the mechanisms through which it may act to affect mental health remain to be identified (Raglin, 1990). However, findings reviewed by Raglin (1990) indicated that exercise was associated with improvements in self-esteem, mood, and state anxiety. The author concluded that

20 - 40 minutes of aerobic activity has resulted in transitory changes in mood and state anxiety that persisted for several hours. In the case of chronic exercise, changes were more pronounced for those individuals with elevated levels of anxiety or depression.

2.3 MAINTENANCE

Although the physiological and psychological mechanisms through which exercise impacts upon weight management requires further investigation "it is clear that those who exercise regularly have a far greater chance of long term success" (Foreyt & Goodrick, 1991).

Several studies examining weight maintenance cited exercise as a contributing factor. Jordan, Canavan, and Steer (1987) conducted a long term follow-up of individuals who had achieved a minimum 15 lb. weight loss in a 20 week cognitive-behavioural program. Six to ten years after treatment they asked the respondents to describe their current approaches to weight control during maintenance, loss and gain. The responses of 36 people who had maintained their weight loss were compared to those of 75 persons who had gained. The researchers found significant differences between maintainers and gainers on the behavioural management of snack time, $t(1,109) = 2.04$, $p<.05$, social occasions, $t(1,109) = 2.12$, $p<.05$, and physical activity scales, $t(1,109) = 2.57$, $p<.05$. Upon further examination, the maintainers had incorporated more additional physical activity such as walking into their daily routine. The researchers noted that "walking, whether by oneself or with others, emerged as one of the most effective

discriminators between those who had and had not maintained their post program weight losses: the most readily available type of exercise was associated with sustained weight loss." (p.20).

An earlier study (Harris & Hallbauer, 1973) investigating self-directed weight control through eating and exercise found that participants in the treatments of behavioural techniques for changing eating habits, behavioural techniques for changing both eating and exercise habits and a attention placebo control had equivalent weight losses at twelve weeks. However, at the seven month follow-up the two behaviour modification groups had lost significantly more than the control group, $t(31) = 3.46$, $p < .01$, and the eating plus exercise behavioural group lost significantly more than the eating only behavioural group, $t(14) = 2.06$, $p < .05$.

Jefferey, Bjornson-Benson, Rosenthal, Lindquist, Kurth, and Johnson (1984) analyzed demographic, social, psychological and behavioural correlates of weight loss and maintenance in a group of middle aged men. Maintenance was assessed over a two year period following a fifteen week intervention program. They found a positive association between weight loss and reported improvements in exercise behaviour (frequency and total time) across the treatment phase, the one year and the two year follow-up testing.

Similar findings by Colvin and Olson (1983) demonstrated the importance of exercise for both weight loss and maintenance. Their study used members of the general population who had maintained a 20% weight loss for over two years. Qualitative methods were employed to explore the subjects' weight management histories.

The researchers found that 10 of the 11 men interviewed used vigorous

exercise both as an adjunct to dieting and a maintenance strategy. All 11 reported using vigorous exercise as one of three principle strategies. Conversely, the general method of weight loss for the women was dieting. Only 3 women of the 41 interviewed reported using exercise as a strategy. During maintenance, exercise became a characteristic strategy: 15 women were engaged in regular programs less than daily, seven were walking 30 - 60 minutes each day and 10 were engaging in vigorous activity at least one hour per day.

Similarly, a five year follow-up study of a behavioural weight loss program found that most successful maintainers were adhering to behavioural procedures and being more physically active (Graham, Taylor, Hovell, & Siegel, 1983). The researchers found that clients who were both active and adhering to at least three behavioural skills lost significantly more weight from pretreatment to follow-up, $t(57) = -4.86$, $p < .0005$. Furthermore, a multi-regression analysis demonstrated that adherence, activity and seeking multiple treatments influenced relative weight change during maintenance, $R^2(56) = .414$, $p < .001$, with adherence and physical activity accounting for the greater proportion of the association.

These findings were consistent with recent studies by Perri, McAdoo, McAllister, Lauer, and Yancey (1986) and VanDale, Saris, and Ten Hoor (1990). Perri et al. (1986) investigated methods of increasing the efficacy of behaviour therapy and demonstrated that those subjects who participated in an aerobic exercise program lost significantly more weight than those that didn't, $p < .05$. Self-reported adherence to the exercise program declined significantly, $p < .001$, over the 18 month follow-up and as a result the exercisers had significant weight gains, $p < .05$.

The research conducted by VanDale, Saris and Ten Hoor (1990) was directed at weight maintenance and resting metabolic rate 18 - 40 months after a 12 week diet/exercise treatment. The researchers found that the subjects in the diet/exercise group regained significantly less than the diet only group at the 18, 36 and 42 week post program assessments, $p < .05$. Sleeping metabolic rate was also significantly more depressed after dieting only (18.6% lower than pretreatment) when compared to exercisers (3.7% lower than pretreatment) and diet plus exercisers (15.8% lower), $p < .05$. They concluded that exercise was one of the factors contributing to the restoration of metabolic rate and consequently long term maintenance of weight loss.

The potential of exercise to affect the physiology, psychology and behaviour of the obese individual who is attempting weight control underscores the importance of attaining ongoing exercise participation throughout an individual's lifetime. Unfortunately, overweight has emerged as an important factor for predicting non-adoption and failure to adhere to exercise in a number of studies (Dishman, 1981; Dishman & Ickes, 1981). Therefore, the inclusion of exercise into treatments for obesity is particularly challenging.

2.4 EXERCISE ADOPTION AND MAINTENANCE

Extensive research has been undertaken examining the factors that influenced both adoption and adherence to exercise programs (Dishman, Sallis, & Orenstein, 1985; Lee & Owen, 1985; Shephard, 1985; Wankel, 1985). However,

> "the absence of uniform standards for defining and assessing physical activity and its determinants and the diversity of the variables,

> population segments, time periods, and settings sampled in published studies make it difficult to interpret and compare results." (Dishman, 1990, p. 78)

Furthermore, population based surveys have not been prevalent; limiting the generalizability of research findings. Chubb (1990) emphasized that only one fifth of the data was from general population surveys and often the information obtained from these surveys was incomplete as only selected aspects of people's perception or motivations were solicited. Further, when used, the reliability, objectivity and validity of the survey questions were often unknown.

Researchers have suggested a distinction between the factors influencing the adoption of exercise and those related to maintenance. However, the research has not clearly addressed this distinction.

A review by Dishman (1990) indicated that those individuals who had high coronary heart disease risk profiles, were blue collar workers, or were obese were less likely to initiate an exercise program. Those individuals who were previously active were more likely to be currently participating.

Among studies in the area, Wankel (1985) investigated factors affecting exercise involvement and found that improving fitness, preventing cardiovascular disease, losing weight and reducing tension and anxiety were the most important goals for initially joining their program. Data from the Canada Fitness Survey (1983) indicated that self-reported reasons for being active were health-related. Sixty percent of the Canadian adults who were asked reported that feeling better was an important reason for participating. British data from the Heartbeat Wales Survey (1987) further supported these findings. The results suggested that fitness, weight loss and general health maintenance were important incentives for participating in sport.

It has, however, been suggested that while health factors may play a role in the initiation of an exercise programme they are unlikely to maintain their influence during maintenance. Adherence may be more related to enjoyment and feelings of well being (Dishman, Sallis and Orenstein, 1985). Further, Dishman (1990) indicated that those individuals who had been previously active were more likely to be currently participating.

Wankel's (1985) study found that adherers scored higher on the initial goals of; developing recreational skills, $t = 2.53$, $p<.01$, going out with friends, $t = 2.05$, $p<.04$, satisfying their curiosity about the program, $t = 2.45$, $p<.02$, releasing competitive drive, $t = 3.89$, $p<.001$, and developing social relationships, $t = 2.25$, $p<.03$. They also had a higher level of social support for their involvement from; friendship within the program, $t = 3.82$, $p<.001$, encouragement from nonwork friends, $t = 3.33$, $p<.001$, and encouragement from their work supervisor, $t = 3.53$, $p<.001$. As well, adherers reported a greater liking for the program activities, $x_2 = 4.96$, $p<.05$) and had a greater increase in positive reactions to the program during their involvement (Wankel, 1985).

It is clear that adherence to an exercise program can be affected by a number of personal, program-based and environmental factors. Dishman, Sallis, and Orenstein (1985) defined personal characteristics as "past or present knowledge, attitudes, behaviors, personality characteristics, biomedical traits, and demographic factors that may influence exercise habits." (p. 181). Body weight was one of the personal characteristics associated with non-adherence, as were smoking, perceived time constraints, low ratings of self-motivation, lack of skills and physical problems such as injury (King & Tribble, 1991). Program based factors included

convenience, intensity of the exercise bout, time constraints, flexibility and skill-training. While support, incentives and minimal disincentives were environmental factors that correlated with adherence to an exercise program (King & Tribble, 1991). Dishman (1990) emphasized that most of the enabling, reinforcing or impeding determinants of exercise were classified as environmental but in fact, the de ee to which the enabling or impeding factors originated with the environment and not the individual was difficult to establish.

It is evident that the efficacy of identifying predictors or determinants of exercise behaviour lies in their application, targeting populations, and developing methods of intervention to increase adherence.

2.5 INTERVENTIONS

2.5.1 Behavioral

Similar to other health behaviors, strategies for helping individuals to maintain exercise behaviors have been proposed, many of which utilized principles of behavior modification. The assumption that differences in body fatness are caused by differences in eating and exercise behavior is consistent with the behavioral conception of obesity (Jeffery, 1987). This implies that obese individuals have learned inappropriate exercise behaviors that have been maintained by an environment including; exposure to situations which encouraged sedentary behavior, inappropriate social models, direct reinforcement for maladaptive behaviors and punishment for participating. Behavioral treatments for obesity have included a variety of principles that could be categorised as stimulus control,

response development and modification, and contingency management. In addition, programming has varied along a continuum of therapist control, from complete therapist control to complete self control (Foreyt, Goodrick, & Gotto, 1981). An early study by Wysocki, Hall, Iwata and Riordan (1979) employed contracting for aerobic points as a behavioral strategy for increasing adherence. Using a multiple baseline design the experimenters had subjects contract to earn back items of personal value that they had deposited with them. This program was successful for increasing the number of aerobic points earned per week for seven of the eight subjects. In addition, at a twelve month follow-up, seven of the eight subjects reported earning more aerobic points than during the initial baseline period; three of these reported earning more than during the contracting intervention.

Epstein, Koeske, and Wing (1984) conducted four controlled-outcome studies conducted at the Pittsburgh Childhood Obesity Research Program to highlight program factors and behaviors that resulted in differing levels of adherence. Meta-analysis was used to examine adherence, fitness and weight changes over a 6 month period. In all studies, the subjects were provided with a common diet and a standardized behavioral program which included "self-monitoring of eating and exercise habits, goal setting for weight loss, stimulus control, social skills, contingency contracts for attendance at treatment meetings and a point economy to motivate the child to adhere to the treatment protocol." (p. 189) The four studies examined the effect of diet alone; diet plus lifestyle exercise (high and low intensity/caloric expenditure); diet plus programmed aerobic exercise (high and low intensity); diet plus stretching and calisthenics (low intensity); lifestyle exercise alone (high and low intensity), and programmed exercise alone (high and

low intensity) on adherence, weight and fitness outcomes.

Statistical analysis showed that weight changes in the six treatment groups were significantly different from the control groups but not different from each other. Fitness changes were also different between treatment and control groups, and although the largest changes occurred for groups exposed to programmed aerobic exercise, the variability in treatment effects was too great to demonstrate differences between the treatments (Epstein, Koeske, & Wing, 1984). Significant differences were apparent for exercise adherence measures but not for adherence to record keeping. There was also significantly greater adherence to both programmed exercise and life-style exercise of low caloric expenditure than those of high caloric expenditure. Upon further examination the high adherence to exercise subjects had greater decreases in weight, fat , BMI and maximal HR and higher adherence to record keeping than the low adherence subjects. Furthermore, correlational analysis demonstrated strong relationships between record keeping, exercise and diet adherence variables.

These researchers highlighted some of the limitations of the studies that affect interpretation of the results. First, the subjects were not randomly assigned from the same initial subject pool and therefore differences did exist in age, personal experience and other independent variables. Second, the expenditure levels (high and low) were not compared in the same study. Third, the adherence data was only sampled over a two month period and later adherence was assumed, and finally, exercise was used as an out-patient adjunct to weight loss so should be compared to on-site exercise programs or non-obese populations with caution.

Despite these limitations, the authors felt that a number of important

findings resulted from their analysis. They found that weight and fitness changes were not reliable indicators of exercise adherence as these two variables did not differ over treatment groups while adherence measures did. This finding is attributed to the fact that weight change can result from dietary change as well as exercise change and that when using weight bearing fitness tests these weight changes may produce fitness changes. As well, changes in non-prescribed activity outside of the laboratory setting may alter weight and fitness.

In addition, it was found that the amount of exercise influenced adherence measures: the greater the energy expenditure the lower the adherence. This finding was not unexpected, as response cost was expected to reduce the response. However, the mechanism for this effect was not identified. It was proposed that injury, increased time commitment with increased intensity, less time for other reinforcing activities and the reinforcing qualities of the exercise itself were possible explanations for these findings. Other findings of importance were that there was a pattern of adherence across response categories; subjects who adhered to diet or record keeping also adhered to other aspects of the program, and, within their select population (the obese), baseline age, sex, weight, relative weight and fitness levels did not predict adherence. However, the researchers felt that the obesity could explain what they called "relatively disappointing overall adherence with exercise point goals" with less than 75% adhering over the first two months of the program (Epstein, Koeske, & Wing, 1984).

Taggart, Taggart, and Siedentop (1986) used a home based behavioral program involving contingency contracts and parental rewards to modify the physical activity levels of elementary school children. A changing criterion design,

which set specific criterion levels of activity for each week, showed that the level of physical activity increased every week. The number of activity points earned by the children increased by 100% over baseline and the time spent in activity increased by 49% as a result of the intervention (9-12 weeks in length).

Decision balance-sheets and social support interventions were two behavioral strategies used by Wankel, Yardley, and Graham (1984) to increase exercise involvement. They utilized the balance sheet in a five-week, once weekly community-based program and found that it had a positive effect on adherence. This supported earlier findings by Wankel and Thompson (1977) which demonstrated that members of a private health club exercised significantly more when exposed to a complete decision balance sheet intervention or a positive only balance sheet than a standard call-up control.

The study by Wankel, Yardley, and Graham (1984) also examined the use of structured social support to enhance exercise adherence and found that it facilitated attendance. Post program evaluations found that in class leader support, buddy support, overall class support and the class attendance chart were considered to be the most important aspects of the program. Home support and self-monitoring were not rated as useful. The findings supported those of an earlier study by Wankel and Yardley (1982). A further study by Wankel and Kreisel (1983) also found that a social support intervention group had significantly better attendance than either a group decision balance-sheet condition or a control condition.

King, Taylor, Haskell, and Debusk (1988) studied the use of telephone contacts for increasing early adherence to a home based exercise program and the

use of daily or weekly self-monitoring on long term maintenance. The researchers found that fitness, as measured by peak oxygen uptake, increased significantly in those subjects who received telephone support in contrast to those in the no-contact group. Of those who significantly increased their peak oxygen uptake in the 6 month program, half were then randomly assigned to a daily self-monitoring intervention and half to a weekly self-monitoring condition for a further 6 month maintenance period. Both groups maintained fitness gains significantly higher than their pretraining levels but those subjects who monitored daily reported completing significantly more training sessions than those who monitored weekly.

A single subject design study by Perkins, Rapp, Carlson, and Wallace (1986) examined changes in exercise behavior after introduction and withdrawal of specific intervention components. Goal setting and posting with performance feedback and contingent reinforcements were used in an effort to increase exercise in nursing home residents. The results demonstrated that the behavioral interventions had a consistent effect on the stationary bike riding behavior of the elderly men. The average increase in distance ridden was 74% above mean baseline values. After four to six goals were met the contingency reinforcement was removed and only minimum reinforcement (stars) was awarded for continued riding, six of the eight subjects maintained their riding levels above baseline measures.

A series of studies by Martin, et al. (1984) utilized goal setting strategies, lottery reinforcement and feedback and praise in an attempt to enhance adherence to a three day per week walk/jog program. The researchers used 143 healthy sedentary adults enrolled in an exercise course over a 4 year period to conduct 6

separate studies, four of which focussed on the behavioral interventions mentioned previously. The programs lasted for 3 months followed by a 3 month maintenance period.

The first study examined the two forms of feedback (immediate/personal or delayed/group) and two types of goals (distance or time) (Martin et al, 1984). The mean percentages of class attendance were not significantly different between the types of feedback or types of goals but an interaction effect was found demonstrating that personal feedback with either goal type, or group feedback with time goals resulted in significantly higher adherence than the group feedback with distance goals condition. Furthermore, the secondary measure of adherence, out of class (third day) exercise showed the same pattern. Other interesting results were that the group feedback - distance goals conditions had the majority of drop outs (86% of 10) for the study and that the fitness measures were significantly correlated with adherence.

In the follow-up assessment, subjects contacted by mail or phone indicated a reduction in adherence with 54% of the personal feedback subjects and 17% of the group feedback subjects adhering to the prescribed amount of exercise. An interesting finding resulted from the self-reported reasons for non-adherence; 71% of the people who relapsed cited inclement weather and another 31% cited loss of their exercise partner.

A second study undertaken by Martin, et al. (1984) used lottery reinforcement plus goal setting to increase adherence. This study replicated parts of the first study on goal setting but a flexible goal setting procedure was compared with the previous fixed goal setting procedure (the subjects were encouraged to

modify the daily distance goal according to how they felt). All groups received personal feedback. The lottery reinforcement condition was not significantly different from the no-lottery condition for class attendance, however, a significant difference was found between the goal setting conditions. Flexible goals resulted in higher class attendance and higher adherence to the 3rd day run. The lowest drop out rates also occurred in flexible goal groups and their post-course improvements were greater.

A third study replicated the procedures of the previous study to examine whether an order effect existed for flexible or fixed goals. Flexible goals were predicted to have a significant effect on adherence despite the time at which they were introduced. The flexible goal condition produced higher rates of adherence when introduced first but in either of the conditions the following 6 weeks adherence declined despite introduction of a new goal setting procedure.

Their final study that focussed on behavioural techniques examined the effect of frequency of goal setting. The researchers tested the hypothesis that goal proximity was a critical factor in the self-regulation of behavior. However, when proximal goal setting strategies were compared to distal it was found that; subjects who set distal goals set higher goals, their class attendance was higher but did not quite reach significance ($p < .07$), their adherence to the third day walk was not significantly different, and at a three month follow-up their adherence was 67% compared to 33% in the proximal condition.

A comparison of lifestyle change and programmed exercise on the weight, fitness and adherence of obese children was conducted by Epstein, Wing, Koeske, Ossip, and Beck (1982). This study yielded predictable results during the 8 week

program. Both conditions produced equivalent weight and relative weight losses and both produced fitness changes. These changes however, were greater in the programmed exercise condition. These differences were consistent with the finding that both groups earned equivalent exercise 'points' although the programmed exercisers spent significantly less time to do it, indicating a greater intensity of training. Interestingly, it was the lifestyle group who maintained their fitness changes during the 6 month maintenance period while the programmed exercisers fitness levels deteriorated and percent overweight increased (Epstein, et al., 1982).

Craighead and Blum (1989) studied the effect of supervision, exercise contracting and minimal contact on exercise in a behavioral treatment for obesity. The end points that were used were weight loss and fitness changes. During the 12 week program the supervised exercise group and the contracting group lost significantly more weight than the minimal contact group although the supervised exercise condition was the only condition which resulted in significant fitness changes. Further, the supervised exercise condition maintained a significantly larger weight loss at the one year follow-up than the other two conditions as well as maintaining their fitness changes (Craighead and Blum, 1989). These results suggested the importance of compliance to exercise for maintenance and the possible importance of initial supervision to affect compliance.

2.5.2 Behavioral Self-Management

As illustrated by the research cited, behavioral interventions may vary along a continuum from therapist control to self-control. It has been suggested that the ultimate goal was to help the client achieve self-control by helping them to

understand and manipulate the antecedent events and consequences which controlled their behaviors (Foreyt, Goodrick and Gotto, 1981). Initially introduced as an alternative to therapist controlled behavior modification in weight management programs, Harris and Bruner (1971) suggested that this would enable the individual to maintain control over the long term. This viewpoint was supported by Kau and Fischer (1974) when they stated "In order to establish and maintain an exercise habit, an attempt at self-directed behavior change seemed appropriate" (p. 213).

Although therapist controlled programs have been the norm in most exercise adherence research some programs did examine self-control techniques. Kau and Fischer (1974), for example, used single subject design to demonstrate the effectiveness of contracting with a significant other to increase adherence to an exercise regime. Reinforcers were chosen by the individual and included an immediate monetary reward at the completion of each exercise period and social activities with her husband if she earned the weekly point goal. The subject's exercise behavior increased over the 10 week program and then was maintained despite the removal of the reinforcers. The authors suggested that this was a result of the natural positive reinforcement of weight and fitness changes. No long term maintenance data was shown, therefore the value of this particular strategy for maintenance was difficult to assess.

Keefe and Blumenthal (1980) examined the efficacy of a combination of stimulus control and self-reinforcement in the acquisition and maintenance of a walking program. Using a multiple baseline design, they introduced the intervention strategy sequentially to each of three overweight men. The subjects were introduced to the program individually in eight to ten one hour sessions spaced

over one year. The stimulus control procedures involved in the program included; exercising at the same time and in a similar setting each day, engaging in a warm-up of predetermined length before each work-out and setting an exercise goal that was not greater than 10% of the the distance previously covered during the previous week. Self-reinforcement involved the subjects in drawing up a list of reinforcers, preferably exercise oriented, and setting up a criterion level for self-administration of the rewards.

All of the three subjects increased their exercise over the one year period and had advanced to jogging. All three had also increased their fitness score from very poor to good and in one case to excellent. At the two year follow-up, all of the subjects had continued jogging at a level of 40 to 50 aerobic points per week and all scored excellent in their fitness evaluation. The subjects reported discontinuing their self-reinforcement program as jogging became rewarding in itself (Keefe & Blumenthal, 1980).

Spevak (1980) combined self-control and therapist control in a multi-strategy approach for enhancing maintenance of personal fitness programs. Following a three week basic fitness education program the treatment group received two (one hour/week) booster sessions and written materials addressing self-control strategies. These strategies were; self-monitoring, graphing, stimulus control and self-reinforcement. In addition, the maintenance treatment included buddy assignment, bibliotherapy, post-treatment phone contacts which were faded out over the two month period following the final booster session, fitness skills development using modelling and contracting.

The corroborated self-reports of minutes exercised demonstrated significant

differences among the basic treatment group, the basic plus maintenance treatment group and the wait-list control group. The maintenance treatment resulted in significantly more minutes of exercise than either the basic treatment, $p < .01$, or the control group, $p < .01$, indicating the efficacy of a multi-strategy maintenance program.

Further research on the self-management approach was conducted by VonSchumperger (1985), comparing a wait-list control group with a self-management group. In the self-management treatment, behaviour modification principles were taught in a classroom setting over a 10 week period. The treatment sessions addressed six topics; self-observation and self-monitoring, self-evaluation, goal-setting, contracting, contingency planning and relapse prevention training. The results demonstrated that the treatment group had significantly greater total exercise minutes, $F(1,24) = 5.78$, $p < .03$, and aerobic exercise minutes, $F(1,24) = 8.33$, $p < .01$, during the 10 week program, when compared to the wait list controls.

A more recent study (Noland, 1989) compared the effect of self-monitoring, reinforcement controlled by another person, and a control condition on exercise adherence. The researcher found that the reinforcement and self-monitoring treatments produced significant changes in exercising heart rate, $t(12) = 2.46$, $p < .05$, and, $t(14) = 2.17$, $p < .05$, respectively, and predicted max VO_2, $t(12) = 1.98$, $p < .07$, and $t(14) = 5.08$, $p < .01$. In contrast, the control group did not demonstrate these significant changes. There were no significant differences between the treatments. As well, individuals in each treatment had a significantly higher frequency of exercise per week than the controls, $F(1,40) = 3.39$, $p < .05$.

Noland recruited her subjects from two populations; moderately fit individuals who had just completed an adult fitness course and sedentary individuals who answered a campus advertisement. The findings demonstrated a differential response to the program between these two groups. The sedentary individuals increased their exercise frequency as a result of treatment, however, the treatments had little effect on the adherence of those subjects who were already exercising fairly regularly when compared to controls.

As a result of the apparent success of behavioral self-management training for the modification of both eating and exercise behaviors, Foreyt and Goodrick (1991) stated that it could be regarded as "the state of the art for the treatment of moderate obesity. However, most patients so treated suffer relapse within 2 years of treatment" (p. 292). The authors suggested that the self-management model of treatment has failed to address the critical processes of control over eating and exercise behavior.

The obese have been found to perceive that they are less able to control eating, less able to get motivated for exercise and more out of control in response to negative emotions than individuals of normal weight (Schlundt & Zimering, 1988). In the case of eating, studies have suggested that inappropriate behaviors tended to occur under negative emotional states (Schlundt, Sbrocco, & Bell, 1989). Foreyt and Goodrick (1991) concluded that the behavioral model assumes rationality. The problem as they defined it was that a person was " required to use self-management techniques in situations of maximal temptation and minimal self-control." (p. 293).

Further limitations of behavioural self-management were discussed by Lee and Owen (1986). They emphasized the difficulty inherent in attempting to

completely control the incentives to exercise in the natural setting and argued that cognitive change may be necessary for the maintenance of behavioural change. The authors suggested that cognitions may be less directly under external stimulus control than overt behaviours and therefore cognitive changes might generalize more readily to other settings. The result of this generalization would be an increased probability of maintaining behavioural change. Kazdin (1980), however, found that cognitive methods alone were less effective than the combination of cognitive and behavioural methods. The use of techniques derived from both cognitive behavioural and social learning approaches to alter exercise behaviour has been recommended (Lee & Owen, 1986).

2.5.3 Relapse Prevention

The relapse prevention model introduced by Marlatt and Gordon (1985) addresses the problem of long-term maintenance of behavioral change. Although the model was initially developed to help in the treatment of addictive behaviors (e.g. alcoholism, smoking, obesity) Brownell and Jeffery (1987) recommend it as an approach for improving maintenance to exercise behaviours.

Rates and patterns of relapse for the different addictive disorders have demonstrated remarkable similarities (Brownell, Marlatt, Lichtenstein, & Wilson, 1986). It is difficult however, to conclude that all of the addictions are similar. Instead, Brownell, et al. (1986) suggested that there may be common psychological adaptations to different physiological pressures (Brownell, et al, 1986).

Marlatt and Gordon's relapse model (1985) is based upon social learning theory and proposes a series of common psychological adaptations that may occur

in the relapse process. A basic assumption within the model is that while individuals are maintaining the target behavior (e.g. exercise) they experience a perceived sense of personal control (self-efficacy) over the target behavior (Marlatt & Gordon, 1985). The model (see Figure 1) illustrates that in the absence of an appropriate coping response (e.g. avoidance) there is a decrease in self-efficacy (the expectation about how they will perform in a future situation), which in turn leads to failure to comply with their rules governing that behaviour. When an individual fails to comply with their target behaviour rules there is an abstinence violation effect (AVE) which results from violation of self-imposed rules (perceived loss of control). The consequences of the abstinence violation effect plus the perceived effect of not complying with the rules is an increased probability of relapse. In contrast, when an individual is successful at coping with a high risk situation their self-efficacy increases. As the number of times they cope successfully increases, their perception of control and their self-efficacy increases in a cumulative fashion (Marlatt & Gordon, 1985).

Relapse prevention utilizes both cognitive interventions and behavioral skill training to reduce the risk of an initial lapse and if it does occur, to prevent it from escalating to a complete relapse. It includes identifying risk situations in which lapses occur, practising responses in protected conditions, and rehearsing cognitive strategies to overcome the negative psychological effects of these lapses (Brownell & Jeffery, 1987). The effectiveness of this training has been established for alcoholics (Chaney, O'Leary, & Marlatt, 1978), smokers (Brown, Lichtenstein, McIntyre, & Harrington-Kostur, 1984) and dieters (Abrams & Follick, 1983; Perri, Shapiro, Ludwig, Twentyman, & McAdoo, 1984). However, results from a small

number of exercise studies have been equivocal. King and Frederiksen (1984) found that relapse prevention training increased exercise program attendance and maintenance significantly. In their study the presentation of relapse prevention strategies was confined to a single session. For this reason, and the relatively small sample size (N=35) conclusions are limited.

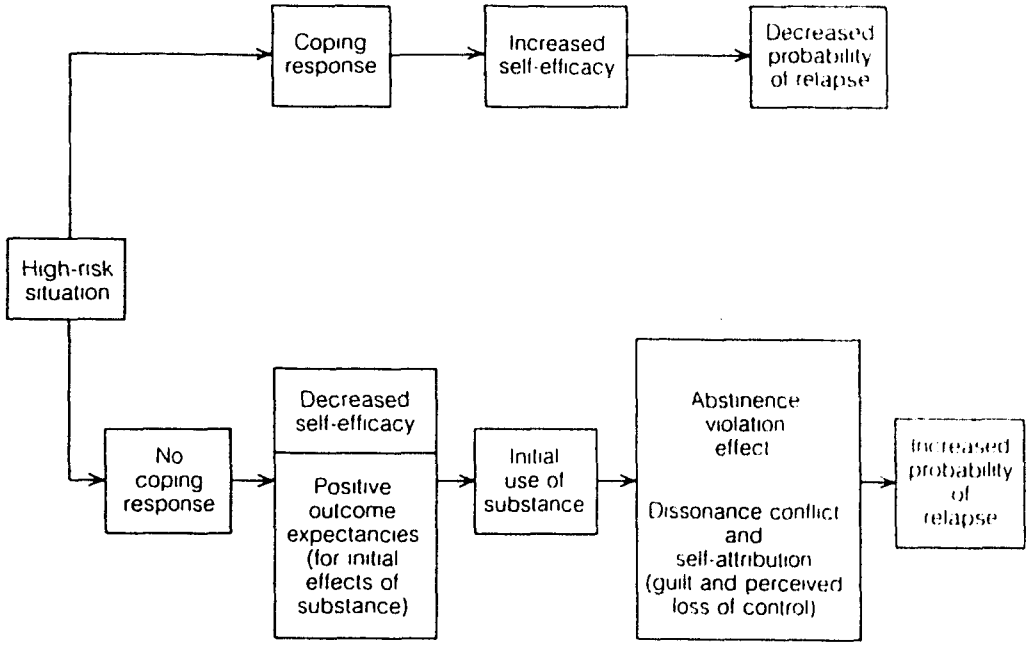


Figure 1. A cognitive-behavioural model of the relapse process. (Marlatt and Gordon, 1985, p.38).

Relapse prevention was used by Martin, et al. (1984) in one of six studies to increase exercise adherence during and after an exercise program. In their program, subjects met twice weekly with instructors to receive instructions on aerobic training and technique and then walked for 15 to 45 minutes on a track, or in a gymnasium during inclement weather. Each session began with a 10 to 20 minute group session and alternated between providing general fitness education and relapse prevention strategies. Class attendance was recorded as well as a self-reported "Third Day run". The researchers compared a basic dissociative program with both a relapse prevention program and a relapse prevention with continued contact program and found no significant differences in program attendance or maintenance at the three month follow-up. Unfortunately, several methodological problems interfered during the program (e.g. new instructors, class resistance to moving indoors, no instructor rotation). In addition, during maintenance the instructor from the basic program continued to meet with her class after the program thus making any interpretation impossible.

Recent studies have also explored relapse prevention training. Belisle, Roskies, and Levesque (1987) conducted two separate studies using participants in beginner level exercise groups at the University of Montreal. The programs were 10 weeks long and devoted to jogging, aerobic dance or pre-ski training. Twelve groups were matched for activity, time of day and days of the week and 6 groups were assigned to either condition; experimental or control. In their initial study there were 178 subjects in the experimental condition and 172 in the control condition. Each group attended twice weekly for a one hour session, 10 - 15 minutes of which was devoted to health education. During the health education

subjects in the experimental condition were exposed to relapse prevention materials while the control subjects were exposed to basic fitness information.

It was found that participants in the experimental conditions had a significantly higher mean number of sessions attended than did the controls, $F(1,340) = 7.37$, $p < .01$ (Belisle, Roskies, & Levesque, 1987). Furthermore, aerobic dance and pre-ski groups had higher attendance than the jogging groups and groups that exercised with one particular instructor (Leader Two) had higher attendance rates. During the three month maintenance period the experimental conditions again reported significantly more exercise periods than the controls, $F(1,340) = 3.88$, $p < .01$. In terms of activity, the jogging groups produced equivocal results while the aerobic and pre-ski groups produced consistently higher adherence. During maintenance the groups that exercised under Leader One showed significantly better adherence, $F(1,340) = 31.13$, $p < .01$, than those for whom Leader Two was responsible; the reverse of during the program itself. Although significant differences were identified, the experimental condition combined with type of activity and leader as sources of variance only explained 8.33% of the variance in attendance (Belisle, Roskies & Levesque, 1987).

The researchers replicated the above study one year later with 243 subjects. During the program a series of rotating strikes launched by University support staff led to the cancellation of between six and nine lessons. Attendance during the program was affected because the participants could not be sure when the center would be in operation and as a result the experimenters only collected long term adherence data. As in the initial study, the experimental condition produced higher adherence in each of the activities. Once again, despite this difference, the

experimental condition combined with the leader and type of activity accounted for only 18.65% of the variance (Belisle, Roskies & Levesque, 1987).

Marcus (1988) compared a relapse prevention program, a reinforcement program and an exercise-only control group for increasing adherence and maintenance behavior in 136 previously sedentary women who had enrolled in an 18 week exercise program. The women participated in a 35 -50 minute flexibility, strength and aerobic program adapted from a Jane Fonda audiotape three times a week and the experimental groups also participated in a 20 minute group session devoted to relapse prevention or reinforcement.

Of those beginning the exercise program, 71% attended less than two-thirds of the sessions. There were no significant differences in attendance between the groups at the end of 18 week program although there were significant differences between the relapse prevention groups and the control groups at the midpoint. No significant differences were found for self-reported adherence following the program. During, and following the program, Marcus (1988) identified a trend indicating higher adherence for those individuals participating in relapse prevention and concluded that the findings supported the notion that the relapse prevention model was useful in helping people to maintain a newly acquired habit.

2.6 HYPOTHESES

Based on the purposes expressed in Chapter One and the findings of previous research, the following null hypotheses were tested.

H_0 - 1: There will be no significant differences among the relapse prevention,

behavioral self-management and control groups on measures of adherence.

H_0 2: There will be no significant differences among the relapse prevention, behavioral self-management and control groups on oxygen pulse scores at each testing session (pretest, 3 months and 9 months).

H_0 -3: There will be no significant differences between the oxygen pulse scores at each testing session (pretest, 3 months and 9 months).

H_0 -4: There will be no significant differences in number of drop-outs among the relapse prevention, behavioral self-management or control groups.

Chapter 3

METHOD

Female subjects (n=50), between the ages of 18 and 60 years of age were recruited by advertising on the University of Victoria campus and through the local Victoria media. Respondents who were rated obese as defined by Blackburn and Kanders (1988) and had been inactive during the preceding six months were included in the subject population. Ninety women expressed interest in participating; 22 failed to meet the criteria and 18 did not attend the orientation

All subjects were required to obtain medical clearance (Appendix A), provide Informed consent (see Appendix B), and complete a subject information health and exercise history packet (see Appendix C) in order to participate in the study.

Upon completion of the entrance requirements, the subjects were assigned to one of three groups based upon the variables of age and oxygen pulse. Each group participated in a walking program conducted at the University of Victoria. In addition to the basic walking program subjects, in Experimental group one (BSC, n=16) were exposed to a behavioral self-management program and those in Experimental group two (RP, n=17) were exposed to a cognitive-behavioral intervention known as relapse prevention (Marlatt and Gordon, 1985). The control group (C, n=17) participated in the walking program with no additional intervention.

3.1 DEFINITION OF TERMS

Obese:

An individual whose excess weight was between 35 and 53 lbs and had a BMI (kg/m2) >30 (Blackburn and Kanders, 1988).

Inactive:

An individual who was not participating in vigorous (60-85% of Max. HR) exercise a minimum of three times per week for 15 minutes or more.

Adherence: Supervised

A percentage measure representing the number of attended supervised sessions divided by the required number of sessions (3x/week). A 6 week and a 12 week percentage were calculated. The 7th week of the program was not included in the analysis because the relapse prevention group were asked to abstain from exercise during this week as a component of their intervention.

Ideal Adherence: Supervised + Fourth Day Walk

A percentage measure representing the total number of exercise sessions (supervised + unsupervised) divided by the ideal number of total sessions (4x/week). Each week the subject was required to complete a Fourth Day Walk record (Appendix D) and this record was used to assess the unsupervised

walking. A 6 week and a 12 week percentage were calculated. The 7th week of the program was not included in the analysis because the relapse prevention group were asked to abstain from exercise during this week as a component of their intervention.

Adherence: Maintenance:

A percentage measure representing the number of exercise sessions (60-85% of Max. HR and in excess of 20 minutes) in which the subject participated during the previous week, as reported over the telephone once a month, divided by the ideal number (3x/week).

Oxygen Pulse:

Oxygen pulse (O_2 pulse) was calculated by dividing the oxygen uptake by the heart rate.

> "It is the volume of O_2 extracted by the peripheral tissues or the volume of O_2 added to the pulmonary blood per heart beat and can be shown to be equal to the product of stroke volume and the arterial-mixed venous O2 difference. (Wasserman, Hansen, Sue, & Whipp, 1987, p.37).

$$O_2 \text{ pulse} = \frac{VO_2(Ml)}{HR \text{ (Bpm)}}$$

Drop-out:

A subject who failed to attend supervised walks and when contacted was not prepared to continue. Dropouts were classified into categories. These

categories were:

1. Subjects who failed to continue walking in the supervised program and did not participate in the second testing session.

2. Subjects who participated in the second testing session but indicated that they would not continue in the maintenance phase.

3. Subjects who continued to report their walking but did not participate in the third testing session.

3.2 PHYSIOLOGICAL TESTING

Fitness was evaluated three times during the study: 1) pre-intervention, 2) post intervention (3 months), and 3) post maintenance (6 months). Each fitness assessment included anthropometry and a submaximal treadmill aerobic fitness test to evaluate fitness changes and provide confirmation of self-reported adherence.

3.2.1 Anthropometry

The assessment of body composition was for descriptive purposes and included the measurement of body weight and height, the sum of eight skinfolds including the triceps brachii, biceps brachii, subscapular, suprailiac, supraspinale, abdominal, front thigh and medial calf and girth measurements at the chest (midsternum), relaxed right arm, waist, hip, right thigh and right calf (Ross & Marfell-Jones,

1982).

Skinfold measures were taken using Slimquide calipers and girths were assessed by steel measuring tape. All body composition measures were taken by one of three Standardized Test of Fitness Appraisers (F.A.C.A., CASS).

3.2.2 Aerobic Fitness test

Subjects were advised to abstain from caffeine, exercise and food for four hours prior to each test. The cardiovascular test consisted of a submaximal treadmill walk of three possible elevation stages, all at a treadmill speed of 2.5 mph. Elevations were altered according to the heart rate and ventilatory response of the subject and a preset safety criterion (see Appendix E).

Following a three minute warm-up at 0 degrees elevation the subjects walked for four minutes at their first elevation. If the subject's heart rate response was within the predetermined safety guidelines the test continued for four minutes at a second elevation. When a subject's heart rate response exceeded the guidelines for increasing elevation during the warm-up phase, the warm-up was extended to six minutes and heart rate at minute 6 was used to calculate O_2 pulse. No stage of the test resulted in HR exceeding 85% of maximum heart rate. A cool down walk on the treadmill was performed until HR dropped below 100 bpm.

In the third testing session modifications to this protocol were applied. To provide a more direct comparison between Test 2 and Test 3 the elevations used during Test 2 were replicated during Test 3.

Both absolute and relative measures of VO_2 were used in the calculation of oxygen pulse (Wasserman, Hansen, Sue, & Whipp, 1987).

All aerobic tests were performed on a Quinton 24-72 treadmill calibrated for speed and elevation each testing day. Respiratory and metabolic measures were monitored every 30 s using a Beckman Metabolic Measurement Cart (MMC). These measurements included minute ventilation (Ve), fractions of expired CO_2 and O_2, volumes of produced CO_2 (VCO_2), and O_2 ($V0_2$) and respiratory exchange ratio (R). The MMC was calibrated with known primary standard gases before and after each test. Heart rate (HR) was telemetered every minute using a Sport Tester (PE3000) monitor.

3.3 WALKING PROGRAM

All groups were enrolled in a supervised graded walking program at the University of Victoria. Basic walking and nutritional information was provided to all participants during the first week (see Appendix F). There were 14 supervised sessions per week to choose from. The participants were expected to attend a minimum of three supervised sessions per week at which attendance was recorded and then participate in an unsupervised "4th Day Walk".

The subjects performed a warm-up walk of 3-5 minutes followed by the walk at the prescribed intensity and duration. Intensity was monitored by manually palpated HR. If the subject experienced difficulty monitoring pulse the experimenter would check it upon their request. Training heart rates were prescribed according to the subject's age and ranged between 60 and 85% of maximum heart rate. Duration was increased by 5 minutes every 2-3 weeks at the discretion of the subject. The goal was to increase from 15 minutes in the first

week of the program to between 40 and 60 minutes by the 12th week of the program. An incentive program was offered to all participants to encourage a base level of participation (see Appendix G).

3.4 INDEPENDENT VARIABLES

The independent variables were the treatment (relapse prevention training, behavioural self-management training, or control), and the time of testing.

3.5 DEPENDENT VARIABLES

The dependent variables consisted of the following measures of adherence:

1. Adherence to the supervised program (attendance at supervised walks).
2. Ideal adherence (attendance at the supervised program and the Fourth Day Walk).
3. Adherence to the maintenance program.
4. Oxygen Pulse (absolute and relative).
5. Number of drop outs.
6. Anthropometric measures (weight, skinfolds, girth)
7. HR
8. Elevation (load)

3.6 INTERVENTIONS

Week 1: All three groups attended a one-hour introduction to the walking session. The principles of training were explained to them and initial intensity and duration levels were set for each individual according to the pretest results (See Appendix F). Further information and guidance was provided by the researcher during the walking program itself.

Week 2 - 12: The control group had no further group intervention beyond the walking program. The two experimental groups participated in one additional 30 minute group session per week. The sessions were scheduled prior to or following scheduled walking times to equalize the number of contacts with the researcher.

The basic format of the group session was:

10 minutes	Individual review
10 minutes	Educational material
10 minutes	Discussion, questions and assignment for the week.

Topics

Experimental Group 1 - Relapse Prevention (Appendix H)

Week 2	Overview of Relapse Prevention
Week 3	Role of High Risk Situations
Week 4	Positive and negative ways to deal with high risk situations
Week 5	Abstinence Violation Effect - Relapse vs Lapse
Week 6	Introduction to the Planned Relapse
Week 7	Discussion: Preparation for the Planned Relapse

Week 8	Strategies for post relapse
Week 9	Discussion: The value of the planned relapse and what it is like to start again
Week 10	Review of Relapse Prevention
Week 11	Preparing for Maintenance
Week 12	Introduction to Maintenance

Experimental Group 2 - Behavioral Self-Management (Appendix I)

Week 2	Overview of Behavioral Self-Management
Week 3	Becoming Your Own Behavior Analyst
Week 4	Commitment to Change
Week 5	Managing Your Consequences - Reinforcement
Week 6	Shaping Your Behavior
Week 7	Recruiting Support
Week 8	Cues to Exercise
Week 9	Conditioned Reinforcers
Week 10	Generalizing Your Behavior
Week 11	Preparing for Behavior Maintenance
Week 12	Introduction to Maintenance

3.7 MAINTENANCE PHASE

Self-reported adherence to a walking program was collected once a month on a variable schedule for all three groups. The subjects were asked to report the

number of times that they participated in vigorous activity during the previous week and if they had adhered to the prescribed amount (three times per week) during the month. All subjects were asked to report on the same weeks.

3.8 STATISTICAL ANALYSIS

The analysis included a series of one way analyses of variance (ANOVAspssx) to test for differences between treatment conditions at the pre-test on demographic, anthropometric and O_2 pulse measures. In addition, one way ANOVAs were used to test for differences between treatment conditions on adherence measures collected at 6 weeks and 12 weeks during the 3 month intervention and at each month during the subsequent maintenance period. Significance levels were set at .05. When significant differences were demonstrated, post-hoc comparisons were conducted using Scheffe's multiple comparison test.

3 x 3 repeated measures ANOVAs were used to test for significant differences on the physiological measures between testing sessions and for an interaction between the treatment conditions and time. When significant differences were demonstrated, further analyses were conducted using one way ANOVAs or paired t-tests. Following the observation of a significant group by test interaction, one way ANOVAs were conducted on calculated change scores to determine the differences in the change that occurred.

Finally, the Chi- square goodness of fit test was used to determine if the frequency of dropouts was distributed equally across groups.

Previous research (Gwinup, 1975; Martin, et al, 1984) has limited the analysis

of scores measured to those individuals who completed a pre-set criterion of participation. Therefore, in this study the one way ANOVAs were conducted using all scores (total entry) and the scores of only those subjects who completed three testing sessions (limited entry). Differences in the statistical observations, as a result of limiting entry into the analyses, will be discussed.

3.9 PROGRAM ANALYSIS

All drop-outs were contacted and asked to indicate their reasons for not continuing in the program. The effectiveness of the treatment packages and components within the packages was assessed every 6 weeks using guided self-report (see Appendix J).

3.9 LIMITATIONS

When reviewing and interpreting the results a number of methodological considerations should be addressed.

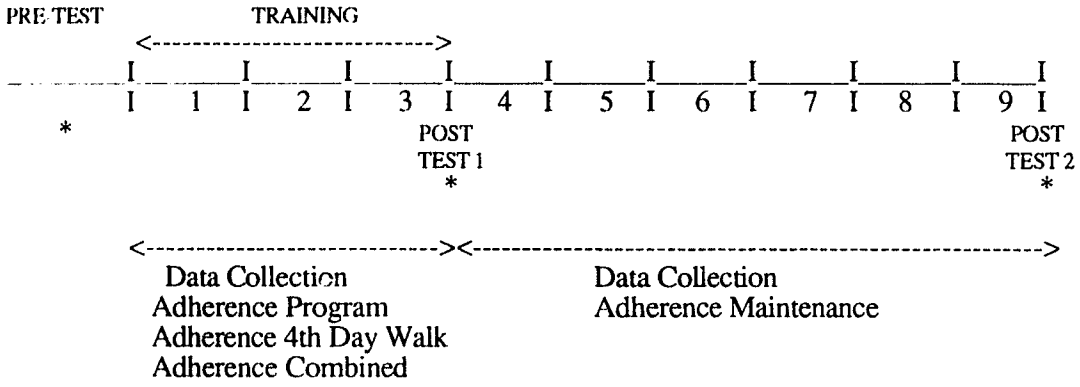
1. Individuals were not randomly assigned to groups. The groups were matched to ensure that levels of fitness and age were equally represented. One way ANOVAs conducted on the pretest scores demonstrated that the goups did not differ on the variables of age, height, weight, and relative and absolute measures of oxygen pulse. However, the groups may have differed significantly on variables which were not addressed in this study.

2. The use of a large number of ANOVAs increased the risk of a Type I error occurring. Therefore, some of the results presented may be spurious and should be treated with caution.

3. Finally, as the study progressed over time the group sizes decreased due to attrition. This may have resulted in a reduction in the power of the design. However, a significant result in these circumstances may also demonstrate the strength of the intervention.

4. All subjects in this study were volunteers recruited through various forms of media and therefore, may not be representative of an obese population.

5. A number of the variables analysed relied upon self-report and therefore are subject to questions of validity.



* Anthropometry and Oxygen Pulse (Treadmill)

Figure 2: **Schedule of Testing** (months)

Chapter 4

RESULTS

The results from the present study are reported according to the hypotheses outlined in Chapter Two.

4.1 CHARACTERISTICS OF THE SUBJECTS

There were no significant differences between the groups on the variables of age, height, weight, or BMI at the pre-test. Descriptive statistics for these variables are displayed in Table 1.

4.2 MEASURES OF ADHERENCE

4.2.1 Adherence to the supervised program.

The means and standard deviations of the percentage adherence to the supervised program are presented in Table 2. Weekly adherence percentages for the program are presented in Figures 3 and 4. When all of the subjects who enrolled in the study were entered into the ANOVA procedure no significant differences were found between the groups

In addition, when only those subjects who completed all three testing requirements were included in the ANOVA no significant differences in overall program adherence were found. When separate analyses were conducted on the

first and second half of the program (6 & 12 weeks) a significant difference was found between the groups over the second half of the program, $F(2,27) = 4.60$, $p < .05$. These results are presented in Table 4.

Further analysis using the Scheffe MRT demonstrated that the B.S.C. group was significantly different from the R.P. group. Comparing the means demonstrated that the B.S.C. group had significantly higher adherence percentages during this portion of the program (see Table 2). However, the controls were not significantly different from the B.S.C. or the R.P. group.

4.2.2 Ideal Adherence

The means and standard deviations for the percentage of ideal adherence are presented in Table 3. Weekly percentages of ideal adherence are depicted in Figures 5 and 6. When all subjects were considered, the ANOVA demonstrated that there was no significant difference among the groups' ideal adherence during the program.

Ideal adherence was however, significantly different when the final 5 weeks of the program was analyzed separately and only scores of those subjects who completed three testing sessions were entered into the ANOVA, $F(2,27) = 5.57$, $p < .01$. These results are displayed in Table 4.

The Scheffe test demonstrated that the B.S.C. group was significantly different from the R.P. group. Examination of the means for the groups showed that the behavioural group had a higher percentage ideal adherence (see Table 3). The R.P. group did not differ significantly from the controls, nor did the controls differ significantly from the B.S.C. group.

Table 1. Means and standard deviations for the entry variables of age, height, weight, and BMI.

Variable	Group	x	S.D.	n
Age (years)	BSC	42.1	9.10	16
	RP	46.1	10.54	17
	Control	45.0	8.12	17
Height (cm)	BSC	162.37	4.04	16
	RP	162.18	4.66	17
	Control	164.12	6.36	17
Weight (kg)	BSC	96.79	10.75	16
	RP	96.15	13.82	17
	Control	101.11	16.53	17
BMI ($kg/^{m2}$)	BSC	36.8	3.75	16
	RP	36.5	4.16	17
	Control	37.5	4.62	17

Table 2. Means and standard deviations for percentage adherence to the supervised program.

Time	Group	x	S.D.	n
Total Entry				
6 week				
	B.S.C.	76.8	12.2	14
	R.P.	87.5	9.3	15
	Control	76.2	19.8	15
12 week				
	B.S.C.	63.2	29.2	12
	R.P.	49.8	26.5	14
	Control	57.4	18.4	15
Total				
	B.S.C.	76.9	16.3	11
	R.P.	75.2	14.1	14
	Control	74.4	13.0	15
Limited Entry				
6 week				
	B.S.C.	85.3	6.7	8
	R.P.	88.7	8.9	12
	Control	73.8	21.7	10
12 week				
	B.S.C.	79.0	8.3	8
	R.P.	56.5	21.7	12
	Control	57.5	17.4	10
Total				
	BSC	85.4	5.6	8
	RP	77.9	12.6	12
	Control	73.3	14.0	10

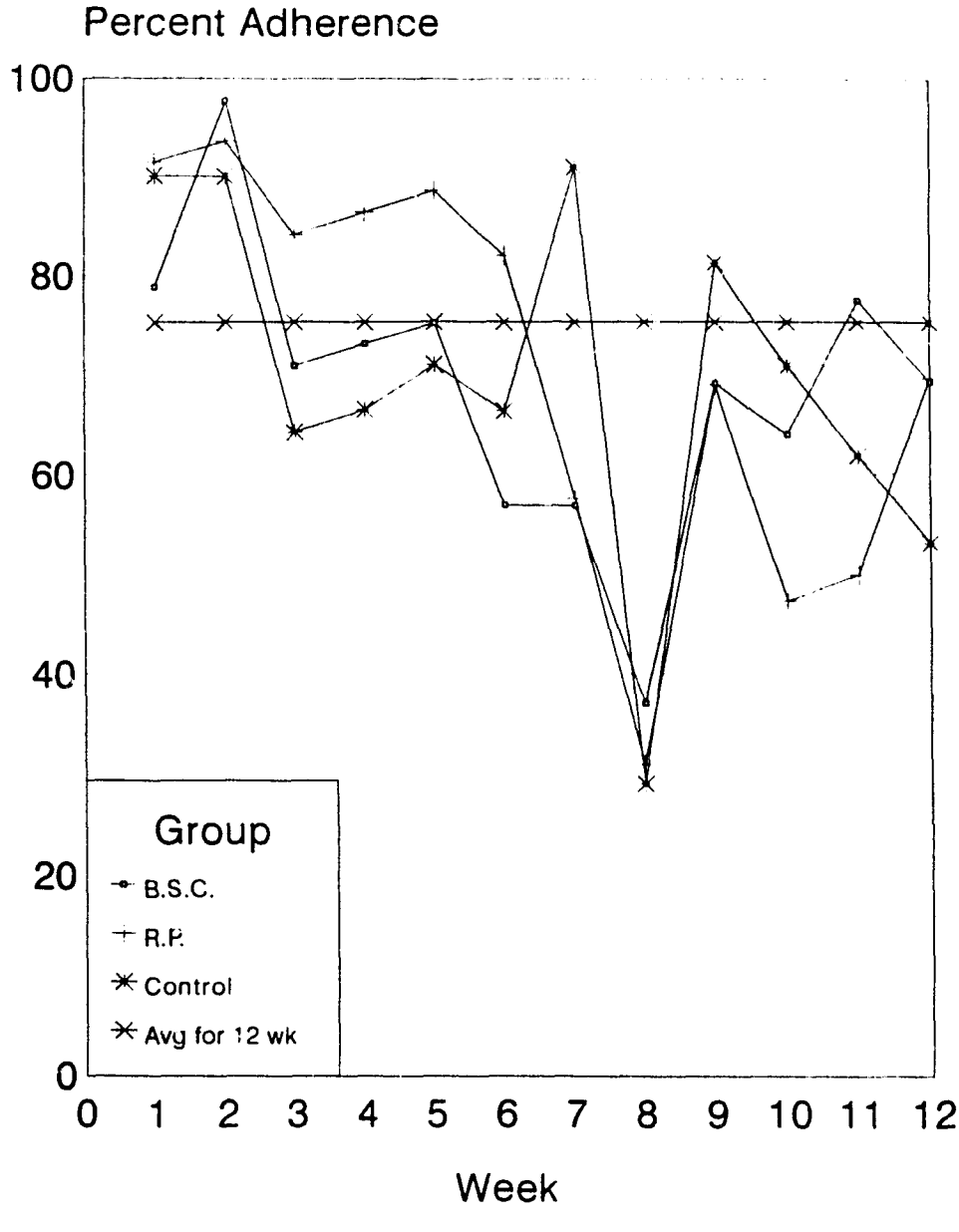


Figure 3. Percentage adherence to the supervised program (total entry).

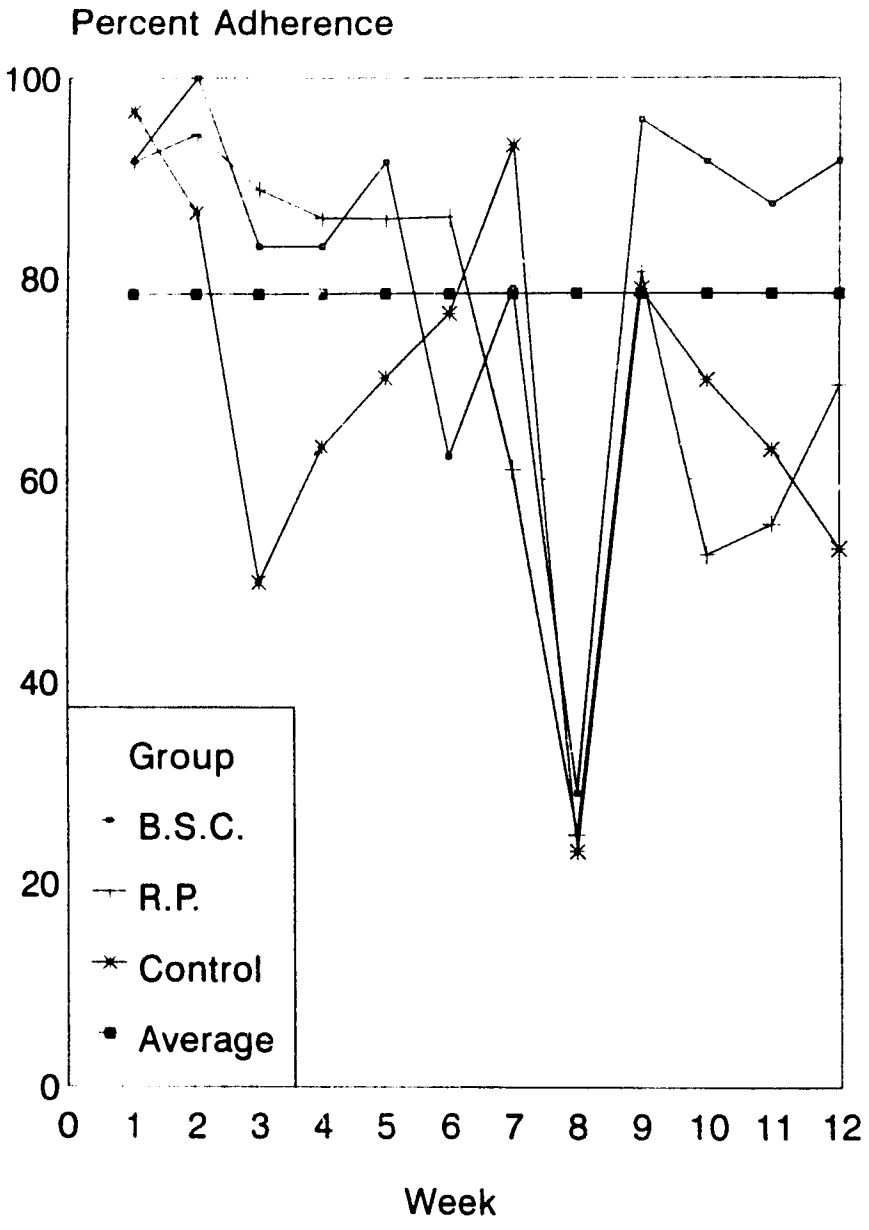


Figure 4. Percentage adherence to the supervised program. Limited Entry (n=30)

Table 3. Means and standard deviations for percentage ideal adherence.

Variable	Group	x	S.D.	n
Total Entry				
6 week				
	B.S.C.	70.2	19.4	14
	R.P.	80.3	12.9	15
	Control	75.3	18.0	15
12 week				
	B.S.C.	63.3	32.9	12
	R.P.	46.1	24.3	14
	Control	62.3	19.7	15
Total				
	B.S.C.	72.4	20.8	12
	R.P.	67.6	13.3	14
	Control	71.5	13.6	15
Limited Entry				
6 week				
	B.S.C.	85.4	7.7	8
	R.P.	81.6	11.2	12
	Control	73.8	19.5	10
12 week				
	B.S.C.	81.9	13.9	8
	R.P.	51.7	20.7	12
	Control	63.5	22.5	10
Total				
	B.S.C.	83.4	8.5	8
	R.P.	70.3	12.0	12
	Control	71.7	14.2	10

Table 4. Differences between groups on 6 week, 12 week and average percent adherence and ideal adherence during the supervised program.

Variable	df	F	p
Limited Entry			
Adherence Week 12	(2,27)	4.60	$<.05$
Ideal Adherence Week 12	(2,27)	5.57	$<.01$

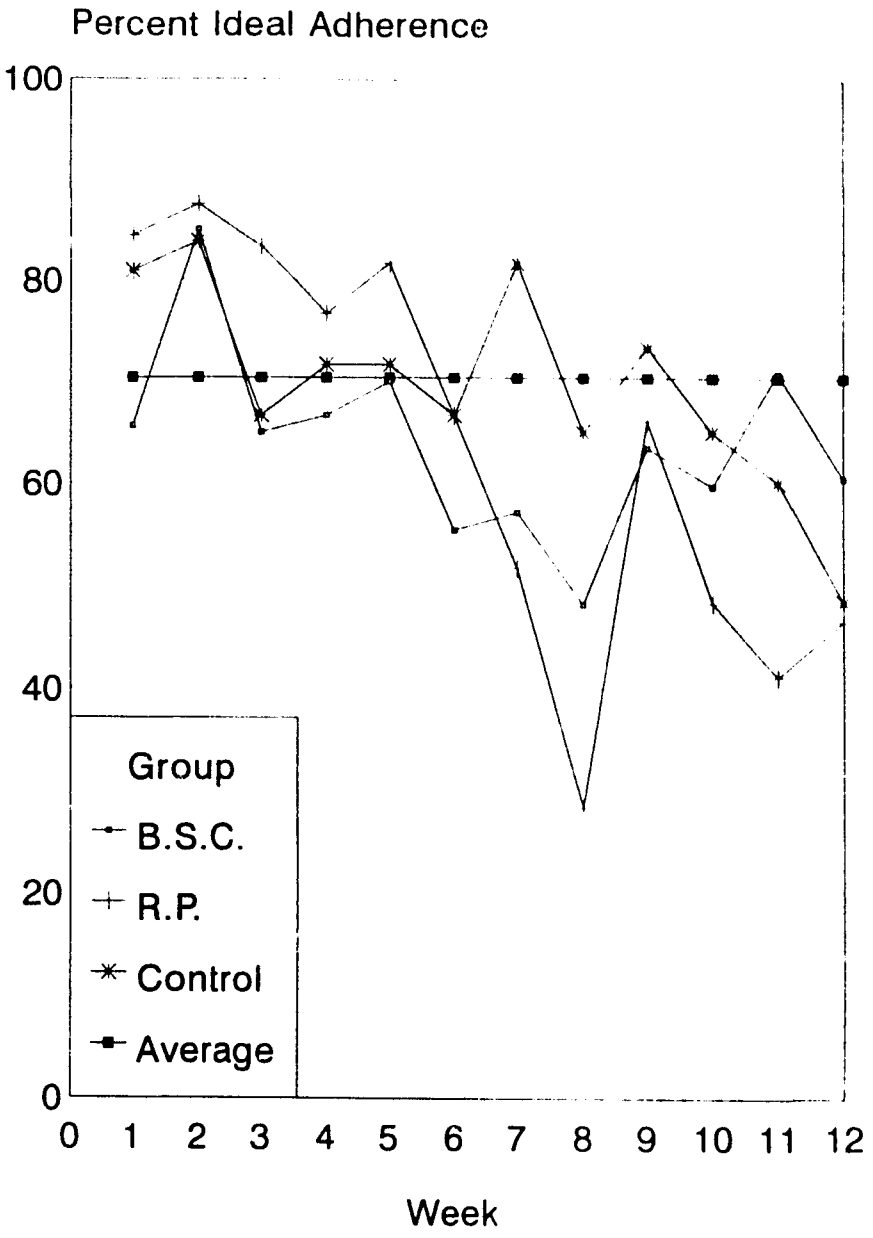


Figure 5. Percentage ideal adherence during the supervised program. (Total Entry)

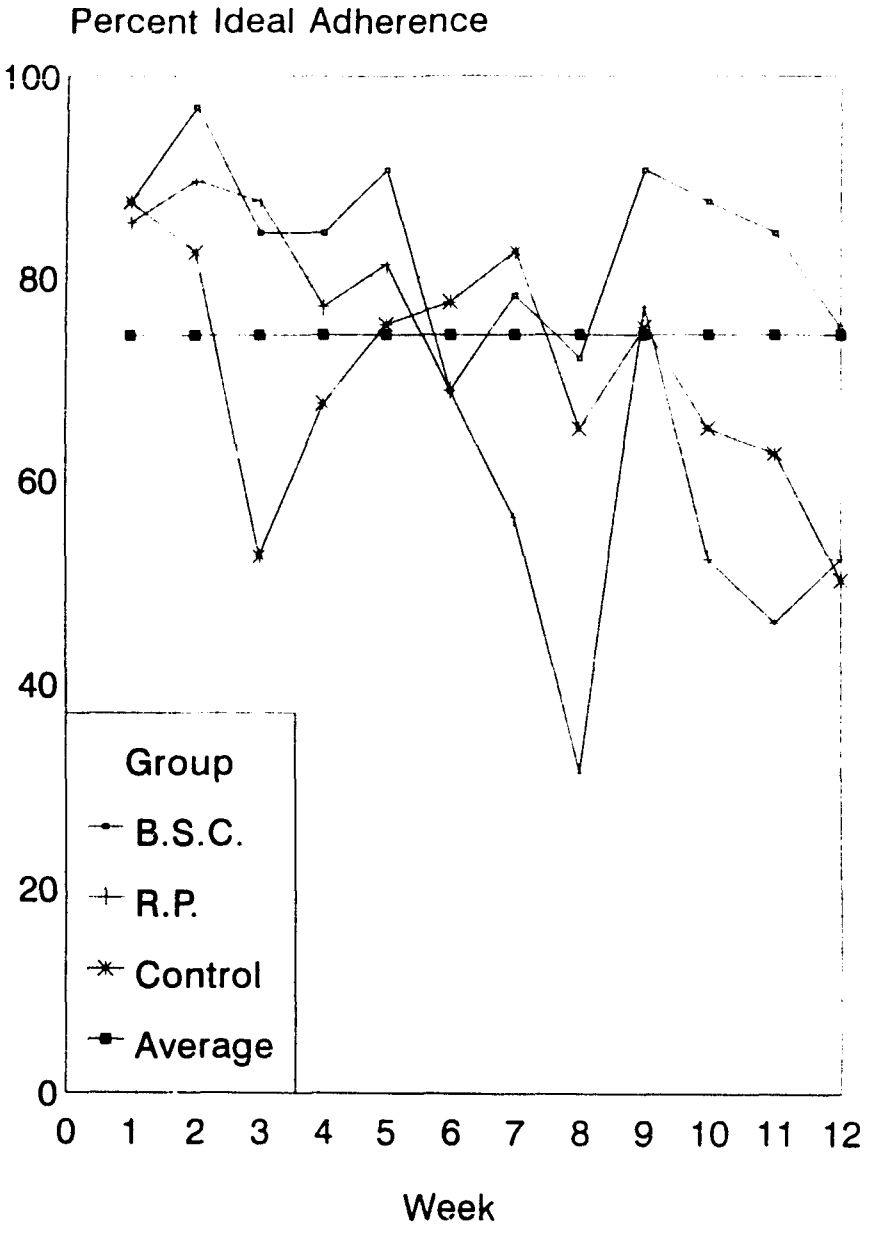


Figure 6. Percentage ideal adherence during the supervised program. Limited Entry (n=30)

4.2.3 Adherence to the Maintenance Program.

When all subjects were considered no significant differences in adherence to exercise during the maintenance period were found between the groups. However, if only those individuals who completed three testing sessions were included in the ANOVA significant differences in adherence were demonstrated during Month 3, $F(2,27) = 4.33$, $p < .05$, Month 4, $F(2,27) = 4.61$, $p < .05$, and Month 5, $F(2,27) = 3.99$, $p < .05$, of the maintenance period. The average overall adherence during maintenance was also significantly different between groups, $F(2,27) = 4.85$, $p < .05$. The means and standard deviations of the monthly adherence percentages are displayed in Table 5 and are depicted in Figures 7 and 8. The results of the ANOVA are presented in Table 6.

The Scheffe tests showed that the BSC group adhered significantly more than the control group during Month 3 and 4. Furthermore, although there was no difference between the RP group and either the BSC or the control group during Month 3, the RP group had significantly lower adherence percentages than the BSC group during Month 4. The RP group and the controls did not differ during this month.

Conversely, during Month 5 there was no significant difference between the BSC treatment and either the RP group or the control group. During this month however, the RP group exercised significantly more than the controls.

When adherence was averaged across the maintenance period the significant difference demonstrated was between the BSC group and the control group. The BSC group had significantly greater adherence than the controls but did not differ significantly from the relapse prevention group.

Table 5. Means and standard deviations of percentage adherence to the program during the six month maintenance period: Limited entry.

Variable	Group	x	S.D.	n
Month 1				
	BSC	83.1	25.4	8
	RP	77.6	32.9	12
	Control	59.9	46.6	10
Month 2				
	BSC	74.3	34.6	8
	RP	72.1	44.6	12
	Control	53.2	45.0	10
Month 3				
	BSC	95.8	12.0	8
	RP	77.7	38.5	12
	Control	46.5	44.9	10
Month 4				
	BSC	91.5	15.7	8
	RP	49.7	36.1	12
	Control	49.8	39.3	10
Month 5				
	BSC	62.4	45.2	8
	RP	72.2	44.6	12
	Control	23.2	35.2	10
Month 6				
	BSC	74.6	23.8	8
	RP	44.3	41.0	12
	Control	39.8	43.8	10
Mean				
	BSC	80.4	14.7	8
	RP	65.6	22.5	12
	Control	45.4	30.7	10

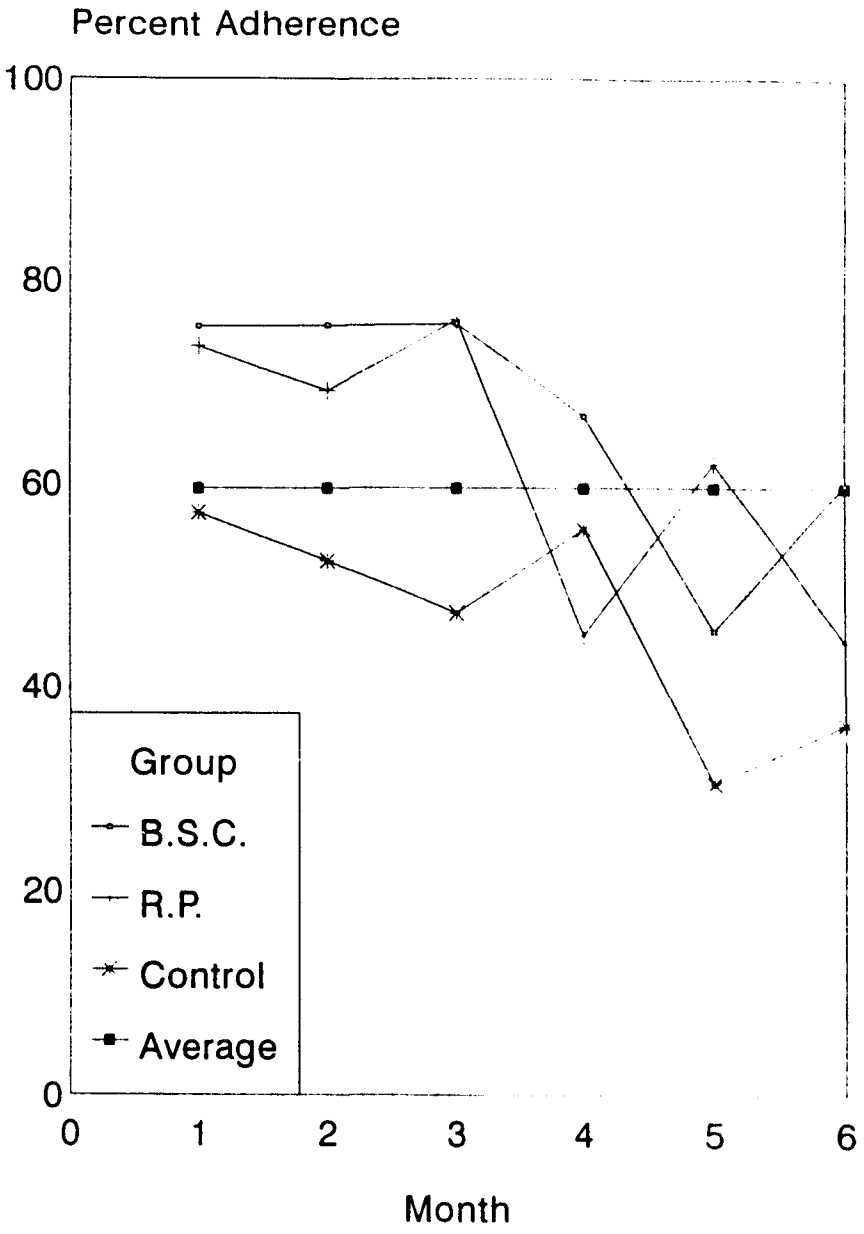


Figure 7. Percentage adherence during the maintenance period. (Total Entry)

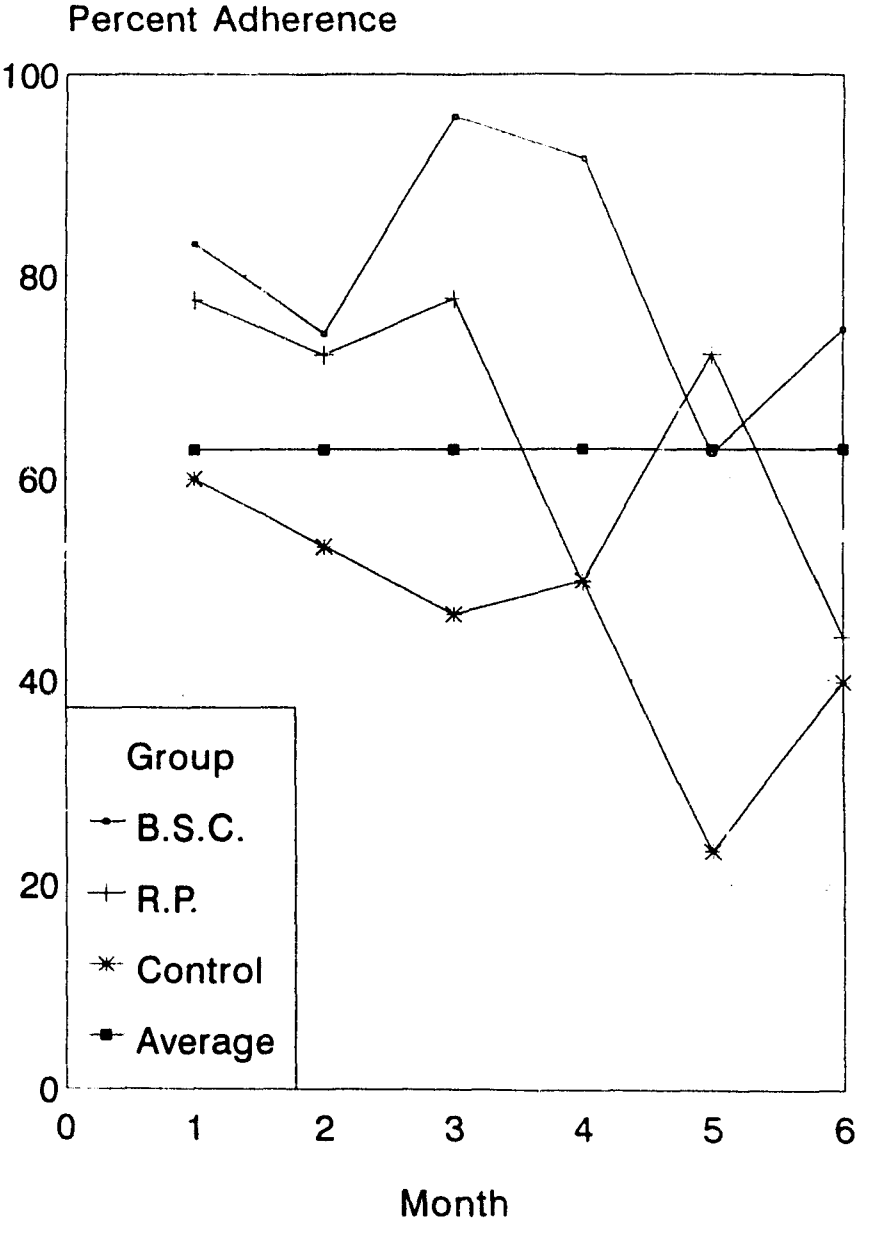


Figure 8. Percentage adherence during the maintenance period. Limited Entry (n=30)

Table 6. Differences between groups on percentage adherence during the six month maintenance period (limited and total entry).

Variable	df	F	p
Limited Entry			
Month 3	(2,27)	4.33	$<.05$
Month 4	(2,27)	4.61	$<.05$
Month 5	(2,27)	3.99	$<.05$
Average	(2,27)	4.85	$<.05$

4.2.4 Dropout.

The number and distribution of dropouts in the groups are displayed in Table 7. No significant differences were found among the three groups using Chi square goodness of fit test.

4.3 ANTHROPOMETRY

4.3.1 Weight

The one way ANOVA on pre-test measures demonstrated no significant differences in weight between groups at the outset of the study. The 3 x 3 repeated measures ANOVA demonstrated that there was no significant test main effect for weight. However, there was a significant group by test interaction, $F(27,2) = 4.17$, $p < .01$. Further analysis using a one way ANOVA showed no significant differences among the groups at each testing session when analysed separately. Means and standard deviations for weight at each testing session are displayed in Table 8.

4.3.2 Sum of Skinfolds and Sum of Girths

There was no significant difference in sum of skinfolds or sum of girths among groups at the pretest as indicated by a one way ANOVA. In addition, there was no significant main effect of test or group nor a group by test interaction for either of these variables when analysed using a 3 x 3 repeated measures ANOVA. Means and standard deviations for these measures are displayed in Table 8.

Table 7. Numbers and distribution of dropouts among groups.

Group Dropout Classification	B.S.C.	R.P.	Control	Total
1	5	3	2	10
2	2	2	4	8
3	1	0	1	2
Total	8	5	7	20

1 = completed one testing session and dropped out
2 = completed two testing sessions and dropped out
3 = completed two tests and reported maintenance

4.4 CARDIOVASCULAR FITNESS

4.4.1 Relative Oxygen Pulse

The ANOVA demonstrated no significant differences in relative O_2 among the groups at the pretest. The 3 x 3 repeated measures ANOVA did not demonstrate a significant main effect for test or group, nor was an interaction effect observed. The means and standard deviations for relative oxygen pulse scores are presented in Table 9.

4.4.2 Absolute Oxygen Pulse

Means and standard deviations for absolute oxygen pulse are presented in Table 10 and the means are further displayed in Figure 8. There was no significant difference in absolute oxygen pulse scores among the groups at the pre-test.

The 3 x 3 repeated measures ANOVAs demonstrated that there was no group main effect at any of the three loads (elevations). There was, however, a main effect for test at the first load $F(27,2) = 5.25$, $p < .01$ (see Table 13). Further analysis using a paired t-test demonstrated that there was a significant difference in absolute O_2 pulse scores between test 2 and test 3, $t(29) = 2.67$, $p < .01$. However, no significant differences were found between test 1 and test 2, nor between test 1 and test 3. No significant main effects were demonstrated for Load 2 or Load 3.

4.4.3 Heart Rate

Means and standard deviations for heart rate at each load over the testing

sessions are presented in Table 11. The repeated measures ANOVA showed a significant test main effect for Load 1, $F(27,2) = 19.65$, $p < .01$, but no significant interaction between group and test (see Table 13). Further analysis using a paired t-test demonstrated a significant difference in heart rates across all groups between test 1 and test 2, $t(37) = 5.24$, $p < .01$, and between test 1 and test 3, $t(29) = 4.56$, $p < .01$ There was no significant difference in heart rate between test 2 and test 3.

In contrast, a significant group by test interaction was demonstrated for Load 2, $F(26,2) = 3.45$, $p < .01$, in addition to a significant test main effect, $F(26,2) = 16.71$, $p < .01$. The paired t-test demonstrated a significant difference in heart rates between test 1 and test 2, $t(35) = 4.61$, $p < .01$, and test 1 and test 3, $t(28) = 4.24$, $p < .01$. One way ANOVAs demonstrated no significant differences in heart rate among the groups at each testing session.

Finally, a main effect of test was found for heart rate on Load 3, $F(23,2) = 13.78$, $p < .01$, while no group by test interaction was demonstrated. Further analysis (paired t-test) demonstrated significant differences in heart rate between test 1 and 2, $t(31) = 2.87$, $p < .01$, test 2 and test 3, $t(28) = 2.36$, $p < .05$, and between test 1 and test 3, $t(25) = 4.40$, $p < .01$ (see Table 14).

4.4.4 Elevation

Means and standard deviations for elevation at each load are displayed in Table 12. Elevation at each load was analysed using repeated measures ANOVA and the results are presented in Table 13. There was a significant test main effect for both Load 2, $F(26,2) = 10.42$, $p < .01$, and Load 3, $F(23,2) = 14.23$, $p < .01$. No group by test interaction was demonstrated.

The paired t-tests demonstrated that there was a significant difference in the elevations at the second load between test 1 and test 2, $t(35) = -3.99$, $p < .01$, and between test 1 and test 3, $t(28) = -4.45$, $p < .01$. There was no significant difference between test 2 and test 3.

In addition, there was a significant difference in elevation at load 3 between test 1 and test 2, $t(31) = -5.52$, $p < .01$, and between test 1 and test 3, $t(25) = -5.57$, $p < .01$. There was no difference in elevation between test 2 and test 3. These results are presented in Table 14.

Table 8. Means and standard deviations for weight, sum of skinfolds and sum of girths: total entry.

Variable	Group	x	S.D.	n
WtT1	BSC	95.98	10.39	16
(kg)	RP	95.29	13.94	17
	Control	100.46	16.12	17
WtT2	BSC	91.75	7.75	10
(kg)	RP	94.64	13.07	14
	Control	98.86	18.19	14
WtT3	BSC	88.96	8.41	8
(kg)	RP	94.28	14.95	12
	Control	97.97	18.30	10
SOST1	BSC	281.56	30.64	15
(mm)	RP	275.24	58.82	17
	Control	277.51	47.38	17
SOST2	BSC	256.97	28.89	9
(mm)	RP	278.10	50.78	14
	Control	263.56	48.88	14
SOST3	BSC	252.43	37.96	7
(mm)	RP	273.77	58.00	12
	Control	273.89	52.13	10
GirSum1	BSC	465.89	37.30	16
(cm)	RP	482.25	35.74	17
	Control	494.66	36.41	17
GirSum2	BSC	459.96	37.43	10
(cm)	RP	483.60	30.69	14
	Control	490.70	42.50	14
GirSum3	BSC	460.14	18.30	7
(cm)	RP	479.31	36.32	12
	Control	485.54	42.98	10

SOS = sum of skinfolds
GirSum = sum of Girths
Wt. = weight

Table 9. Means and standard deviations for relative oxygen pulse scores (ml/kg/hrt beat): total entry.

Variable	Group	x	S.D.	n
Test 1				
Load 1	BSC	.100	.015	16
	RP	.099	.018	17
	Control	.101	.016	17
Load 2	BSC	.107	.015	16
	RP	.103	.018	16
	Control	.106	.030	16
Load 3	BSC	.115	.015	12
	RP	.109	.024	14
	Control	.119	.019	14
Test 2				
Load 1	BSC	.106	.016	10
	RP	.101	.016	10
	Control	.104	.019	14
Load 2	BSC	.105	.011	10
	RP	.110	.018	13
	Control	.106	.016	14
Load 3	BSC	.107	.015	10
	RP	.116	.019	13
	Control	.106	.032	14
Test 3				
Load 1	BSC	.103	.015	8
	RP	.100	.018	12
	Control	.090	.033	10
Load 2	BSC	.108	.027	8
	RP	.096	.032	11
	Control	.100	.019	10
Load 3	BSC	.117	.030	8
	RP	.110	.020	11
	Control	.114	.024	10

Table 10 Means and standard deviations for absolute oxygen pulse score: (l/beat): total entry

Variable	Group	x	S.D.	n
Test 1				
Load 1	BSC	.015	.023	16
	RP	.010	.002	17
	Control	.016	.022	17
Load 2	BSC	.016	.023	16
	RP	.010	.002	16
	Control	.011	.002	16
Load 3	BSC	.011	.003	12
	RP	.011	.002	14
	Control	.012	.002	14
Test 2				
Load 1	BSC	.010	.001	10
	RP	.009	.002	14
	Control	.010	.001	14
Load 2	BSC	.010	.001	10
	RP	.010	.002	13
	Control	.011	.002	14
Load 3	BSC	.010	.001	10
	RP	[illegible]	.002	13
	Control	[illegible]	.002	14
Test 3				
Load 1	BSC	.009	.002	8
	RP	.009	.001	12
	Control	.009	.002	10
Load 2	BSC	.009	.002	8
	RP	.010	.002	11
	Control	.010	.002	10
Load 3	BSC	.010	.002	8
	RP	.010	.002	11
	Control	.011	.002	10

Table 11. Means and standard deviations for heart rate (bpm) at 3 loads over 3 testing sessions.

Variable	Group	x	S.D.	n
Load 1				
Test 1	BSC	118.7	12.2	16
	RP	132.5	58.3	17
	Control	117.0	12.2	17
Test 2	BSC	112.2	12.4	10
	RP	110.9	15.1	14
	Control	109.2	10.3	14
Test 3	BSC	103.0	7.3	8
	RP	111.8	16.8	12
	Control	107.2	15.5	10
Load 2				
Test 1	BSC	129.5	11.9	16
	RP	146.5	86.5	16
	Control	123.5	11.1	16
Test 2	BSC	121.8	10.2	10
	RP	119.2	13.9	13
	Control	117.6	8.8	14
Test 3	BSC	107.6	10.2	8
	RP	118.4	16.3	11
	Control	115.6	12.0	10
Load 3				
Test 1	BSC	135.2	9.0	12
	RP	131.4	9.2	14
	Control	130.0	9.0	14
Test 2	BSC	131.8	12.1	10
	RP	127.4	10.4	13
	Control	127.6	9.3	14
Test 3	BSC	120.5	7.6	8
	RP	126.7	14.8	11
	Control	123.0	12.0	10

Table 12. Means and standard deviations for elevation (degrees) at each load for three testing sessions.

Variable	Group	x	S.D.	n
Load 2				
Test 1	BSC	1.8	.8	16
	RP	1.8	.8	16
	Control	1.9	.6	16
Test 2	BSC	2.1	.9	10
	RP	2.3	.9	13
	Control	2.3	.6	14
Test 3	BSC	2.1	.8	8
	RP	2.5	.7	11
	Control	2.4	.7	10
Load 3				
Test 1	BSC	3.8	1.1	12
	RP	3.3	1.1	14
	Control	3.4	.9	14
Test 2	BSC	3.7	1.3	10
	RP	4.2	1.3	13
	Control	4.1	.9	14
Test 3	BSC	3.8	1.3	8
	RP	4.4	1.4	11
	Control	4.3	1.0	10

Table 13. Significant test main effects for the physiological measures of absolute oxygen pulse, heart rate and elevation.

Variable	df	F	p
Absolute Oxygen Pulse			
Load 1	(2,27)	5.25	$<.05$
Heart Rate			
Load 1	(2,27)	19.65	$<.01$
Load 2	(2,26)	16.71	$<.01$
Load 3	(2,23)	13.78	$<.01$
Elevation			
Load 2	(2,26)	10.42	$<.01$
Load 3	(2,23)	14.23	$<.01$

Table 14. Significant differences in measures of absolute O_2 pulse, heart rate and elevation between tests

Variable	t(df)		
	Test 1 & 2	**Test 2 & 3**	**Test 1 & 3**
Absolute O_2 Pulse		2.67(29)**	
HR			
Load 1	5.24(37)**		4.56(29)**
Load 2	4.61(35)**		4.24(28)**
Load 3	2.87(31)**	2.36(28)*	4.40(25)**
Elevation			
Load 2	-3.99(35)**		-4.45(28)**
Load 3	-5.52(31)**		-5.57(25)**

$p < .05$ *
$p < .01$ **

Chapter 5

DISCUSSION

5.1 MEASURES OF ADHERENCE

5.1.1 Adherence to the supervised program

It is important to emphasize that when discussing the rates of adherence found in this study and comparing them to rates found in other research, definitional issues will influence the discussion. Other researchers have often referred to a dropout or relapse rate as a measure of adherence (Dishman, 1988; Hunt, Barnett, Branch, 1971). Conversely, adherence has also referred to the number of sessions attended during a supervised program (Belisle, Roskies & Levesque, 1987; Martin et al, 1984), or the amount of self-reported activity in an unsupervised setting (Epstein, Koeske & Wing, 1984; Martin et al, 1984). This discussion will delineate between the two definitions whenever possible.

Furthermore, when comparing adherence rates among the treatment groups in the present study a number of differences were detected. Fewer differences were found between the groups when all subjects were included in the analysis over the situation when only those subjects who completed the treatment and all tests were included. It is possible that the differences caused by the intervention were masked by other factors affecting adherence.

When all subjects entering the study were considered, average attendance

was 75.38%, that is, of the 40 individuals who completed the program most were adhering to the prescribed amount of walking 75% of the time. This percentage was higher (78%) when the adherence of those completing three tests was analysed separately. In both cases the overall percentage adherence declined from week one to week 12 (see Figure 3 & 4). The overall program adherence range across intervention groups was from 74.49% in the control group to 76.91% in the BSC group. When the figures for the initial 6 weeks of the program were compared a greater variation was evident. Further, a large, uncharacteristic decrease occurred for all groups in Week 8, which could be attributed to a long weekend.

Of the studies that defined adherence as a percentage or rate of attendance at program sessions, Martin, et al. (1984) found an average class attendance of 56% in their relapse prevention study. However, when those individuals who didn't attend 75% of their group sessions were excluded from the analysis, the rate was 78%. It was unclear whether the 13 individuals not included in their analysis dropped out completely or had continued to attend but failed to meet the 75% attendance criteria. This lack of clarity makes a direct comparison with the present study difficult.

Previous studies by Martin et al (1984) found adherence rates that varied according to intervention. The mean percentage of class attendance was 71.05% in their study of goal setting and feedback. Percentage adherence ranged from 51.6% for the group feedback/distance goal group to 79.4% for the personal feedback/time goal group. Similarly, their lottery/fixed and flexible goals study resulted in an average adherence rate of 76.3%. The range was from 66.7% for the lottery/fixed goals to 93.1% for the basic/flexible goals group. Their fourth and fifth studies

examining proximal versus distal goals and cognitive association versus dissociation strategies found average adherence rates of 77% and 68%. The lowest rate was 58.7%, for the associative group, and the highest, 83%, for the distal goal group. The range of adherence rates between groups was larger than that found in the present study.

A further study using session attendance as an adherence measure found an average attendance (58.4% and 50.4%) for the experimental condition and the control condition respectively (Belisle, Roskies, & Levesque, 1987). These measures represented adherence across a variety of activities including jogging, pre-ski training, and aerobics. This may explain the lower rates of adherence, as there were significant differences between rates for different activities and between the different instructors. A study by Marcus (1988) found a mean overall percentage of sessions attended by subjects of 51% for a relapse prevention group, 49% for a reinforcement group and 44% for a control group. Furthermore, 71% of the participants in the study attended less than two-thirds of the sessions.

Epstein, Koeske & Wing (1984) used the total number of weeks that the obese children in their study met the exercise points goal that they had set as a measure of adherence. They found that over an eight week unsupervised program the children achieved the prescribed exercise point goals 52.5% of the time. This score varied significantly between groups. Those in the low caloric expenditure groups had significantly higher adherence (61.25%) than those in the high expenditure (43.75%). The highest adherence for two months was less than the 75.8% found during the present study. This research has been cited as an indication of lower rates of adherence for the obese (Dishman, 1990). However,

when the findings of their study are compared to others using attendance based definitions of adherence, the reported differences between the obese and the non-obese populations are not obvious.

In addition to reporting attendance rates a number of the studies provided information on drop-out rates; each using a different criterion to define drop-out. The present study had a drop-out rate of 20% at 3 months and 40% after the six month maintenance period. This was a lower rate than expected, although as mentioned previously, there was a varying amount of adherence to the program itself. Further, a large proportion of the program drop-outs dropped during the first few sessions. Seven of the 10 who failed to continue dropped out in the first month.

Marcus (1988), using the criteria of two-thirds attendance, found that 75% of the participants who began the program did not complete it. The program was conducted twice a week and was 18 weeks in length. This, in addition to their definition of a drop-out, made comparison with the current study difficult.

In contrast, Martin, et al (1986) defined drop-outs as subjects who failed to attend six consecutive classes throughout the 10 week course. They found drop-out rates of 30.3% in their feedback and goal-setting study; 20.5% for their lottery and goal flexibility study; and 17% and 12% for their proximal/distal goal-setting and their dissociation/association studies respectively. This set of studies demonstrated the variability of this measure, but in general, the percentages were similar to the 20% found in the present study. The different attendance requirements and small group numbers in their study may have affected the results.

Gwinup (1975) studied obese women and defined drop-outs as individuals

who didn't maintain the minimum of 30 minutes exercise per day. The researcher found a drop-out rate of 67.7% which exceeded that which is typically found in supervised programs for normal-weight individuals. This research is cited as support for the statement that the obese are less likely to adhere (Dishman, 1990), when in fact, the difference could be reflecting the extreme attendance requirement.

A critical period for dropout has been identifed as the first few program sessions (Carmody, et al., 1980). The results of the present study supported this. In contrast, the results of Belisle, Roskies and Levesque (1989) failed to support the existence of the negative acceleration curve suggested by Dishman (1988). Drop-out rates in their study accelerated over the program from 5-6% in the first 7 weeks to 11 & 10% in Week 8 and 9. Further, they reported that 57.4% of the total sample (N=350) in their study did not complete the 10 week program. This dropout rate over the 10 week period exceeded that found in the present study using obese women.

As Marlatt and Gordon (1985) cautioned, the assumption that an initial lapse represents a relapse or drop-out can be short-sighted. When those individuals who failed to exercise two-thirds of the prescribed time were considered as drop-outs (Marcus, 1988), information about individuals who actually remained exercising was lost. In addition, an absence from 6 scheduled classes during a program represents two or three weeks, depending on the frequency of the program. It is plausible that individuals may return to a program after a period of this length, as occurred in this study. For example, a number of individuals took two to three week holidays despite a request by the researcher at their initial orientation that only those that could be present for the entire 12 week program participate. Some

individuals reported walking during these periods and most returned to the program. Furthermore, illness and family crises also resulted in 2-3 week absences which were reflected in the percentage attendance scores. Relying on a stringent preset attendance criteria as a definition for drop-out may result in an inaccurate representation of the actual adherence to the program. Artificial criterion may lack external validity.

Dishman (1988) stated that "in the typical supervised exercise setting, about 50% of the clients or patients will dropout of the program within 6 months to a year" (p.1), and that those beginning an exercise program will fail to maintain it at the level initially undertaken. The results of this study confirm these statements. However, the results following the three month program for obese women are not different from those found with normal populations. Both Gwinup (1975) and Epstein, Koeske and Wing (1984) suggested that a lower intensity routine such as walking may result in a better adherence response for the obese. This contention was supported by the present study.

Furthermore, the fact that the program was specifically designed for obese women was likely to have produced different results than those involving all populations. Another factor of the present study that may have impacted upon the results was that both the activity and the instructor were uniform across all conditions.

The adherence results were inconsistent. There was no significant difference between groups during the initial 6 weeks of the program, however, the average adherence during the final 5 weeks of the program was significantly different. The behavioural self-control group had higher adherence rates than the relapse

prevention group during this period, although neither of these groups were significantly different from the control group. In contrast, adherence rates averaged over the total 12 week period were not significantly different among the groups.

There are a number of possible explanations for the inconsistent and non-significant results. The intervention education was directed at the maintenance period, therefore there may have been no immediate effect during the program itself. There was also a strong behavioural component in the program, possibly overriding any effect of the group interventions. The program provided a commitment, goals and immediate reinforcement from the researcher/exercise leader for attendance. Those in the relapse prevention group were not exposed to a realistic setting in which to practice their skills unless a lapse situation arose and then, if one did, the behavioural components of the program were possibly sufficient to maintain adherence. Program evaluations supported this statement. A number of the individuals in the relapse prevention group reported that it was difficult to use the relapse prevention concepts during the program. In addition, several individuals did not adhere to the practice lapse. Further, if the intervention had an immediate effect upon exercising behaviour it may have been masked by other more powerful influences not controlled for in this study. Dishman (1990) has suggested that such factors as demographics, convenience, time, and climate may all affect adherence. However, these were largely considered by the design of this study.

A number of factors which were not controlled for have been suggested as important for maintaining exercise participation. Of these, Wankel (1985) found that social support and enjoyment were factors. The solitary nature of the activity

therefore, may have influenced adherence. Although the walkers met the researcher before and during their walk often their walk was unaccompanied. Wankel (1985) also found that friendship within a program was associated with adherence. Anecdotal evidence from the present study supported this finding: those with walking partners seemed more satisfied. In addition, it is possible that some individuals may have enjoyed walking, as an activity choice, to a lesser degree than others.

A further influence has been defined by Prochaska and DiClemente (1983) who suggested that there are stages of change within which different processes of change are applied differentially. The evaluation forms from this study did demonstrate that only some of the behavioural skills that were taught were used and a small number discussed the fact that they weren't ready to apply them.

Finally, the style of delivery (educational) and content of the interventions may not have had a significant effect on the individuals involved, or, if they did, this may have been subject to high response variability between subjects. Those differences that did result, may have been strictly due to chance.

5.1.2 Ideal Adherence

Ideal adherence, also differed over time, and between groups. The average ideal adherence for the 12 week period was 70.38% when all subjects were considered and 74.23% when entry was restricted. These percentages demonstrated that the participants in this study walked three times per week on average instead of the ideal four. Significant differences were found between groups during the final 5 weeks of the program when the analysis was limited to those individuals who

completed 3 tests. The BSC group had a higher percentage of ideal adherence than the R.P. group, although there was no significant difference between the control group and either of the intervention groups. There were no significant differences during the initial 6 weeks nor when percentages of ideal adherence were averaged over 12 weeks. Once again, the inconsistency of the findings suggests that caution should be used when interpreting the results of any single week. If adherence is inconsistent then attributing differences to the intervention is questionable.

The finding that the RP group had significantly lower ideal adherence rates during the final 5 weeks may be a result of the planned lapse. All individuals did not return to the program directly following the lapse, which demonstrated the difficulty that starting back after a lapse might present. These individuals were in a controlled situation with marked behavioural incentives to return and still had difficulty. The use of a planned lapse as a part of this treatment program failed to support its efficacy.

Martin et al. (1986) suggested that the unsupervised run/walk would increase generalization of the running/walking behaviour to other settings which would increase the likelihood of adherence during the maintenance period. Few studies have studied exercise adherence in both the supervised and unsupervised setting. Martin et al. (1986) used the "Third Day" walk/run which was a self-reported walk/run outside of the supervised program as an additional measure of adherence. Their series of six studies found that differences in adherence between groups were consistent over both measures; In-class and Third day run adherence. Ideal adherence; a measure of participation in both supervised and unsupervised exercise was consistently lower than adherence to the program alone. Ideal

adherence ranged from 30% (n=7) for the group feedback/distance goal condition, to 66% (n=8) for the basic behavioural/flexible goals condition. The average across five studies (n=108) was 46.32%. This percentage is lower than that found in the present study. However, similar to Martin et al. (1986), ideal adherence rates were lower than the rates found for the supervised program. In addition, the differences, or lack thereof, between groups on both measures of adherence were also consistent.

Non-adherence to the 4th day walk in itself, is an interesting finding which demonstrated the power of the supervised program. When there was less direct social pressure (checking in) and no immediate reinforcement, the subjects' walking behaviour was less consistent. This finding has implications for those involved in prescribing exercise programs and especially for those working with the obese individual.

5.1.3 Maintenance Adherence

When adherence to the maintenance exercise program was assessed and when the results of all subjects entering the program were analysed there were no significant differences between groups. Differences were evident however, when comparing those individuals who completed the total program.

Visual examination of the data for mean adherence rates demonstrated that the percent adherence was consistently lower in the control group with the exception of Month 4 where the relapse group and the control group had similar adherence. When comparing the controls to the behavioural self-control group, the

control group had significantly lower adherence to exercise than the behavioural group in Month 3, Month 4 and on average over the six month period. Differences between the relapse prevention group and the control group were only significant during Month 5. The results were inconsistent when comparing the two intervention groups. There was no significant difference between the two groups when adherence was averaged over the 6 month maintenance period.

These results indicated that the behavioural self-control group had a significant impact on maintenance exercise adherence when compared to the controls. However, no significant differences were found between the two intervention groups. Nor was the difference between the relapse prevention group and the controls significant. As with program adherence and ideal adherence, the percentage of adherence to the exercise prescription of 3 days per week during maintenance declined from 73.17% to 50.87% (see Table 7).

Previous studies have found a decline in maintenance adherence when compared to the supervised program (Martin, et al, 1986). In six different studies they found percentages ranged from 17% to 87.5% with the average across studies of 42.2% Direct comparisons between their studies and the present study were difficult because the percentage used in the previous studies represented those subjects who continued to walk/run three or more times per week. Whereas in the current study, the percentage represented actual participation compared to the requested ideal of three times per week.

The present study employed a method similar to that used by Belisle, Roskies and Levesque (1989). They found that their experimental condition groups exercised 70% of the time and the non-experimental groups 61.3%. This difference

was statistically significant. A second study by these researchers found similar results; 70.8% for the experimental condition groups and 47.7% for the control conditions. The maintenance period during the present research was longer (6 months versus 3 months) and the self-report recall period shorter (7 days versus 14 days) and yet the maintenance results are similar.

Sixty percent of the individuals who initiated participation in the program remained involved at the end of 9 months. This trend could be predicted from previous literature indicating 50% adherence to a program by 6 months (Dishman, 1990). In contrast, this program did not find support for the assumption that the obese were more likely to drop out (Dishman, 1990). As was stated previously, this finding may be related to the nature of the program which was specifically designed and utilised by obese women in contrast to programs involving all populations.

In addition, both Frankel (1984) and Oldridge (1977) have emphasized the importance of the exercise leader. It is possible that the relationship between the researcher and the participants in the study resulted in above average adherence. Furthermore other contingencies that were not controlled for in this study may have been operating increasing the chances that the participants adhered to exercise. Once again, it is essential to delineate adherence to the program from adherence to the prescription.

5.1.4 Dropout

The rate of dropout was not significantly different among the groups. Other factors may have operated more powerfully than the program itself or the

interventions resulting in an even distribution across conditions. For example, four of the dropouts in this study suffered from physical injury, two of which appeared to be overuse injuries. Foss (1984) cautioned that the obese may be prone to increased risk of overuse injury. In one of these cases the subject failed to comply with the prescription and increased her walking duration too rapidly against the advice of the researcher. This demonstrated another problem that may face the practioner in the field: walking is a relatively low impact, low intensity activity, however, the added weight of excess fat may alter this situation.

5.2 ANTHROPOMETRY

5.2.1 Weight

There was no significant difference between the groups at each testing session nor was there a significant difference over the testing sessions. There was no dietary constraint or monitoring during this study, therefore this result was not unexpected. Evidence of the lack of dietary restraint was provided by the RP group which gained significantly more weight than the BSC group between Test 1 and Test 2. The behavioural self-control group did lose significantly more weight than the controls between Test 2 and 3, and than both groups over the study period(Test 1 to Test 3). This may be a result of the higher rates or it may indicate a possible difference between the groups not accounted for in this study. It may also suggest that the individuals in this group applied the behavioural principles to a further area of change (eating behaviour). Anecdotal evidence supported this possibility as some individuals reported success at changing eating behaviours.

Changes in weight would also have an impact on measures of cardiovascular change as weight was a factor in workload. Changes in weight may have masked gains in fitness. For example, elevation was adjusted according to heart rate. Therefore, those individuals who gained weight might not have increased in elevation at Load 2 despite possible increases in fitness. Those who maintained or lost weight might have increased their elevation.

5.2.2 Sum of Skinfolds and Sum of Girths

No significant differences in sum of skinfolds or sum of girths were found during during this study. As some of the individuals were not actively attempting to reduce their caloric intake, this was also to be expected. The lack of response to exercise alone has implications for individuals attempting to lose weight as well as those researchers using weight as a measure of exercise efficacy.

It has been suggested that an untrained obese population may have greater energy requirements for walking as a result of balance and coordination problems and movement restriction imposed by excessive layering of fat (Foss, 1986). No significant changes in measures of body fat were found in this study suggesting that related decreases in movement restriction and balance and coordination problems did not explain possible reductions in oxygen consumption.

5.3 PHYSIOLOGICAL MEASURES OF ADHERENCE

The primary indirect measures of adherence were relative and absolute oxygen pulse. These measures were intended to provide validation of exercise

adherence (Epstein, Koeske, & Wing, 1984). Anthropometric, heart rate, and elevation measures can describe, and provide evidence of, increases in, and maintenance of fitness.

The primary measures of O_2 pulse did not demonstrate fitness response to the program. However, measures of heart rate and elevation provided evidence that physiological changes did occur in response to the supervised program, and that these changes were not reversed during the maintenance period. This suggests that the self-reported levels of activity were adequate to maintain the changes and that the individuals had continued some effective level of activity.

5.3.1 Relative Oxygen Pulse

No significant differences were found between groups or test times on measures of oxygen pulse relative to body weight. Epstein, Koeske and Wing (1984) cautioned researchers on the dangers of using physiological data to measure adherence to exercise protocols. Any measures affected by weight loss or gain may change as a result of weight change and not as a result of actual fitness changes. Weight change itself may be a result of changes in eating behaviour unrelated to exercise. Furthermore, changes in fitness in response to increased activity may be masked by increases in weight which are either diet or exercise related. As a representation of oxygen consumption relative to body weight, O_2 pulse (relative) demonstrated no change as weight change in this study varied across groups.

5.3.2 Absolute Oxygen Pulse

The repeated measures ANOVA indicated a significant main effect for test

on the first load (warm-up). Further analysis indicated that the significant difference in absolute O_2 pulse across all subjects in this study was between Test 2 and Test 3. Visual examination of the means showed that absolute oxygen pulse for Load 1 decreased between the final training sessions. Significant differences were not found on either of the following two loads which suggests caution in interpretation.

A number of physiological changes can occur at the submaximal level in response to training that may not be reflected by the O_2 pulse measure. Oxygen pulse is measured as oxygen consumption per heart beat and therefore, changes in either of these variables may affect this measure.

Changes in cardiovascular function depend upon the type an intensity of the exercise. The subjects in this study were requested to exercise between 60 and 85% of maximal heart rate for a minimum of 15-20 minutes, 3 to 4 days per week. Heart rates were monitored and duration increased over the three month period. The program was in accordance with levels of intensity and duration suggested by Brooks and Fahey, (1984) and therefore, it could be suggested that an aerobic conditioning effect had occurred.

5.3.3 Heart rate

Heart rate and stroke volume are the major factors involved in increased cardiac output during exercise. Endurance training decreases heart rate and increases stroke volume at a given submaximal load (Brooks & Fahey, 1984). However, these authors suggested that it is not always appropriate to use heart rate as an indicator of fitness gains because large fluctuations in submaximal heart rate

are possible at the same levels of oxygen consumption.

During low intensity submaximal exercise, heart rate can be affected by anxiety, dehydration, ambient temperature, altitude and elapsed time after meals (Brooks & Fahey, 1984). A number of these factors were controlled for in this study. Each individual fasted and was caffeine free for 4 hours prior to the test. Testing was conducted in the same laboratory which controlled for altitude. Ambient temperature was not controlled as the testing sessions were held in different seasons. However, ventilation was good in the laboratory, temperatures ranged from 21-23^{o}C. If heat was a factor in the summer testing session it would be expected that heart rates would increase when, in fact, they did the opposite. This suggested that ambient temperature was not a factor.

Anxiety and dehydration were not controlled for. The subjects were familiarized with the treadmill and expired air collecting equipment prior to the test. However, anecdotally, the difference in anxiety and comfort between testing sessions was obvious to the testing staff. In addition, the subjects had become familiar with the testing staff and the researcher on the second testing session. It is possible that some of the decrease in heart rate from Test 1 to Test 2 could be accounted for by a decrease in anxiety.

This study found a significant difference in heart rates over the intervention period on all three loads. Overall, heart rates decreased from Test 1 to Test 2 and Test 2 to Test 3. Elevation, however, was not held constant between testing sessions as body weight changed and elevation changed according to the preset safety protocol. From Test 2 to Test 3 elevation was held constant to enable more accurate assessment of fitness changes and therefore an evaluation of maintenance

activity levels.

On Test 1 and Test 2 the elevation was adjusted according to heart rate and was shown to differ significantly between these two tests. Therefore those who gained weight might not have experienced an increase in elevation despite possible increases in fitness, while those who maintained or lost weight might have increased in elevation. The result would be a masking of the fitness gains as indicated by changes in heart rate. Significant decreases in heart rate despite this limitation would appear to support the presence of increases in fitness. The extent of these gains is difficult to identify. Changes in weight represented a change in load from either; increased body weight, or increased elevation, and significant decreases in heart rate were still present.

Change in heart rate was shown to differ among groups between Test 2 and Test 3. The behavioural self-control group had significant decreases in heart rate concomitant with significant decreases in weight when compared to the RP and control groups. This weight loss represented a decrease in load, as the elevations were held constant between Test 2 and Test 3, and could possible result in a decreased heart rate response. Therefore, the significantly different change in heart rate in the BSC group may not reflect an increase in fitness.

In summary, heart rate decreased significantly even as elevation increased from Test 1 to Test 2. Similarly heart rate decreased significantly when elevation was held constant between test 2 and test 3 and this change was concurrent with the finding that there was no significant difference in weight between testing sessions in the RP and control groups. The group with a significant weight change (BSC) did however, have a significantly greater decrease in heart rate.

Heart rate decreased during this study which would result in an increase in absolute oxygen pulse if oxygen consumption were to remain constant for a submaximal load as predicted (Brooks & Fahey, 1984). The lack of significant differences in oxygen pulse found in this study may indicate that the decrease in heart rate was accompanied by a decrease in oxygen consumption despite an increase in load, as in Test 2. Oxygen consumption is expected to remain constant at submaximal loads in response to training (Brooks and Fahey, 1984). It is possible oxygen consumption may have changed as a result of changes in efficiency.

Body composition has been suggested as a factor that influences efficiency and therefore oxygen consumption in the obese (Foss, 1986). However, significant changes in body fat and weight did not occur in this study. The specificity of the training (walking) to the test (walking on a treadmill) and the pre-test experience may have eliminated problems of balance and coordination which have also been suggested to have an impact on oxygen consumption in the obese (Foss, 1986).

It is interesting that, although adherence to the program decreased, and it was measured only as frequency of activity, fitness changes (heart rate) were maintained at 9 months. This is of particular importance when working with an obese population as it highlights the possible impact of limited amounts of activity.

5.4 CONCLUSIONS

A number of findings have resulted from this study. Based upon the hypotheses posed, a number of conclusions could be made. In addition, further

conclusions resulted from the statistical analysis and observations made during the study.

The results of the study were mixed, therefore it was possible to accept or reject parts of the null hypotheses upon which this study was based.

1. There was a significant difference among the relapse prevention, behavioural self-management and control groups on measures of adherence during the final 6 weeks of the program and during the maintenance period.

2. There was no difference among the groups during the initial 6 weeks or when adherence rates were averaged over the 12 week period.

3. There was no significant difference among the groups on the physiological measures of oxygen pulse, heart rate and elevation (with the exception of one load).

4. There was a significant difference in the physiological measures of heart rate and elevation between testing sessions. The differences were between Test 1 and Test 2 and indicated changes in fitness during the supervised program which was consistent with the confirmed adherence. The lack of significant differences between Test 2 and Test 3 indicate that fitness was maintained and provide indirect confirmation of self-reported adherence to walking during the maintainance period.

5. There was no significant difference in the physiological measure of O_2 pulse (relative and absolute) between testing sessions.

6. There was no significant differences in number of drop-outs among the groups.

7. The obese individuals in this study responded to exercise similarly tc non-obese individuals in previous studies. Rates of adherence as measured by drop-out were similar to those reported by Dishman (1986) for a six month period. Furthermore, rates of adherence when measured as attendance were comparable with results from other studies and in many cases the rates (approx. 75%) were higher (Martin, et al, 1986; Belisle, Roskies, & Levesque, 1988).

8. Fitness changes were maintained at 9 months despite participation rates far below recommended guidelines (Brooks & Fahey, 1984). This has implications for exercise prescription and maintenance.

9. There appear to be a number of different styles of adhering to a program which need to be accounted for in both research and program planning.

10. Behavioural self-control programs in an educational skill based setting appeared to be the most effective means of maintaining exercise behaviour over a 9 month period. However, as indicated by previous research in the

field of weight and exercise management, long term maintenance remains problematic.

10. The lack of significant results for the relapse prevention group is consistent with some of the previous research (Marcus, 1988; Martin, et al., 1984). This program may not be suitable for a group intervention. Relapse prevention focusses on behavioural skills but also relies on the cognitive concepts of restructuring and self-efficacy which may require more intensive counselling at the time of an event. Cognitive restructuring may need to be reinforced in the setting within which it will be used. This would likely prove difficult within the constraints of a typical exercise program or during a maintenance period where there is no contact with the client.

5.5 RECOMMENDATIONS FOR FURTHER RESEARCH.

From the results and discussion presented previously a number of recommendations can be suggested.

1. Research into, and discussions about, exercise adherence should seek to clearly delineate between drop-out statistics and attendance rate statistics.

2. As behavioural self-control skills bave consistently been demonstrated to have an effect on behaviour change it is important to identify the factors involved in the continuing application of the principles during maintenance

of behaviour change.

3. Lapses appear to occur in response to a variety of life events therefore, a further exploration of the methods by which individuals reinstate exercise behaviours is needed.

4. While there is little support for the efficacy of relapse prevention as an intervention to enhance exercise behaviours in a group setting, the manner in which the model has been applied in the research setting has varied. Research should address its efficacy in an individualised counselling setting.

5. Segregated programming should be considered when attempting to involve obese women in exercise programmes. Further exploration of the impact of segregated and integrated programs on exercise adherence in the obese is needed.

6. Single subject and multiple baseline designs using both groups and individuals as the unit of analysis should be used to examine the impact of interventions, the time period over which they have maximum effect and what type of stimuli will encourage their use during maintenance.

7. Replication of exercise adherence work on individuals in the more extreme categories of obesity is needed.

REFERENCES

Abrams, D.B., & Follick, M.J. (1983). Behavioral weight loss intervention at the worksite: feasibility and maintenance. Journal of Consulting and Clinical Psychology, 51, 226-233.

Ballor, D.L., Katch, V.L., Becque, M.D., & Marks, C.R. (1988). Resistance weight training during caloric restriction enhances lean body weight maintenance. American Journal of Clinical Nutrition, 47, 19-25.

Belisle, M., Roskies, E., & Levesque, J.M. (1987). Improving adherence to physical activity. Health Psychology, 6(2), 159-172.

Belko, A.Z., VanLoan, M., Barbieri, T.F., & Mayclin, P. (1987). Diet, exercise, weight loss, and energy expenditure in moderately overweight women. International Journal of Obesity, 11, 93-104.

Bielinski, R., Schutz, Y., & Jequier, E. (1985). Energy metabolism during the postexercise recovery in man. The American Journal of Clinical Nutrition, 42(July), 69-82.

Blackburn, G.A., & Kander, B. (1987). Evaluation and Treatment of the Medically Obese Patient with Cardiovascular Disease. American Journal of Cardiology, 60(11).

Bray, G.A. (1985). Complications of Obesity. Annals of Internal Medicine, 103(6 pt 2), 1052-1062.

Bray, G.A. (1990). Exercise and obesity. In C. Bouchard, R.J. Shephard, T. Stephens, J.R. Sutton, & B.D. McPherson (Eds.), Exercise, fitness, and health: a consensus of current knowledge. (pp. 497-510). Champaign, Il.: Human Kinetics Books.

Bray, G.A., Whipp, B.J., & Koyal, S.N. (1974). The acute effects of food intake on energy expenditure during cycle ergometry. The American Journal of Clinical Nutrition, 27(March), 254-259.

Brooks, G.A., & Fahey, T.D. (1984). Exercise Physiology Human Bioenergetics and its Applications, New York, John Wiley & Sons.

Brown, R.A., Lichtenstein, E., McIntyre, K.O., & Harrington-Kostur, (1984). Effects of nicotine fading and relapse prevention on smoking cessation. Journal of Consulting and Clinical Psychology, 50, 820-840.

Brownell, K.D. (1982). Obesity: understanding and treating a serious, prevalent and refractory disorder. Journal of Consulting and Clincial Psychology, 50(6), 820-840.

Brownell, K.D., & Jeffery, R.W. (1987). Improving long-term weight loss:

pushing the limits of treatment. Behavior Therapy, 18, 353-374.

Brownell, K.D., Marlatt, G.A. Lichtenstein, E., & Wilson G.T. (1986). Understanding and preventing relapse. American Psychologist, 41(7), 763-782.

Brownell, K.D., Stunkard, A.J., & Albaum, J.M. (1980). Evaluation and modification of exercise patterns in the natural environment. American Journal of Psychiatry, 137(12), 1540-1545.

Canada Fitness Survey (1983a). Fitness and Lifestyle in Canada. Ottawa: Canada Fitness Survey.

Canada Fitness survey (1988a). Fitness and Lifestyle in Canada. Ottawa: Canada Fitness Survey.

Carmody, T.P., Senner, J.W., Malinow, M.R., & Matarazzo, J.D. (1980). Physical exercise rehabilitation: long-term dropout rate in cardiac patients. Journal of Behavioral Medicine, 3, 163-168.

Chad, K.E., & Wenger, H.A. (1985). The effects of duration and intensity on the exercise and post exercise metabolic rate. The Australian Journal of Science and Medicine in Sport, 17(4), 14-18.

Chad, K.E., & Wenger, H.A. (1988). The effect of exercise duration on the exercise and post-exercise oxygen consumption. Canadian Journal of Sport Science, 13(4), 204-207.

Chubb, M. (1990). Discussion: determinants of participation in physical Activity. In C. Bouchard, R.J. Shephard, T. Stephens, J.R. Sutton, & B.D. McPherson (Eds.), Exercise, fitness, and health: a consensus of current knowledge. (pp. 103-108). Champaign, Il.: Human Kinetics Books.

Colvin, R.H., & Olson, S.B. (1983). A descriptive analysis of men and women who have lost significant weight and are highly successful at maintaining the loss. Addictive Behaviors, 8, 287-295.

Craighead, L.W., & Blum, M.D. (1989). Supervised exercise in behavioral treatment for moderate obesity. Behavior Therapy, 20, 49-59.

Dallosso, H.M., & James, W.P.T. (1984). Whole body calorimetry studies in adult men. 2. The interaction of exercise and overfeeding on the thermic effect of a meal. British Journal of Nutrition, 52, 65-72.

Dishman, R.K. (1981). Biologic influences on exercise adherence. Research Quarterly for Exercise and Sport, 52(2), 143-159.

Dishman, R.K. (1986). Exercise compliance: a new view for public health. The Physician and Sportsmedicine, 14(5), 127-143.

Dishman, R.K. (1988). Overview. In In Dishman, R.K. (ed), Exercise Adherence Its impact on Public Health (pp. 237-277). Champaign, Illinois, Human Kinetics.

Dishman, R.K. (1990). Determinants of participation in physical activity. In C. Bouchard, R.J. Shephard, T. Stephens, J.R. Sutton, & B.D. McPherson (Eds.), Exercise, fitness, and health: A consensus of current knowledge. (pp. 75-101). Champaign, Il.: Human Kinetics Books.

Dishman, R.K. (1991). Increasing and maintaining exercise an physical activity. Behavior Therapy, 22, 345, 378.

Dishman, R.K., & Ickes, W. (1981). Self-motivation and adherence to therapeutic exercise. Journal of Behavioral Medicine, 4(4), 421-438.

Dishman, R.K., Sallis, J.F., & Orenstein, D.R. (1985). The determinants of physical activity and exercise. Public Health Reports, 100(2), 158-171.

Epstein L.H., Wing, R.R., Koeske, R., Ossip, D., & Beck, S. (1982). A comparison of lifestyle change and programmed aerobic exercise on weight and fitness changes in obese children. Behavior Therapy, 13, 651-665.

Epstein, L.H., Koeske, R., & Wing, R.R. (1984). Adherence to exercise in obese children. Journal of Cardiac Rehabilitation, 4, 185-195.

Epstein, L.H., Wing, R.R., & Thompson, J.K. (1978). The relationship between exercise intensity, caloric intake, and weight. Addictive Behaviors, 3, 185-190.

Foreyt, J.P., & Goodrick G.K. (1991). Factors common to successful therapy for the obese patient. Medicine and Science in Sports and Exercise, 23(3), 292-297.

Foreyt, J.P., Goodrick, G.K., & Gotto, A.M. (1981). Limitations of behavioral treatment of obesity: review and analysis. Journal of Behavioral Medicine, 4(2), 159-174.

Foss, M.L. (1984) Exercise concerns and precautions for the obese. In J. Storlie & H.A. Jordon (Ed.), Nutrition and Exercise in Obesity Management (pp. 105-135), Champaign: Life Enhancement Publications.

Franklin, B.A. (1984). Exercise program compliance; improvement strategies. In J. Storlie & H.A. Jordan (Eds.), Behavioral Management of Obesity (pp.105-135), Champaign: Life Enhancement Publications.

Franklin, B.A. (1988). Program factors that influence exercise adherence: practical adherence skills for the clinical staff. In Dishman, R.K. (ed), Exercise Adherence Its impact on Public Health (pp. 237-277). Champaign, Illinois,

Human Kinetics.

Frechette, E.S., Davis J.M., Ward, D.S., Sargent, R.G., & Dixon, H.L. (1991). Effects of exercise intensity on EPOC in women. Medicine and Science in Sports and Exercise, , S60. (Abstract).

Frey-Hewitt, B., Vranizan, K.M., Dreon, D.M., & Wood, P.D. (1990). The effect of weight loss by dieting or exercise on resting metabolic rate in overweight men. International Journal of Obesity, 14, 327-334.

Graham, L.E., Taylor, C.B., Hovell, M.F., & Siegel, W. (1983). Five-year follow-up to a behavioral weight-loss program. Journal of Consulting and Clinical Psychology, 51(2), 322-323.

Gwinup, G. (1975). Effect of exercise alone on the weight of obese women. Archives of Internal Medicine, 135, 676-680.

Hall, S. (1972). Self-control and therapist control in the behavioral treatment of overweight women. Behavioral Research and Therapy, 10, 59-68.

Hall, S.M., Bass, A., & Monroe, J. (1978). Continued contact and monitoring as follow-up strategies: A long-term study of obesity treatment. Addictive Behaviors, 3, 139-147.

Hallstrom, T., & Noppa, H. (1981). Obesity in women in relation to mental illness, social factors & personality traits. Journal of Psychosomatic Research, 25, 75-82.

Hammer, R.L., Barrier, C.A., Roundy, E.S., Bradford, J.M., & Fisher A.G. (1989). Calorie-restricted low-fat diet and exercise in obese women. American Journal of Clinical Nutrition, 49, 77-85.

Harris, M.B. (1969). Self-directed program for weight control. Journal of Abnormal Psychology, 74(2), 263-270.

Harris, M.B., & Bruner, C.G. (1971). A comparison of a self-control and a contract procedure for weight control. Behaviour Research and Therapy, 9, 347-354.

Harris, M.B., & Hallbauer, E.S. (1973). Self-directed weight control through eating and exercise. Behaviour Research and Therapy, 11, 523-529.

Health and Welfare Canada (1990). Nutrition Recommendations. The Report of the Scientific Review Committee. Ottawa, Canada, p. 25.

Heartbeat Wales (1987). Exercise for Health: Health-related Fitness in Wales (Report No. 23). Cardiff, Wales: Hearbeat Wales.

Henson, L.C., Poole, D.C., Donahoe, C.P., & Heber, D. (1987). Effects of

exercise training on resting energy expenditure during caloric restriction. American Journal of Clinical Nutrition, 46, 893-9.

Hill, J.O., Schlundt, D.G., Sbrocco, T., Sharp, T., Pope-Cordle, J., Stetson, B., Kaler, M., & Heim C. (1989). Evaluation of an alternating-calorie diet with and without exercise in the treatment of obesity. American Journal of Clinical Nutrition, 50, 248-54.

Hill, J.O., Sparling, P.B., Shields, T.W., & Heller, P.A. (1987). Effects of exercise and food restriction on body composition and metabolic rate in obese women. American Journal of Clinical Nutrition, 46, 622-30.

Hunt, W.A., Barnett, L.W., & Branch, L.G. (1971). Relapse rates in addiction programs. Journal of Clinical Psychology, 27, 455-456.

Jeffery, R.W. (1987). Behavioral treatment of obesity. Annals of Behavioral Medicine, 9(1), 20-24.

Jeffery, R.W., Bjornson-Benson, W.M., Rosenthal, B.S., Lindquist, R.A., Kurth, C.L., & Johnson, S.L. (1984). Correlates of weight loss and its maintenance over two years of follow-up among middle-aged men. Preventive Medicine, 13, 155-168.

Jordan, H.A., Canavan, A.J., & Steer, R.A. (1987). Long-term follow-up of patients who lost weight in a cognitive behavioural treatment program. Psychology of Addictive Behaviors, 1(1), 14-21.

Kau, M.L., & Fischer, J. (1974). Self-modification of exercise behavior. Journal of Behavioral Therapy and Experimental Psychiatry, 5, 213-214.

Kazdin, A.E. (1980). Covert and overt rehearsal and elaboration during treatment in the development of assertive behavior. Behavior Research and Therapy, 18, 191-201.

Keefe, F.J., & Blumenthal, J.A. (1980). The life fitness program: a behavioral approach to making exercise a habit. Journal of Behavioral Therapy and Experimental Psychiatry, 11, 31-34.

King, A.C., & Tribble, D.L. (1991). The role of exercise in weight regulation in nonathletes. Sports Medicine, 11(5),331-349.

King, A.C., Taylor, C.B., Haskell, W.L., & Debusk, R.F. (1988). Strategies for increasing early adherence to and long-term maintenance of home-based exercise training in healthy middle-aged men and women. American Journal of Cardiology, 61, 628-632.

Krotkiewski, M., & Bjorntorp, P. (1986). Muscle tissue in obesity with different distribution of adipose tissue effects of physical training. International Journal of Obesity, 10, 331-341.

Lee, C., & Owen, N. (1985). Reasons for discontinuing regular physical activity subsequent to a fitness course. The ACHPER National Journal, March, 7-9.

Lee, C., & Owen, N. (1986). Exercise persistence: contributions of psychology to the promotion of regular physical activity. Australian Psychologist, 21(3), 427-467.

Lennon, D., Nagle, F., Stratman, F., Shrago, E., & Dennis, S. (1985). Diet and exercise training effects on resting metabolic rate. International Journal of Obesity, 9, 39-47.

Maehlum, S., Grandmontagne, M., Newsholme, E.A., & Sejersted, O.M. (1986). Magnitude and duration of excess postexercise oxygen consumption in healthy young subjects. Metabolism, 35(5), 425-429.

Marcus, B. (1988). The use of cognitive and behavioral interventions to increase exercise behavior. (Doctoral dissertation, Auburn University, 1988) Dissertation Abstracts International, (University Microfilms No. 8805007).

Marlatt, G.A. (1985). Relapse prevention: theoretical rationale and overview of model. In G.S. Marlatt & J.R. Gordon (Ed.), Relapse Prevention: Maintenance Strategies in the Treatment of Addictive Behaviors (pp. 3-67). New York, The Guilford Press.

Marshall Hoerr, S.L., Nelson R.A., & Essex-Sorlie, D. (1988). Treatment and follow-up of obesity in adolescent girls. Journal of adolescent health care, 9, 28-37.

Martin, J.E., Dubbert, P.M., Katell, A.D., Thompson, J.K., Raczynski, J.R., Lake, M., Smith, P.O., Webster, J.S., Sikora, T., & Cohen, R.E. (1984). Behavioral control of exercise in sedentary adults: studies 1 through 6. Journal of Consulting and Clinical Psychology, 52(5), 795-811.

McReynolds, W.T., Green L., & Fisher, E.B. (1983). Self-control as choice management with reference to the behavioral treatment of obesity. Health Psychology, 2(3), 261-276.

Mole, P.A., Stern, J.S., Schultz, C.L., Bernauer, E.M., & Holcomb, B.J. (1989). Exercise reverses depressed metabolic rate produced by severe caloric restriction. Medicine and Science in Sports and Exercise, 21(1), 29-33.

Moore, M.E., Stunkard, A.J., & Srole, L. (1962). Obesity, social class and mental illness. JAMA, 181, 962-966.

Morgon, W.P. & O'Connor, P.J. (1988). Exercise and mental health. Chapter in R.K. Dishman (Ed.). Exercise adherence: its impact on public health, pp. 91-121, Champaign, Human Kinetics.

Nieman, D.C., Haig, J.L., DeGuia, E.D., Dizon, G.P., & Register, U.D. (1988). Reducing diet and exercise training effects on resting metabolic rates in mildly obese women. The Journal of Sports Medicine and Physical Fitness, 28(1), 79-88.

Noland, M.P. (1989). The effects of self-monitoring and reinforcement on exercise adherence. Research Quarterly For Exercise and Sport, 60(3), 216-224.

Pacy, P.J., Webster, J., & Garrow, J.S. (1986). Exercise and obesity. Sports Medicine, 3, 89-113.

Pekarik, G., Blodgett, G., Evans, G., & Wierzbicki, M. (1984). Variables related to continuance in a behavioral weight loss program. Addictive Behavior, 9, 413-416.

Perkins, K.A., Rapp, S.R., Carlson, C.R., & Wallace, C.E. (1986). A behavioral intervention to increase exercise among nursing home residents. Gerontologist, 26, 479-481.

Perri, M.G., McAdoo, W.G., McAllister, D.A., Lauer, J.B., Yancey, D.Z. (1986). Enhancing the efficacy of behavior therapy for obesity: effects of aerobic exercise and multicomponent maintenance program. Journal of Consulting and Clinical Psychology, 54(5), 670-675.

Perri, M.G., McAllister, D.A., Gange, J.J., Jordan, R.C., McAdoo, W.G., & Nezu, A.M. (1988). Effects of four maintenance programs on the long-term management of obesity. Journal of Consulting and Clinical Psychology, 56(4), 529-534.

Perri, M.G., Shapiro, R.M., Ludwig, W.W., Twentyman, C.T., & McAdoo, W.G. (1984). Maintenance strategies for the treatment of obesity: an evaluation of relapse prevention training and postreatment contact by mail and telephone. Journal of Consulting and Clinical Psychology, 52(3), 404-413.

Poehlman, E.T., Melby, C.L., & Goran, M.I. (1991). The impact of exercise and diet restriction on daily energy expenditure. Sports Medicine, 11(2), 78-101.

Poehlman, E.T., Melby, C.L., Badylak, S.F., & Calles J. (1989). Aerobic fitness and resting energy expenditure in young adult males. Metabolism, 38(1), 85-90.

Prochaska, J.O., & DiClemente, C.C. (1983). Stages and processes of self-change of smoking: toward an integrative model of change. Journal of Consulting and Clinical Psychology, 51(3), 390-395.

Raglin, J.S. (1990). Exercise and mental health beneficial and detrimental effects. Sports Medicine, 9(6), 323-329.

Ross, W.D., & Marfell-Jones, M.J. (1991). Kinanthropometry. Chapter in J.Duncan MacDougall, H.A. Wenger, & H.J. Green (Eds.). Physiological Testing of the High Performance Athlete, 2nd Edition,Human Kinetics Books, Champaign.

Schlundt, D.G., & Zimering, R.T. (1988). The dieter's inventory of eating temptations: a measure of weight control competence. Addictive Behaviors, 13, 151-164.

Schlundt, D.G., Sbrocco, T., & Bell, C. (1989). Identification of high-risk situations in a behavioral weight loss program: application of the relapse prevention model. International Journal of Obesity, 13, 223-234.

Sedlock, D.A., Fissinger, J.A., & Melby, C.L. (1989). Effect of exercise intensity and duration on postexercise energy expenditure. Medicine and Science in Sports and Exercise, 21(6), 662-666.

Segal, K.R., & Gutin, B. (1983). Thermic effects of food and exercise in lean and obese women. Metabolism, 32, 581-589.

Segal, K.R., & Pi-Sunyer, F.X. (1989). Exercise and obesity. Medical Clinics of North America, 73(1), 217-235.

Segal, K.R., Gutin, B., Albu, J., & Pi-Sunyer, F.X. (1987). Thermic effects of food and exercise in lean and obese men of similar lean body mass. American Journal of Physiology, 252(Endocrinol. Metab. 15), E110-E117.

Segal, K.R., Gutin, B., Nyman, A.M., & Pi-Sunyer, F.X. (1985). Thermic effect of food at rest, during exercise and after exercise in lean and obese men of similar body weight. Journal of Clinical Investigation, 76, 1107-1112.

Segal, K.R., Presta, E., & Gutin, B. (1984). Thermic effect of food during graded exercise in normal and obese men. American Journal of Clinical Nutrition, 40, 995-1000.

Shephard, R.J. (1985). Motivation: the key to fitness compliance. The Physician and Sportsmedicine, 13(7), 88-101.

Silverstone, J.T. (1968). Psychological aspects of obesity. Proceedings of the Royal Society of Medicine, 61, 371-375.

Sjoberg, L., & Persson, L. (1979). A study of attempts by obese persons to regulate eating. Addictive Behaviors, 4, 349-359.

Spevak, P.A. (1980). A multi-strategy approach to the maintenance of personal fitness programs. (Doctoral dissertation, University of Missouri-Columbia, 1980). Dissertation Abstracts International, (University Microfilms No. 8409117).

Stalonas, P.M., Johnson, W.G., & Christ, M. (1978). Behavior modification for obesity: the evaluation of exercise, contingency management, and program adherence.

Stuart, R.B. (1967). Behavioral control of overeating. Behavioral Research and Therapy, 5, 357-365.

Taggart, A.C., Taggart, J., & Siedentop, D. (1986). Effects of a home-based activity program. Behavior Modification, 10(4), 487-507

Thompson, C.E., & Wankel, L.M. (1980). The effects of perceived activity choice upon frequency of exercise behavior. Journal of Applied Social Psychology, 10(5), 436-443.

Tremblay, A., Nadeau, A., Fournier, G., & Bouchard, C. (1988). Effect of a three-day interruption of exercise-training on resting metabolic rate and glucose-induced thermogenesis in trained individuals. International Journal of Obesity, 12, 163-168.

U.S. Department of Health and Human Services Public Health Service. (1988). The Surgeon General's Report on Nutrition and Health (DHHS Publication No. 88-50210). Washington, D.C.: U.S. Government Printing Office.

Van Dale, D., & Saris W.H.M. (1989). Repetitive weight loss and weight regain: efects on weight reduction, resting metabolic rate, and lipolytic activity before and after exercise and/or diet treatment. American Journal of Clinical Nutrition, 49, 409-416.

Van Dale, D., Saris, W.H.M., & Ten Hoor, F. (1990). Weight maintenance and resting metabolic rate, 18-40 months after a diet/exercise treatment. International Journal of Obesity, 14, 347-359.

Van Dale, D., Saris, W.H.M., Schoffelen, P.F.M., & Ten Hoor, F. (1987). Does exercise give an additional effect in weight reduction regimens? International Journal of Obesity, 11, 367-375.

Von Schlumperger, B. (1985). Formation and maintenance of an exercise habit: an exploratory study of a self-management approach.(Doctoral dissertation, University of Oregon, 1985) Dissertation Abstracts International, (University Microfilms No. 8605866).

Wadden, T.A., & Stunkard, A.J. (1985). Social and psychological consequences of obesity. Annals of Internal Medicine, 103(6 pt 2), 1062-1067.

Wankel, L.M. (1984). Decision-making and social -support strategies for increasing exercise involvement. Journal of Cardiac Rehabilitation, 4, 124-135.

Wankel, L.M. (1985). Personal and situational factors affecting exercise involvement: the importance of enjoyment. Research Quarterly for Exercise and Sport, 56(3), 275-282.

Wankel, L.M. (1987). Enhancing motivation for involvement in voluntary exercise programs. In Advances in Motivation adn Achievement: Enhancing Motivation, 5, (239-286).

Wankel, L.M., & Kreisel, P.S.J. (1983). A comparison of the effectiveness of structured social support and group decision balance-sheet approaches to motivating exercise adherence. Unpublished research report prepared for Fitness and Amateur Sport, Canada, Project #218, Ottawa, Ontario.

Wankel, L.M., & Thompson, C. (1977). Motivating people to be physically active: self-persuasion vs. balanced decision making. Journal of Applied Social Psychology, 7(4), 332-340.

Wankel, L.M., & Yardley, J.K. (1982). An investigation of the effectiveness of a structured social support program for increasing exercise adherence of high and low self-motivated adults. Paper presented at the Canadian Parks/Recreation Association National Conference, Saskatoon, Saskatchewan.

Wankel, L.M., Yardley, J.K., & Graham, J. (1985). the effects of motivational interventions upon the exercise adherence of high and low self-motivated adults. Canadian Journal of Applied Sport Science, 10(3), 147-156.

Ward, A., & Morgan, W.P. (1984). Adherence patterns of healthy men and women enrolled in an adult exercise program. Journal of Cardiac Rehabilitation, 4, 143-152.

Wasserman, K., Hansen, J.R., Sue, D.Y., & Whipp, B.J. (1987). Principles of Exercise Testing & Interpretation, Philadelphia, Lea & Febiger.

Wollersheim, J.P. (1970). Effectiveness of group therapy based upon learning principles in the treatment of overweight women. Journal of Abnormal Psychology, 76(3), 462-474.

Wyatt, J.T. (1983). A comparison of three theoretically based interventions to increase exercise adherence. (Doctoral dissertation, Pennsylvania State University, 1983). Dissertation Abstracts International, (University Microfilms No. 8409117).

Wysocki, T., Hall, G., Iwata, B., & Riordan, M. (1979). Behavioral management of exercise: contracting for aerobic points. Journal of Applied Behavior Analysis, 12, 55-64.

APPENDIX A

To Physicians of individuals interested in participating in the "Exercise Adherence of the Medically Obese Individual" study.

From Dr. B.L. Howe, Ph.D. Professor
P.J. Naylor, B.P.E., M.A.
School of Physical Education,
University of Victoria

Dr. J.E. Petersen, M.D.
Director, University Health Services

We are conducting a research project to observe the adherence of obese individuals during a three month walking program and in the following six month maintenance period. The individuals enrolled in this study will participate in a progressively prescribed supervised walking program three times during a week as well as participating in one day of unsupervised walking. Each individual will be instructed about basic principles of fitness concerning frequency, intensity and duration. The subjects will exercise at an intensity between 60 and 85% of their maximum heart rate (220-Age) as prescribed by the ACSM (1978), and the duration of the exercise will be graded, increasing every 2-3 weeks from a minimum of 10-15 minutes of continuous walking to between 30 and 60 minutes. The walking program will take place at the University of Victoria and will always be conducted under close supervision by the primary investigators and their designated research assistants.

The study will involve a number of exercise tests to be performed through out the period of training. There will be three test in all: one pre-test, a post-test at the end of the three months and a post-test at the end of nine months. There will be two sections to each test, body composition and aerobic fitness.

(i) Body Composition.

Measurement will include height and weight, eight skinfolds and five girths as described by CASS (1987). The data collected from this section of the test will allow us to monitor any changes in the body during the study and confirm other measures of adherence.

(ii) Aerobic Fitness.

This will be assessed during a submaximal (between 60-85% of max heart rate. ACSM, 1978), treadmill walk at a minimum of two elevations. The subject will

warm-up at 0 degrees elevation walking at a speed of 2.5 mph for three minutes. They will then walk for four minutes at 2 degrees elevation and if necessary 4 degrees. Heart rates and VO2 will be collected every 30 seconds during the test and termination of the test will occur when the subject reaches 85% of their maximum heart rate.

All the testers involved in the study are fully certified technicians from the Sport and Fitness centre at UVic. All data collected will be confidential in nature and will only be used for the present study.

Before allowing an individual to participate in our study they must be medically obese (>53lbs over weight, Blackburn & Kanders, 1987), complete a Physical Activity Readiness Questionnaire (PAR-Q) demonstrating no personal knowledge of, or history of cardiovascular problems and obtain their physicians permission.

In light of this final requirement we, the researchers would kindly request that you review the requirements of the study, read the enclosed forms and after careful consideration complete and sign the forms if you believe the program is appropriate for you patient.

We look forward to beginning this exciting project. Should you have any questions, comments or suggestions, or would like further clarification regarding the study, please do no hesitate to contact one of us at the School of Physical Education at UVic. You have been given two copies of this letter so that you may keep one for future reference.

Your cooperation is appreciated. Thank you for you support of this project.

Yours sincerely,

P.J. Naylor (721-8392)

Dr B.L. Howe (721-8383)

Dr. J.E. Petersen (721-8492)

CLIENT HISTORY QUESTIONNAIRE
(To Be Completed by Physician)
FOR PARTICIPATION IN GENERAL FITNESS ASSESSMENT
AND EXERCISE PRESCRIPTION

Name:
Address:
Phone: (Home) (Work)
Physician:
Physician's Phone Number
Birth Date:
Height (cm): Weight: (kg)

Patient Description (Please check)	
I consider the above individual to be:	_____ "Normal" (with the exception of their obesity)
	_____ Cardiac Patient
	_____ Prone to Coronary Heart Disease
	_____ Other (please explain)

Diagnostic Data Etiologic (Please check)	
____No Heart Disease	Hypertension
____Rheumatic Heart Disease	Ischemic Heart Disease
____Congenital Heart Disease	Other (please explain)
____Heart Murmurs or Gallops	

Present Physical Activity (Please check)	
____ 'ery Active	Inactive
____Moderately Active	Restricted Activities
____Active	Sedentary

Electrocardiographic Information (Please check)	
____Within Normal Limits	Abnormal: Previous Infarct
____Drug Effect Only (i.e. digitalis)	Other (please explain)
____Abnormal Non-specific	

1. The above listed person is capable of participating in a laboratory controlled physical fitness test under the direct guidance and supervision of a laboratory technician.

2. The above listed person is capable of participating in a graded, supervised walking program following the guidelines described previously.

Date:_____**Signature:**_____

APPENDIX B

INFORMED CONSENT

Purpose:

To examine the exercise adherence patterns of medically obese women.

Procedure:

(1) You will be asked to participate in three exercise testing sessions over the course of nine months. All testing sessions will involve a submaximal (60-85% max heart rate), walking test on a treadmill, walking 2.5 mph at elevations of 0, 2 and 4 degrees. The test will be between 3 and 11 minutes in duration. Body composition assessments using skinfold calipers at eight sites and girth measurements at five sites will also be collected. Testing will occur before the walking program begins, after the three month program and after the 6 month maintenance phase.

(2) You will be asked to take part in at least three supervised walking sessions at the University of Victoria and one unsupervised aerobic activity each week for the initial 12 weeks of the study. Your walking program will progress according to your initial fitness level.

(3) You may also be asked to attend a weekly group session.

Risk:

Obesity is considered to be a risk factor in the development of coronary heart disease. For this reason we will not accept your participation without your physician's permission or if there is any evidence of heart problems. Although the test is performed at submaximal loads and for a non-obese person would be considered low risk, your obesity does increase the risk of a coronary incident occurring. The intensity of the testing and the exercise is not higher than what you would experience in daily activity.

If you have been inactive for a prolonged period you may experience some discomfort upon testing. You may experience some of these sensations; breathlessness, overheating, weak limbs or light headedness.

Consent:

I have read the above and agree to participate in this research project at my own risk. I realise that I may expect a thorough explanation and/or demonstration of any procedures during the testing or training sessions and that I may terminate participation at any time during the study.

I understand that all results will remain confidential and that, if requested, the data will be destroyed after analysis.

Having voluntarily assumed participation in the project I hereby disclaim and release the University of Victoria, it's agents, servants or employees, including all personnel involved in the research project, from any and all liability that might otherwise arise as a result of my participation as a research subject in this study.

Name:_____ **Date:**

Signature:_____

APPENDIX C

SUBJECT INFORMATION
HEALTH AND EXERCISE HISTORY

PERSONAL INFORMATION	
Name:	
Address:	
Phone: (Home)	(Work)
Age:	

EXERCISE HISTORY

1. How would rate your physical activity?

   NOTE: Physical activity includes work, recreational activities that require sustained physical exertion such as walking briskly, running, lifting and carrying.

   Please check your level.

   Level 1 - Little or no physical activity

   Level 2 - Occasional physical activity

   Level 3 - Regular physical activity at least three times per week.

2. Does your work or daily activity primarily involve: (Check only one)

   Sitting

   Standing

   Walking or other active exercise

   Heavy labor (such as lifting heavy objects)

   Other (please describe)

3. Have you engaged in VIGOROUS exercise which markedly increased your breathing such as: vigorous walking, cycling, swimming, running, etc. over the last 6 months?

   Yes

   No

If so, how often?

   Less than one time per week

   1 - 2 times per week

   3 - 5 times per week

   6 or more times per week

4. When you did vigorous exercise, how long did you spend at each session?

_____ 0 - 15 minutes
_____ 16 - 30 minutes
_____ 31 - 45 minutes
_____ 46 - 60 minutes
_____ Over 60 minutes

5. Have you ever participated a in regular (3 x per week) vigorous exercise program? If so; When?

What type of exercise?

How long did you participate for? (ie. months)

7. How long have you been overweight?

PHYSICAL ACTIVITY READINESS QUESTIONNAIRE (PAR-Q)

For most people, physical activity should not pose any problem or hazard. PAR-Q has been designed to identify the small number of adults for whom physical activity might be inappropriate or those who should have medical advice concerning the type of activity most suitable for them. If you answer "yes" to any of the questions below, consult with your doctor before starting exercise.

YES	NO	
		1. Has your doctor ever said you have heart trouble?
		2. Do you frequently have pains in your heart and chest?
		3. Do you often feel faint or have spells of severe dizziness?
		4. Has a doctor ever told you that you have a bone or joint problem such as arthritis that has been aggravated by exercise, or might be made worse with exercise?
		5. Has a doctor ever said your blood pressure was too high?
		6. Is there a good physical reason not mentioned here why you should not follow an activity program if you want to?
		7. Are you over age 69 and not accustomed to vigorous exercise?

APPENDIX D

FOURTH DAY WALK REPORT

*DATE:*_____ _____ *NAME:*_____

1. Did you do a fourth day of exercise this week?

If so please describe:

Type:

Time: (length)

Intensity: (heart rate)

Frequency: (did you do more than one extra exercise session?)

APPENDIX E

CARDIOVASCULAR TEST CRITERIA

1. If the heart rate is between 50% and 60% of maximum HR after the 3 minute warm-up period or the first load the grade will be increased by 3% for the following 4 minute period.

2. If the heart rate is between 60% and 70% of maximum HR after the 3 minute warm-up period or the first load the grade will be increased by 2% for the following 4 minute period.

3. If the heart rate is betweem 70% and 80% of maximum HR after the 3 minute warm-up period or the first 4 minute load the grade will be increased by 1% for the following 4 minute period.

4. If the heart rate is between 80% and 85% of maximum HR after the 3 minute warm-up period or during the following loads the test will be continued until the end of the current load and then followed by a 2 minute cool-down.

5. If the heart rate is above 85% of maximum HR at any time during tthe test, the test will be terminated and followed by a 2 minute cool-down.

APPENDIX F

U.VIC. WALKING STUDY

WALKING: HOW TO BEGIN

Welcome to the start of an exciting 3 months!! Below are a few things you should know to begin your walking program.

FREQUENCY

The optimal number of aerobic exercise sessions each week is between 3 & 5. In this study you will take part in 4 walks per week following the guidelines below. You are free to add extra walking but please report this on your 4th day walk form.

INTENSITY

1. Maximum Heart Rate (MHR) is 220 - Age. Your MHR is

2. The Training Heart Range (THR) is 60 - 85% of MHR. Therefore your THR is:

_____ beats/minute or _____ beats/10 sec.

3. Check your heart rate while pedalling on the spot about 5 minutes into the walk. If it is below the THR then pick up your pace of walking and if it is to high, reduce your pace.

4. Check your heart rate near the end of your walk as well.

TIME

5. Following the warm-up you should try to walk for _____ minutes in your THR.

*Add a minute a day for the first week if you feel able up to 20 minutes
*Increase your time by 5 minutes every 2-3 weeks (1 minute/day or 5 minutes from one week to the next)

WARM-UP

6. Your warm-up should be 3-5 minutes of low intensity movement (e.g. slow walk, pedalling on the spot etc.

COOL-DOWN

7. Spend 3-5 minutes cooling down from your walk with lower intensity walking followed by four basic stretches:

a) calf (back of lower leg)
b) Quadriceps muscle group (front of thigh)
c) Hamstrings (back of thigh)
d) Hip flexors (front of hip/upper leg)

Appendix G

Month 1

All individuals who completed the first month of the study were awarded with a pair of flourescent shoe laces.

Month 2

During the second month each day that the participant attended a walk their name was entered into a draw for a $20.00 gift certificate at a running shoe store or a hat with a visor.

Month 3

Each participant who completed the three month programme and attended the second testing session received a specially designed t-shirt.

APPENDIX H

Relapse Prevention Program

Session 1

20 minutes	Seven reasons why you have to commit to exercise for the rest of your life. a) Energy Balance Equation b) Metabolic Benefits c) Health d) Longevity e) Appetite suppression f) Quality of life g) Mental health
30 minutes	FITT Principle a) Frequency b) Intensity c) Type d) Time Overload Principle Rest Principle
10 minutes	Warm-up Cool-down SAMPLE WALK (familiarization with the area)

Session 2

10 minutes	Introduction of the researcher Describe the format of a group session
15 minutes	Describe the purpose of relapse prevention Importance of exercise Importance of maintenance Importance of relapse prevention in maintenance (goals)
5 minutes	Introduction of terms (with hand-out) a) The role of high risk situations b) Coping with high risk situations c) The value of a practice relapse

BASIC CONCEPTS OF RELAPSE PREVENTION

PURPOSE:

To prevent a return to non-activity. Relapse prevention is used in many treatments for addictive disorders and applies to relapse in voluntary (you aren't forced to participate) behavioral self-control efforts (ie. exercise, eating).

HIGH RISK SITUATIIONS:

A situation that challenges one's perceived self-control relative to the behavior change regimen. (ie. friends dropping in for a drink during your walking time or your walking partner cancels).

COPING:

A response (ie. time management, communication) that deals with the situation while maintaining the desired behavioral self-control (ie. the exercise program).

LAPSE:

An incident of non-behavior (ie.night off because friends drop in) which may lead to a full blown relapse (continued failure to exercise).

PLANNED LAPSE:

A practical aspect of this program is to plan and practice for inevitable lapses so that you know what to do when a lapse occurs.

CORRECTING LIFESTYLE IMBALANCE:

Making changes in your life to minimize the risk of not exercising.

Session 3	Role of High Risk Situations
10 minutes	Greeting Discussion of hand-out Individual accountability for walking
15 minutes	Defining High Risk Situations Introduction of the "Journey Analogy" Role of the High Risk Situation on the Journey Positive outcome expectancies as cognitive beliefs
5 minutes	Identifying your high risk situations and outcome expectancies

THE JOURNEY:
FROM INACTIVITY TO FITNESS

One way of looking at a lifetime commitment to fitness is as a journey. On a journey there are many stopping points, places to rest, places to turn off, and people that make the journey easier.

HIGH RISK SITUATIONS:

Situations that pose a threat to your feeling of control and thus increase the risk of relapse.

What High Risk Situations do you expect on your journey to physical fitness?

What are your outcome expectations in each of the above situations?

What are your outcome expectations regarding exercise?

Session 4	Positive and Negative Ways of Dealing with High Risk Situations
10 minutes	Greeting Accountability for identification assignment and walking
15 minutes	Discuss ways of dealing with high risk situations a) Positive b) Negative Active coping and perceived control
5 minutes	Developing a plan for high risk situations Mental rehearsal

HIGH RISK SITUATION	*PLANNED COPING RESPONSE*

Session 5	Abstinence Violation Effect
10 minutes	Greeting Accountability for high risk situation planning
15 minutes	Describe the Abstinence Violation Effect Relapse vs Lapse Attributions and their role in relapse Cognitive changes
5 minutes	Reevaluating relapse situations with adjusted attributions

RELAPSE SCENARIO ATTRIBUTIONS

RELAPSE SCENARIO	ATTRIBUTION

Session 6	Introduction to the Planned Relapse
10 minutes	Greeting Accountability for attribution worksheet and walking
15 minutes	Role of planned relapse Discussion of feelings about relapse
5 minutes	Relapse planning sheet

LAPSE
PLANNING SHEET

IN PREPARATION FOR THE LAPSE:

DURING THE LAPSE:

REINTRODUCTION OF EXERCISE:

Session 7	Preparation for the Relapse
10 minutes	Greeting Accountability for walking and relapse planning sheet
15 minutes	Discussion of planned relapse
5 minutes	Reintroduction of exercise plan

Session 8	Strategies for post relapse
10 minutes	Greeting Accountability for reintroduction plan
20 minutes	Getting back on track Enlisting support Stimulus cues

GETTING BACK ON TRACK AFTER A LAPSE

THINGS TO REMEMBER:

** *Make a Plan*

**Recruit Support (ie. friends to meet)*

**Set Up Cues in Your Surroundings (ie. self instruction, models, time of day, things in your immediate surroundings and other people)*

YOUR PLAN:

STRATEGIES:

SUPPORT:

CUES:

Session 9	Analyzing the Lapse
10 minutes	Greeting Accountability for walking
20 minutes	Positive and negative components of relapse What is it like to start again Increasing self-efficacy and maintenance Correcting Lifestyle Imbalances

Session 10	Review of Relapse Prevention
10 minutes	Greeting Accountability for walking
20 minutes	Importance for maintenance High Risk Situations Abstinence Violation Effect Planned Relapse: What is learned

CORRECTING LIFESTYLE IMBALANCES

DOES YOUR LIFESTYLE SUPPORT YOUR EXERCISE BEHAVIORS?

IF NOT, WHAT CAN YOU IDENTIFY THAT INTERFERES OR NEGATIVELY AFFECTS WHETHER YOU EXERCISE?

HOW WILL YOU GO ABOUT CHANGING YOUR LIFESTYLE SO THAT IT DOES SUPPORT YOUR EXERCISE BEHAVIOR?

Session 11	Planning for maintenance
10 minutes	Greeting Accountability for walking
15 minutes	Discussion of risk in next 6 months Plan for coping Strategies
5 minutes	Developing a maintenance plan

Session 12	Maintenance
10 minutes	Greeting Accountability for the maintenance plan
20 minutes	Discuss what will happen over the next 6 months Importance of exercise maintenance Expectancies Applying Relapse prevention

RELAPSE PREVENTION

EXERCISE MAINTENANCE PLAN

HIGH RISK SITUATIONS

Within the next 6 months:

Within the next 2 years:

STRATEGIES FOR COPING: *(ie. planning, support, changes in thought processes, cues)*

LIFESTYLE CHANGES THAT NEED TO BE MADE TO SUPPORT YOUR EXERCISE:

MAJOR CONCEPTS OF RELAPSE PREVENTION

HIGH RISK SITUATIONS:

* *IDENTIFYING THEM*
* *COPING STRATEGIES (+/-)*
* *PLANNING*

ABSTINENCE VIOLATION EFFECT:

* *PROLAPSE VS RELAPSE*
* *LAPSES VS FAILURES*
* *ATTRIBUTIONS (external/situational vs internal/individual "blame")*

PLANNED LAPSE

* *THE VALUE OF PRACTICING THE SKILLS*
* *SELF-EFFICACY (increasing the feeling that you are able to come back after a break)*

CORRECTING LIFESTYLE IMBALANCES

* *PRIORITIES*
* *IDENTIFY THE PROBLEM*
* *PLAN*

APPENDIX I

Behavioral Self-Management Program

Session 1

20 minutes	Seven reasons why you have to commit to exercise for the rest of your life. a) Energy Balance Equation b) Metabolic Benefits c) Health d) Longevity e) Appetite suppression f) Quality of life g) Mental health
30 minutes	FITT Principle a) Frequency b) Intensity c) Type d) Time Overload Principle Rest Principle
10 minutes	Warm-up Cool-down SAMPLE WALK (familiarization with the area)

Session 2	Behavioral Self-management
10 minutes	Introduction of the researcher Describe the format of a group session Discuss the "No Discussion" between walkers rule
15 minutes	Describe the purpose of behavioral self-management of exercise: a) Importance of exercise b) Importance of maintenance c) Learning to manage or control your own behaviors
5 minutes	Handout log books for recording exercise and events surrounding it

WEEKLY EXERCISE LOG

DATE	TIME	DURATION (how long)	ACTIVITY (type)	HR (heart rate)	RATING (circle)
					POOR 1 2 3 4 5 GREAT
Comments: (ie. feelings, obstacles, problems)					
					POOR 1 2 3 4 5 GREAT
Comments: (ie. feelings, obstacles, problems)					
					POOR 1 2 3 4 5 GREAT
Comments: (ie. feelings, obstacles, problems)					
					POOR 1 2 3 4 5 GREAT
Comments: (ie. feelings, obstacles, problems)					

Session 3	Becoming your own Behavior Analyst
5 minutes	Greeting Explanatiion of how the group will proceed
15 minutes	Becoming your own behavior analyst a) Specify the problem b) Write out your goal c) Make a list of things that you say or do that clearly indicate that you have met the goal (evidence) d) List specific behaviors that will help you reach that goal
10 minutes	Hand-out and explain the goal sheet

STEP ONE:
SPECIFY THE PROBLEM

A. Write out the goal.

B. Make a list of the things that you should say or do that clearly indicate that you've met the goal. That is, what would you take as evidence that your goal has been achieved?

C. If a number of people had the same goal as you how would you decide who had met the goal and who hadn't?

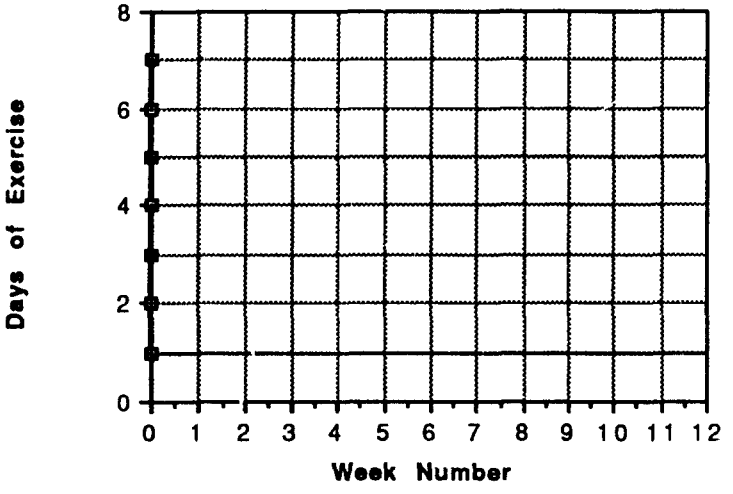
D. If your goal is an outcome (rather than just one thing that you do - ie. losing weight), make a list of specific behaviors that will help you to achieve that outcome.

Session 4	Commitment to Change
10 minutes	Greeting Individual Accountability for Goal sheet assignment
15 minutes	Discuss the word "want" - what it means Commitment: wanting to change a) high frequency of thoughts about change b) need both commitment and knowledge
5 minutes	Public Commitment - 20 Commitment cards to be handed out to people that have an impact in their lives

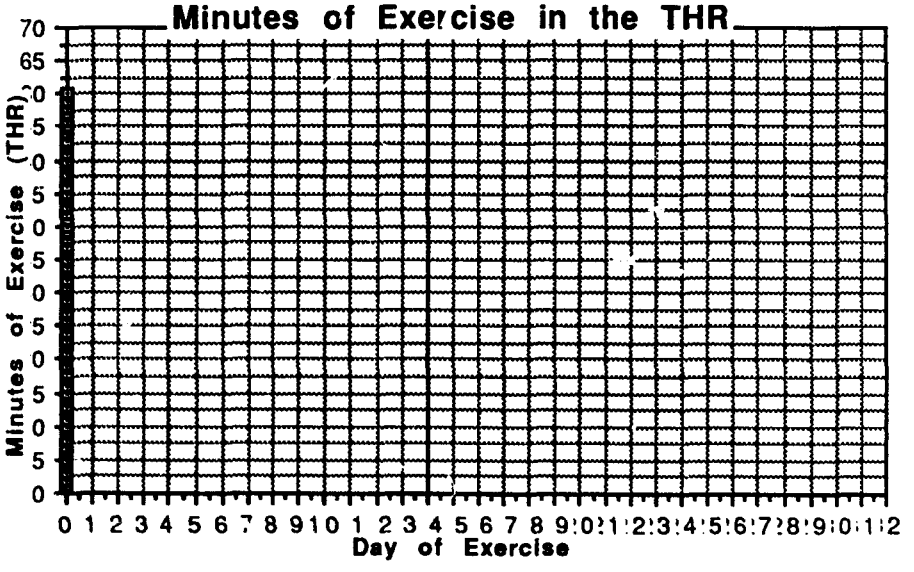
I, _____, am making changes to my exercise habits. I will _____ _____ _____. *Please consider this card as my public commitment to this change and feel free to ask me how my program is going.* *Thank you for your support*	*I, _____, am making changes to my exercise habits. I will _____ _____ _____.* *Please consider this card as my public commitment to this change . If you _____ _____ I will _____* *Thank you for your support*
I, _____, am making changes to my exercise habits. I will _____ _____ _____. *Please consider this card as my public commitment to this change and feel free to ask me how my program is going.* *Thank you for your support*	*I, _____, am making changes to my exercise habits. I will _____ _____ _____.* *Please consider this card as my public commitment to this change . If you _____ I will _____* *Thank you for your support*

Session 5	Managing your consequences: reinforcement
10 minutes	Greeting Individual accountability for Commitment cards
15 minutes	Define and discuss reinforcement Discuss elimination of certain reinforcers Manipulating consequences by self-recording and graphing Arranging for special reinforcers
5 minutes	Handout graphs Creating a reinforcers list

Exercise Frequency Graph



Minutes of Exercise in the THR



REINFORCERS LIST

REINFORCER	RATING (1- 10)
I	
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Session 6	Shaping your Behavior
10 minutes	Greeting Individual accountability for graphing and creating a reinforcers list
15 minutes	What is shaping? a) Starting small b) Meet master criterion c) Small steps
5 minutes	Demonstrate how to fill out Mastery Criterion sheet

MASTERY CRITERION SHEET

GOAL:

CRITERION: (List the steps in sequence)

STEPS	COMPLETION

Session 7	Recruiting Support
10 minutes	Greeting Individual accountability for Mastery Criterion sheet
15 minutes	Public commitment Contract a) target behaviors b) who reinforces c) immediate vs prolonged reinforcement Other people
5 minutes	Hand-out and discuss contract

BEHAVIORAL CONTRACT

The Behavior:

How will it be measured?

What are the reinforcers? (immediate and long term)

Who will administer the reinforcement?

When will you be reinforced? (schedule of reinforcement)

Exceptions and specific details:

I, _____ agree to the above contract and will administer the reinforcement described above as _____ fulfills their commitment.

Signature

I, _____ agree to the above contract

Signature

Session 8	Cues to Exercise
10 minutes	Greeting Individual Accountability for contract
15 minutes	Instructions Modeling Immediate surroundings Time of day Other people
5 minutes	Discuss the Identifying Cues assignment

IDENTIFY CUES TO EXERCISE

1. ***INSTRUCTIONS TO YOURSELF*** *(things you can say to yourself to cue you to exercise):*

2. ***MODELS*** *(people, celebrities, etc. that are an example for you to follow):*

3. ***CUES IN YOUR IMMEDIATE SURROUNDINGS*** *(things in your environment that you can use as reminders to exercise or cues you can add to your surroundings to remind you):*

4. ***TIME CUES*** *(organizing your exercise so that a certain time is always the time for exercise - Keep It Consistent If You Can):*

5. ***OTHER PEOPLE*** *(people in your life who can be your exercise cue ie. every time you see Sue you go for a walk with her):*

Session 9	Conditioned Reinforcement
10 minutes	Greeting Individual accountability
15 minutes	Define conditioned reinforcer Exercise as a conditioned reinforcer Existing reinforcement Premack Principle
5 minutes	Identifying ways of combining exercise with other reinforcers

EXERCISE AS A CONDITIONED REINFORCER

Definition: *A behavior that acquires reinforcing properties through association with existing reinforcers. (ie. praise - often results in a financial or privilege reward like getting a raise and therefore has become reinforcing in itself.)*

THE PLAN

Identify reinforcers that could be combined or associated with your exercise. (Don't forget about pleasurable thoughts and high frequency activities).

How will you incorporate existing reinforcers into your exercise program?

Develop a plan for fading (reducing the influence of the major reinforcers) the other reinforcers.

Session 10	Generalizing your Behavior
10 minutes	Greeting Individual accountability
15 minutes	Use of behavioral self-management principles in other areas of your life Exercising in different settings (Response generalization) Variety of cues for exercise (Stimulus generalization)
5 minutes	Recording exercise other than that required by the program

GENERALIZING

CUES: *(List a variety of cues that you will use to encourage exercise the more, the better)*

EXERCISE: *(Try to exercise in a variety of settings and in a variety of different ways)*

DATE	ACTIVITY	TIME	DURATION

Session 11	Preparing for Behavior Maintenance
10 minutes	Greeting Accountability
15 minutes	Discuss maintenance plan Specific behavioral strategies a) buddy system b) contracting c) recruiting a natural community of reinforcement
5 minutes	Maintenance plan

BEHAVIORAL SELF-CONTROL: A PLAN FOR MAINTENANCE

WHAT STRATEGIES HAVE YOU USED THUS FAR?

HOW WILL YOU USE THESE STRATEGIES DURING MAINTENANCE (in what situations)?

6 MONTHS

2 YEARS

WHAT STRATEGIES MIGHT HELP DURING MAINTENANCE THAT YOU HAVEN'T USED THUS FAR?

6 MONTHS

2 YEARS

IN WHAT SITUATIONS WILL YOU USE THESE STRATEGIES?

Session 12	Introduction to Maintenance
10 minutes	Greeting Individual Accountability
15 minutes	Discussion of next 6 months Applying the principles of behavioral self-management Reinforcement for applying the principle Importance of maintaining exercise
5 minutes	Closure

APPENDIX J

PROGRAM EVALUATION

1. Are you using the strategies that you have been introduced to at this point in the program?

2. If so, which do you find most effective and why?

3. If you aren't using the strategies, why not? (ie. hard to understand the material, not effective, too much, etc.)