Exercise Applications and Promotion in Behavioral Medicine: Current Status and Future Directions

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The present article summarizes and comments on the clinical applications and promotion of aerobic (endurance) exercise within behavioral medicine. Highlighted applications include cardiovascular risk modification, obesity, diabetes, and smoking. Particular emphasis is placed on the problem of poor adherence to exercise programs in clinical and apparently healthy populations alike, on the identification of the high-risk dropout, and on the modification of exercise adherence. Finally, preliminary findings are summarized, and recommendations are made for future research and exercise program applications and promotion.

The topic of exercise has received considerable attention in recent years, both from the standpoint of cardiovascular risk reduction and in respect to life-quality enhancement. Research by exercise physiologists, epidemiologists, and others suggests an inverse relationship between habitual physical activity and cardiovascular morbidity and mortality (Fox, Naughton, & Haskell, 1971; Kannel & Sorlie, 1979; Morris, Everitt, Pollard, Chave, & Semmence, 1980; Paffenbarger, Hale, Brand, & Hyde, 1977). Additionally, exercise has been associated with important psychological and quality-of-life improvements in normal and clinical populations (Folkins & Sime, 1981; Stern & Cleary, 1981).

Although the term exercise encompasses many forms of physical activity, in the present context it refers mainly to sustained increases in large muscle and cardiopulmonary activity, which, when performed with sufficient frequency, intensity and duration, result in improved endurance (ACSM, 1978). Considerable research has accumulated documenting the physiological changes that accompany this form of exercise training (Claussen, 1976). In contrast, relatively little is known about the psychological and behavioral effects of exercise.

Despite its demonstrated and presumed benefits, exercise remains an experimental "therapy" in many areas of interest to clinical and health psychologists. In these areas, in particular, much of the evidence regarding the clinical efficacy of exercise has accrued from anecdotal case studies and from correlational and/or flawed experimental analyses that fail to demonstrate a causal relationship. Perhaps even more important, exercise adherence is typically poor even among those who are likely to benefit the most. In fact, the problem of exercise adherence is not unique to clinical populations: Surveys have indicated that roughly two thirds of Americans do not exercise regularly (Harris Poll, 1978a; 1978b), and 45% may not exercise at all (Bucher, 1974). Thus far, the problem of demonstrating the clinical efficacy of exercise and of changing habits of people who do not exercise properly, or at all, remains a significant challenge to the health professions. The psychologist/behavioral medicine specialist may be uniquely well equipped to meet this challenge by furthering our understanding of the effects of exercise and of the important behavioral and psychological factors that re-

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late to the acquisition and maintenance of the exercise habit.

The present review is a summary and commentary on the clinical applications and promotion of exercise within behavioral medicine. Given the importance of the problem of poor exercise participation and adherence, a considerable portion of the present article will be devoted to the analysis and promotion of exercise behavior. Due to the volume of studies in some areas and to space limitations, only a representative sample of the studies that have been published are discussed, with the primary emphasis on those studies incorporating aerobic\(^1\) (endurance) exercise.

**Clinical Application of Exercise**

The present section focuses on application of exercise training to enhancement of physical health and lifestyle change. The topics discussed include areas of traditional interest in behavioral medicine and conditions for which exercise has already been shown or has been suggested to have beneficial effects.

**Cardiovascular Risk Modification**

Exercise has been employed perhaps most extensively in the prevention and treatment of coronary heart disease (CHD) and its sequelae. A systematic program of aerobic exercise has been shown to both improve cardiovascular efficiency (Scheuer & Tipton, 1977) and modify cardiovascular risk profiles in apparently healthy, high-risk, and coronary patients (Clausen, 1976; Kannel & Sorlie, 1979; Leon & Blackburn, 1977; Mann, Garrett, Farhi, Murray, & Billings, 1969; Wilhelmsen et al., 1975). For example, exercise has been associated with reductions in the harmful plasma triglycerides and LDL cholesterol and increases in the protective HDL cholesterol (Wood & Haskell, 1979); decreases in resting and active heart rate and blood pressure; and increases in stroke volume and oxygen utilization (Clausen, 1976).

There is some suggestive evidence (Boyer & Kasch, 1970; Choquette & Ferguson, 1973; Horton, 1981) that exercise may reduce blood pressure in hypertensives, independent of weight or dietary sodium reductions. Although blood pressure reductions have been linked to exercise training, this finding must be interpreted extremely cautiously due to the methodological inadequacies of the studies and in light of the negative findings of large-scale epidemiological and multiple-risk-factor intervention studies (Leon & Blackburn, 1982; Taylor, Buskirk, & Remington, 1973). These conflicting results may indicate differential effects of exercise across various subtypes of hypertensives. The limited evidence available suggests that, in general, borderline or mild hypertensives might benefit the most from exercise interventions. Much more research is needed, however, before any definitive statements can be made.

In addition to its potential primary and secondary benefits in the area of CHD risk modification, exercise has been shown to be important in the tertiary physical and psychosocial rehabilitation of the cardiac patient (Pollock & Schmidt, 1979; Stern & Cleary, 1981). In coronary patients, even low-intensity exercise has been shown to improve preanginal exercise and stress tolerance (Ferguson, Cote, Gauthier, & Bourassa, 1978), to improve self-care and emotional status (Stern & Cleary, 1981), and to attenuate perceived exertion (Gutman, Squires, Pollock, Foster, & Anholm, 1981), whereas higher intensity (aerobic) exercise may reduce myocardial ischemia (Ehsani, Heath, Hagberg, Sobel & Holloszy, 1981). Early and sustained physical mobilization has been associated with shorter hospitalization and a more complete return to work, the latter relating to increased survival rate (Wenger, 1978; 1979). Unfortunately, as in other areas of exercise application, cardiac patients typically show poor compliance to even medically prescribed and supervised exercise programs (Oldridge, 1979b, 1982).

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\(^1\) Aerobic (endurance) exercise is used to describe repetitive isorhythmnic activities such as brisk walking, jogging, cycling, and swimming involving major muscle groups (e.g., legs) in which energy is derived from metabolic processes using a constant flow of oxygen (Cooper, 1968; McArdle, Katch, & Katch, 1981). For cardiovascular benefit these activities should occur at a minimum intensity of 60% to 65% of maximum heart rate, for a duration of 15 to 30 minutes or more, and at a minimum frequency of three times per week (American College of Sports Medicine, 1978, 1980).
Obesity

Until recently, exercise received surprisingly little attention as a component in weight-reduction programs. Aerobic exercise training has consistently been shown to produce weight loss and improvement in body composition (lean to fat ratio) for obese as well as normal-weight individuals; although without concurrent dietary caloric restriction, changes in weight and body fat are clinically small (Epstein & Wing, 1980a). The extent of behavioral (eating) compensation that may or may not result from increased caloric output due to exercise remains an unsettled issue (Brownell & Stunkard, 1980; Epstein & Wing, 1980a). Bjorntorp (1976; 1978) has suggested that weight and body-fat changes achieved through exercise therapy can be predicted, as in the dietary treatment of obesity, by the individual's pretreatment fat-cell number. The available evidence suggests that individuals with increased fat-cell number achieve expected gains in fitness without loss of body fat; therefore, exercise may not be a good sole alternative for the treatment of hyperplastic obesity.

Controlled studies support the hypothesis that treatment programs that emphasize increased caloric expenditure as well as reduced caloric intake produce greater average weight losses and better maintenance (Dahlkoetter, Callahan, & Linton, 1979; Stalonas, Johnson, & Christ, 1978). A number of mechanisms that may mediate these effects have been suggested: Increased activity may decrease appetite (Bjorntorp, 1976; Mayer, Roy, & Mitra, 1956); regular exercise counteracts the homeostatic reduction in metabolic rate, which reduces the effectiveness of caloric-intake restriction (Brownell & Stunkard, 1980; Thompson, Jarvie, & Lahey, 1982); exercise serves as a healthful substitute for or timeout from snacking as a coping technique (Epstein & Wing, 1980a); and exercise may reduce stress from dieting or other sources (Foreyt, Goodrick, & Gotto, 1981). Although most obese patients seek to reduce primarily for cosmetic reasons, weight losses that are cosmetically disappointing may, when combined with an exercise program, be associated with significant improvements in cardiovascular risk indicators such as hypertension (Stamler et al., 1980).

As noted by Epstein and Wing (1980a), exercise may provide important benefits in the control of energy balance, but it can only benefit individuals who adhere to the program. An excellent illustration of this point is the results of an uncontrolled study by Gwinup (1975), in which 11 women who exercised 1 hour a day for 1½ years lost an average of 22 pounds, but 23 of the original 34 subjects dropped out. Although Epstein and Wing found little information on adherence to exercise by obese subjects in the behavioral literature, investigators in the areas of cardiac rehabilitation and exercise physiology have reported that obese subjects may be more likely than normals to drop out of exercise programs (Dishman & Gettman, 1980; Massie & Shephard, 1971).

Diabetes

Exercise may also play an important role in the behavioral management of diabetes. Early medical records show that exercise was one of the oldest forms of treatment for diabetics, and that its specific effects in diabetic-like conditions have been recognized for at least 2,000 years. Today, regular moderate exercise is recommended to diabetics as an adjunctive treatment, along with diet and insulin, because of its potential to improve metabolic control, reduce plasma insulin, and improve insulin sensitivity and glucose tolerance (Soman, Koivisto, Deibert, Felig, & DeFronzo, 1979). These exercise-mediated changes may, in turn, significantly reduce the overall risk of cardiovascular disease (Richer, Ruderman, & Schneider, 1981; Vranic & Berger, 1979). However, the potential therapeutic effect of exercise occurs only if other therapy is already sufficient to prevent ketosis. It is not yet known whether regular exercise will prolong life or decrease morbidity in diabetics, as much of the data relevant to the beneficial effects of exercise has only been collected for nondiabetics (Sherwin & Koivisto, 1981). We are not aware of any published studies in the psychological literature evaluating the specific role of exercise therapy or adherence to exercise programs.
in diabetic populations, and this must be considered an important area for future research.

Smoking

Epidemiological studies indicate an inverse relationship between smoking and habitual physical exercise (Criqui et al., 1980), and there have been anecdotal reports that smokers who begin intensive aerobic training programs often quit smoking (Morgan, 1981). However, the U.S. Public Health Service collaborative study (Taylor et al., 1973) found no significant differences in smoking quit rates between exercise and control subjects after 1 year. Furthermore, studies have indicated that smokers are far less likely to enter exercise programs (Massie & Shephard, 1971) and that those that do are likely to drop out both early (<1 mo.; Oldridge, Wicks, Hanley, Sutton, & Jones, 1978) and later (≥2 yrs; Andrew et al., 1981).

Especially in light of these preliminary negative findings, one must question whether exercise alone would be an effective intervention, particularly in short-term treatment programs. It seems more likely that exercise may, as in the treatment of obesity, work best in combination with other effective treatment and maintenance interventions. Exercise may be particularly important for individuals concerned about the risk of weight gain associated with smoking cessation (Jacobs & Gottenborg, 1981). Exercise may also be useful in reducing health risk by accelerating the ventilation of carbon monoxide (CO) in those smokers consuming higher CO-yield substances who are unable or unwilling to quit (Frederiksen & Martin, 1979; Martin & Frederiksen, 1980).

Psychological Effects

Some of the potential beneficial effects of exercise in the prevention and treatment of cardiovascular and other health disorders may, in fact, accrue from exercise-mediated psychological changes; that is, decreases in depression (Greist, Klein, Eischens, Gurman, & Morgan, 1979; Morgan, Roberts, Brand, & Feinerman, 1970), decreases in anxiety (Bahrke & Morgan, 1978; Morgan, 1979, 1981; DeVries, 1981), and improved self-concept (Collingwood & Willet, 1971; Folkens & Sime, 1981). Unfortunately, there is still little evidence from controlled studies documenting these psychological effects, particularly with behavioral medicine populations. Nevertheless, the possible mediators of the apparent antidepressive and anxiolytic effects of aerobic exercise are currently a topic of great interest (Sacks & Sachs, 1981).

For example, exercise has been associated with acute changes in norepinephrine catecholamine levels (Dimsdale & Moss, 1980), and there is intriguing evidence that beta-endorphins, the body’s “natural opiates,” may be liberated during exercise (Apenzeller, Standefer, Apenzeller, & Atkinson, 1980). It has been suggested that these effects may be responsible for mood improvements, and could even create a “positive addiction” to the exercise (Apenzeller, 1981; Glasser, 1976).2

The Problem of Exercise Adherence

As the clinical efficacy of exercise for a variety of health-related disorders is demonstrated, the problem of ensuring exercise adherence becomes paramount. Studies indicate clearly that of those who begin an exercise program, whether on their own or in a structured program, roughly one half or less will still be exercising after 3 to 6 months (Durbeck et al., 1972; Morgan, 1977; Taylor et al., 1973). Relatively similar exercise adherence levels have been cited for apparently healthy, coronary-risk, and cardiac-rehabilitation populations (Bruce, Frederick, Bruce, & Fisher, 1976; Carmody, Senner, Malinow, & Matarazzo, 1980; Cooper, 1968; Morgan, 1977; Oldridge, 1979b, 1982; Taylor et al., 1973). Reported attrition in these types of programs typically ranges from approximately 30% to 70% (Dishman, 1982; Franklin, 1978; Oldridge, 1979b; 1982). Exami-

2 An interesting illustration of the potential “addicting” effects of chronic exercise is provided by Glasser, who reported anecdotally that they were unable to get high-intensity exercisers (distance runners) to stop exercising for any amount of money!
nation of the exercise dropout/relapse pattern indicates a negatively accelerated curve not unlike that found for the negative addictive behaviors: The majority of dropouts/relapses occur within the initial 3 months, followed by continued deterioration, with attrition leveling off between 50% and 70% after 12 to 24 months (Carmody et al., 1980; Oldridge, 1979b, 1982; Shephard, 1979). An excellent, well-controlled study from Finland illustrates this disheartening situation: Kenthala (1972) found that only 77 out of 298 postmyocardial infarction patients entered a recommended exercise program; of those, only 39% remained through 5 months and only 13% through 1 year.

**Definition of Exercise Adherence**

Unfortunately, it is extremely difficult to evaluate the present exercise-adherence data, due to the fact that the definitions of adherence vary so widely from study to study in addition to the fact that the bulk of the studies used self-selected, male high-risk or CHD subjects enrolled in formal programs. Perhaps most confusing is the fact that many of the cardiac-rehabilitation studies have determined overall dropout rate (e.g., Oldridge, 1979a), whereas others have employed a preset attendance criterion to identify adherers (e.g., Mann et al., 1969). Also, most investigators have reported only adherence/attendance to ongoing treatment programs, while providing little information regarding maintenance of exercise subsequent to termination of treatment—that is, some of the dropouts may actually have been exercising on their own (Wilhelmsen et al., 1975).

**Exercise Adherence Profile**

Despite the difficulties inherent in properly defining exercise adherence, it is clear that most people who begin an exercise program will drop out, usually within the first 3 to 6 months. Given the magnitude of the problem, it is somewhat surprising that there is little experimental research on exercise adherence. The existing studies consist mainly of retrospective analyses of variables that characterize the exercise nonparticipant, dropout, poor adherer, and good adherer (Andrew & Parker, 1979; Andrew et al., 1981; Dishman & Gettman, 1980; Heinzelmann & Bagley, 1970; Kavanaugh, Shephard, Chisholme, Qureshi, & Kennedy, 1980; Massie & Shephard, 1971; Morgan, 1977; Oldridge et al., 1978). Factors that have been found to predict exercise participation and level of adherence may be loosely separated into subject factors, social/environmental factors, and exercise program factors (Martin, 1981).

**Subject Factors**

It is curious that the most obvious psychological predictor, one’s attitude toward exercise, does not appear to predict participation or later adherence. Studies have indicated that even the very sedentary have extremely favorable attitudes toward personal exercise (Dishman & Gettman, 1980; Morgan, 1977). One psychological factor that does appear to predict attrition from an exercise program is low “self-motivation,” as measured by Dishman’s self-motivation inventory (SMI; Dishman & Ickes, 1981; Dishman, Ickes, & Morgan, 1980). Oldridge and associates (Oldridge et al., 1978) have noted that psychosocial reasons, principally “lack of motivation” are frequently cited by individuals for their exercise dropout. A link may also exist between the maintenance of self-motivation (and, hence, exercise) and the achievement of one’s exercise goals. For example, Danielson and Wanzel (1977) found that exercisers who failed to attain their own exercise goals dropped out roughly twice as fast as those who did attain them.

**Behavioral** predictors of exercise dropout include smoking (Massie & Shephard, 1971; Oldridge, 1979; Oldridge et al., 1978), inactive leisure-time pursuits (Oldridge, 1979a; Teraslinna, Partanen, Koskela, & Oja, 1969), Type A behavior pattern (Oldridge et al., 1978) and, curiously, poor credit rating (Heinzelmann & Bagley, 1970; Massie & Shephard, 1971). Oldridge (1979a) found that 80% of smokers who had inactive jobs and leisure-time pursuits and were blue collar workers eventually dropped out of the Ontario Exercise Programs. Smoking was the single best predictor in the Ontario study, associated with a 59% likelihood of dropout.
Smoking has also been found to predict poor exercise-program enrollment (Massie & Shephard, 1971).

Few biological factors predict adherence (Dishman & Gettman, 1980; Morgan, 1977). Several studies, however, have related overweight, especially high percentage of body fat, to dropout and poor adherence (Dishman & Gettman, 1980; Massie & Shephard, 1971). A combination of biological and psychological variables may prove much more powerful in predicting adherence. Dishman and Gettman (1980) have proposed a "psychobiologic" model, based on SMI scores and body-composition measures, which they claim can correctly identify 80% of individuals as potential adherers or dropouts.

Social/Environmental Factors

Social support or reinforcement both in the home environment and during the exercise has consistently been related to increased adherence. Heinzelmann and Bagley (1970) found that subjects with spouses who supported their exercise habit were twice as likely to have "good adherence" than those whose spouses were either neutral or negative toward exercising, whereas Andrew et al. (1981) found that their cardiac patients without spouse support were three times more likely to drop out. Oldridge et al. (1978) have noted that family problems, as well as change of job or residence, were cited frequently by former exercisers as responsible for their poor adherence or dropout. Wilhelmsen and associates (1975) found significantly poorer long-term adherence in those who exercised alone. Similarly, Massie and Shephard (1971) found that whereas only 47% of participants in individual aerobic exercise programs were adherent, 82% participating in group exercise were adherent. Heinzelmann and Bagley (1970) reported that 90% of a sample of 195 exercisers stated that they either did prefer or would have preferred exercising with others.

Program Factors

Inconvenient exercise program location has been found by many investigators to detract significantly from adherence to the program components and overall participation (Andrew & Parker, 1979; Andrew et al., 1981; Bruce et al., 1976; Kentala, 1972; Massie & Shephard, 1971; Morgan, 1977; Oldridge et al., 1978; Sanne, Elmfeldt, Grimby, Rydin, & Wilhelmsen, 1973; Teraslinna et al., 1969). Another important predictor of adherence is the overall intensity of exercise. Pollock (1977) and others (Kilbom et al., 1969; Mann et al., 1969) have found higher intensity exercise to be associated with lower exercise adherence. These authors reported that approximately one half of the participants in their programs developed orthopedic injuries that necessitated discontinuation of exercise and that many of the injuries appeared due to excessive exercise intensity. Along these lines, Oldridge et al. (1979a) have found that medical reasons were cited by 22% of their coronary patients as the primary reason for their dropout. Finally, recent results from the Ontario Heart Exercise Project implicate fatigue and perceived exertion as important factors in attrition (Andrew et al., 1981).

Modification of Exercise Patterns

Although there have been suggestions as to how to retain more exercisers and enhance overall adherence levels (Dishman, 1982; Franklin, 1978; Oldridge, 1977), there have been few data-based studies and even fewer specific applications of behavioral technologies to the analysis and modification of exercise behavior in either healthy or coronary subjects (Epstein & Wing, 1980b; Martin, 1981). Studies relating to the modification of exercise participation or adherence can be categorized according to the primary controlling variables targeted, including stimulus control, reinforcement control, and cognitive/self-control.

Reinforcement control. As in most other areas of behavioral management, many of the published exercise-modification studies have focused predominantly on manipulating the consequences of exercising. Several studies have shown the relative effectiveness of contracting and lottery procedures in improving short-term exercise program attendance (Epstein, Thompson, Wing, & Griffin, 1980; Oldridge & Jones, 1981) and adherence (Kau & Fischer, 1974; Wysocki, Hall,
Iwata, & Riordan, 1979). For example, Epstein et al. (1980) compared weekly attendance contracts ($1.00 deposit return) with an attendance lottery and control condition across a 5-week (25-day) jogging program. Subjects were trained to monitor performance (speed, distance, intensity) and were provided feedback (e.g., resting and maximal heart rates) on a daily basis. The contracting and lottery interventions were associated with lower dropout and similar attendance (64%), with both clearly superior to the control group (46% attendance). Wysocki et al. (1979) employed a group multiple-baseline design to study the effect of contracting for aerobic points to earn back personal items placed on deposit. In the Wysocki et al., study, 7 of the 12 subjects at least doubled their aerobic points earned at 10 weeks; however, only 4 maintained or improved upon this level at 1 year. Unlike the Epstein et al. study, adherence and fitness levels were not directly assessed. Contingency management has also been employed in enhancing exercise in the mentally retarded (Allen & Iwata, 1980) and token reinforcement has been shown to stimulate exercise in institutionalized geriatric patients (Libb & Clements, 1969).

Reinforcement control of exercise was the main focus of two of five community studies conducted by Martin and colleagues (Martin et al., Note 1). The overall program consisted of 12 weeks of aerobic jogging/brisk walking with two classes per week (subjects were requested to exercise a third day each week on their own). Informant corroboration and fitness testing allowed validation of self-reported third-day and postcourse exercise-adherence data. In the first study (N = 33), it was found that individualized feedback and praise during exercise resulted in superior program attendance and third-day adherence than standard, group-based feedback/praise following exercise. Three-month follow-up revealed that 54% of the individualized praise/feedback group were still jogging, whereas only 17% of those in the standard group had continued to exercise. In Study 2 (N = 36) an attendance lottery for gift certificates, running clothes, shoes, and so forth failed to add to the effectiveness of the individualized feedback/praise procedure. The authors hypothesized that the basic program of shaping, modeling, and personalized feedback and reinforcement during exercise, administered by enthusiastic participant-therapists, was such a powerful intervention that the tangible reinforcement represented by the lottery was less important to the exercisers.

Stimulus control. Antecedent control over physical activity has been demonstrated in several studies. Brownell, Stunkard, and Albaum (1980) increased stair climbing by posting a clever cartoon sign by an escalator/stairway showing a healthy heart coaxing people to use the stairs rather than the escalator. Wankel and Thompson (1977) found that telephone prompts to health-club dropouts successfully increased attendance and maintenance if they recorded positive reasons for returning. In a follow-up study (Thompson & Wankel, 1980) female health-club members who were led to believe that their activity preferences helped determine their prescribed exercise program had superior attendance to those members who were told that their preferences were not considered.

Cognitive/self-control. Several studies have employed self-management strategies (including stimulus control, self-contracting and goal setting, self-reward, and/or other cognitive techniques) in the modification of exercise behavior. Perhaps the first reported application of self-control procedures in this area was by Turner, Polly, and Sherman (1976), who used self-monitoring, self-reward, and self-punishment (self-contracting) in a fitness-improvement program for a young adult woman. Fitness improvements were documented through 5 months to validate self-reports of aerobic points earned. Oldridge and Jones (1981) found that cardiac patients who signed an agreement to complete the exercise program had better adherence than those who did not. Keefe and Blumenthal (1980), using a multiple baseline across subjects design, evaluated the effects of a self-control-based exercise program on three adult overweight males. The training

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3 The Cooper aerobic point system (Cooper, 1977) is a nicely flexible gauge of exercise participation, as well as fitness, and has been employed by others for monitoring adherence in addition to fitness tracking.
program involved a very gradual shaping procedure in which subjects set easily attainable goals, with self-reinforcement for meeting these goals. At the 2-year follow-up, all subjects reported they were still exercising, and all scored in the excellent fitness category. It is interesting that all subjects reported they no longer relied on the self-control procedures because they found the exercise itself to be rewarding.

Five studies conducted by Martin et al. (Note 1) involved systematic evaluation of the effects of cognitive/self-control procedures on exercise adherence. The exercise program was similar in structure to that described previously, and in some cases self-control strategies were tested as a part of the same studies. In four of the studies, exercise-goal selection was manipulated and program attendance and overall exercise adherence were examined. In the first study (N = 33) subjects were assigned progressive exercise goals based on distance (e.g., jog 1 mile) or time (e.g., jog 15 minutes). Although the exercise adherence of subjects receiving distance-based goals did not differ from that of subjects receiving time-based goals, time-based goals were associated with better adherence than distance-based goals in subjects who did not receive individualized feedback/reinforcement (i.e., “special attention”) during running. In the next study (N = 36), flexible exercise goal setting by the participant was associated with better attendance and 3-month maintenance than fixed (by instructor) exercise goal setting. In a subsequent study (N = 16), flexible goal setting was found to be superior, regardless of when it was introduced. The final goal-setting study (N = 27) evaluated the effects of proximal (weekly) exercise-goal selection by participants vs. distal (every 6 weeks) exercise-goal selection. Consistent with the previous goal-setting results, the more flexible distal goal-setting procedure was associated with superior attendance (82% vs. 71%) and overall adherence.

In a more recent study (N = 16), Martin et al. (Note 1) evaluated the effects of two cognitive strategies on exercise behavior. Subjects trained to use distraction/dissociation during running; that is, think pleasant, coping thoughts, set small mental goals, and “go slowly and smell the flowers,” exhibited superior attendance (77%) and 3-day/week exercise adherence (78%) than subjects trained to “associate” by focusing on bodily sensations and challenging goals (“be your own coach”; 62% and 51%, respectively). These results as well as the other exercise-modification studies must be considered preliminary, however, and only suggestive of the important variables that may control exercise adoption and maintenance.

Conclusions and Future Directions

The present review has chronicled the applications and modification of exercise within behavioral medicine. At the present time, we believe the following conclusions are warranted.

1. The evidence strongly suggests that aerobic exercise may be beneficial in the treatment and/or prevention of a variety of health disorders, although not always because of the physiological effects of exercise. However, we frequently do not know what types of exercise or how much will be required to produce the desired clinical effects (i.e., the exercise dose–response curve).

2. Many of the exercise studies within the area of behavioral medicine are methodologically flawed to the extent that it is not possible to separate the specific effects of exercise from the nonspecific ones. For example, few studies have reported physiological measures that would quantify the exercise-training effect, if any, and its relationship to clinical change. It is possible that in a number of the problem areas (e.g., depression, anxiety, smoking) exercise has no direct effects, but rather some positive cognitive and behavioral side effects such as improved self-efficacy and increased adherence to life-style or other health-behavior changes. Certainly, these potential side effects are of great interest to the psychologist and should, therefore, be carefully studied in future investigations of the clinical efficacy of exercise.

3. Even in areas in which the clinical efficacy of some form of exercise therapy has been relatively well established (such as cardiovascular risk reduction and obesity), the overall effectiveness of exercise remains in doubt because of the problems of adherence.
Although researchers have used different criteria to define dropouts and adherence, it is clear that many recruits are lost, especially in the early stages of the exercise program, and most of those who remain more than a few weeks will eventually relapse.

4. The current lack of standardized or even of well-specified definitions of exercise adherence, nonadherence, and dropout makes cross-study comparisons and conclusions difficult or impossible. Actual exercise participation may be better or worse in some of the subject populations or program types, but this is difficult to determine because of the different criterion measures used and the lack of appropriate follow-up.

5. The preliminary studies on the modification of exercise behavior indicate that various interventions, including stimulus control, reinforcement control, and self-control procedures, can improve exercise adherence, but the effects appear to be temporary for most. Few studies have focused on the maintenance side of exercise adoption.

These conclusions prompt us to offer the following suggestions as to the most important questions to be addressed in future research by psychologists in this area.

1. What is the relationship between improvements in cardiovascular fitness and the behavioral and psychological/cognitive changes attributed to exercise? We believe that physiological measures must be presented to validate and quantify the impact of adherence to any experimental exercise-training program. Assessments must be conducted under standardized conditions and the dependent measures selected with care to avoid confounding by other variables.

2. How should exercise “adherence” be defined? We propose that percentage of overall adherence, the observed adherence of an individual compared with a preset criterion for ideal performance, be adopted as the standard method of reporting adherence. In our studies, for example, we are now comparing the individual’s frequency of aerobic exercise sessions in a given week with the ideal standard of three per week. Weekly adherence can then be averaged across subjects or can be averaged for an individual or group of subjects over a period of time. An ideal adherence definition might also take into account the minimal exercise duration, intensity, and frequency necessary to produce a desired effect. If cardiovascular fitness is targeted, then adherence might be stated as the percentage of sessions in which 60% to 65% maximum heart rate is achieved for at least 15 to 30 minutes (ACSM, 1978). It is also important that exercise outside the program be considered in some manner, since some dropouts report continued exercising on their own (Wilhelmsen et al., 1975). In any event, it is vital that adherence and dropout be defined precisely in all future studies.

3. What factors control exercise participation and adherence: (a) Initially, when and how an individual decides whether to begin an exercise program; (b) within the context of an ongoing program, such as a community, clinical rehabilitation program, or a course at a college or other institution; and (c) after the intensive treatment program has ended? Without a doubt, exercise participation and adherence (however defined) across all populations has typically been disappointing. This is not so surprising in light of the complexity of the behavior changes required to successfully initiate and maintain an exercise program or increases in routine activity. It is not yet clear that we can accurately identify those most likely to drop out or adhere poorly. A variety of exercise dropout profiles have been proposed, but many predictions are based on self-report data that may not accurately reflect the true reasons for poor exercise participation or attrition. Further, once the “high risk” dropouts can be identified, it remains to be shown whether any special treatment can “save” these high-risk individuals. It can be argued that our efforts might now best be directed to ensuring the successful long-term adherence of those who are more likely to remain in treatment.

The research indicates that both stimulus control and reinforcement procedures can at least temporarily enhance adherence during the initial weeks of an ongoing program. Whether these procedures have meaningful impact on long-term adherence, or maintenance of the exercise program, is a separate question that will require longer term experimental studies and follow-up than have usu-
ally been reported. The literature from such areas as the treatment of obesity, for example, consistently shows that the measurable impact of these manipulations almost invariably disappear by the 6-month or 12-month follow-up.

We believe that far too little attention has been directed toward the cognitive/psychological/social variables controlling exercise adherence. The enjoyment or aversiveness of each exercise session may be strongly influenced by the individual’s interpretations of bodily sensations accompanying the exercise and perceived success in achieving personal goals. These subjective evaluations may, in turn, continually erode or enhance the individual’s probability of engaging in the exercise behavior, depending on their quality (cf. Andrew et al., 1981). We also believe that, for the exercise habit to be maintained, there must be a high ratio of enjoyable experience, sensations, and cognitions to those of neutral, or especially of an aversive, quality.

There may well be various stages (cf. Dishman, 1982) of establishing and maintaining the exercise habit, much as in other operant behaviors, each requiring different optimal contingencies and, perhaps, types of reinforcement. As the literature illustrates, we lose most would-be exercisers in the early and middle acquisition stages. The importance of determining the key stages in the acquisition of the exercise habit is exceeded only by the need to tailor a treatment package to those requirements. For example, it may be best to begin with a single exercise behavior, establish it in a single environment, and then establish it in other environments (i.e., stimulus generalization). Subsequently, a variety of other exercise behaviors may be introduced, at first in a single environment (response generalization), and then in many environments (stimulus and response generalization). The latter steps may provide the foundation for effective maintenance of the exercise habit.

At this point, however, one of the most important tasks facing behavioral medicine/health psychologists studying exercise and exercise adherence is the development of powerful treatment “packages”—suitable for individual tailoring—that will produce acceptable adherence to both home and institutional/structured exercise programs. This optimal package for ensuring adequate exercise adherence may need to vary according to the type of program; that is, community/prevention or cardiac rehabilitation, and even to the makeup of the participants; that is, male, female, smoker, overweight, and so forth. Unfortunately, much of the data on exercise adherence come from primarily male-dominated, cardiac, or high-risk patient programs. As in the treatment of obesity (Stuart, 1980), we have not yet incorporated all we know to provide an optimal treatment package. In the case of exercise, the optimal treatment package should probably include a very convenient location (e.g., neighborhood-based programs), group-based, lower intensity exercise with enthusiastic participant therapists, ample modeling, feedback and social reinforcement, flexible, participant-influenced exercise goal-setting, and extensive family/social involvement. The program should also be tailored to individual needs, for example, personal health goals/limitations, body composition, skill level, need for social approval versus independent pursuit of goals, and desire for variety or competition versus camaraderie (Oldridge, 1977; 1982). Choice, either perceived or actual, appears to be important to adherence to exercise (Thompson & Wankel, 1980) as well as other behaviors (Kirschenbaum, Tomarken, & Ordman, in press). In respect to the overly competitive individual (e.g., Type A), we recommend that very highly competitive activities be allowed only in addition to a more relaxed, enjoyable fitness training/maintenance program.

By emphasizing the development of optimal programmed exercise interventions, we do not wish to deemphasize the potential importance of strategies designed to increase routine activities, which may themselves have significant health benefits (Morris et al., 1980) and/or may serve as an effective first step in shaping exercise in the extremely sedentary. Brownell and Stunkard (1980) have suggested two useful categories of exercise behavior that may have important implications for adherence: programmed (special)
activities, including sports and exercises that occur in scheduled sessions (e.g., jogging, tennis, swimming), and routine (regular) activities, which can readily be incorporated into daily living (using stairs instead of elevators, walking instead of driving short distances). Routine activities have the advantage of requiring no special equipment, places, or times. There is evidence from at least one controlled study (Epstein, Wing, Koeske, Ossip, & Beck, in press) supporting Brownell & Stunkard's (1980) hypothesis that adherence is superior for routine activity increases resulting in similar long-term fitness and weight change.

No matter how optimal the exercise-adherence treatment package, it will likely be insufficient to ensure maintenance once the program ends or if the participant must withdraw (e.g., move). Thus, special maintenance procedures or relatively permanent environmental changes must be empirically validated and implemented to insure that the exercise is continued and the gains are not wasted. Merely extending treatment will probably not be as effective as the use of generalization training or special procedures such as continued self-monitoring, periodic program contact/feedback (e.g., newsletter, "crisis" phone line) and relapse-prevention training. Changing the environment, such as enhancing environmental cues for exercising or implementing participatory, noncompetitive exercise programs in the schools (cf. Cooper et al., 1975), may be especially effective methods of predetermining exercise maintenance. However, very few data are available and this must be considered an ideal area of research. Finally, more research can be devoted to the initial stage of exercise adoption, recruitment. The marketing of exercise/health programs can draw from advertising research, from the relatively recent research on health marketing as conducted by health psychologists (Frederiksen, Solomon, & Brehony, in press; Martin & Prue, in press) and from the data on the antecedent control of exercise and physical activity (e.g., Wankel & Thompson, 1977).

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