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# The Role of Physical Exercise in Alcoholism Treatment and Recovery

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A growing body of literature has demonstrated that physical exercise is associated with favorable mental health outcomes. Exercise has the potential to be an accessible and affordable adjunct treatment option for persons with alcohol use disorders (AUD); however, exercise-based interventions have rarely been applied to this population. The authors examine the potential role of physical exercise in the process of recovery from AUD. Possible physiological, psychological, and social mechanisms whereby exercise may exert influence on alcohol use outcomes are outlined. Studies examining the effects of physical exercise on alcohol and other addictive behaviors are reviewed, and the viability of structured, exercise-based adjunct interventions for AUD populations is discussed.

Alcohol use disorders (AUD) are among the most common of the psychiatric disorders, affecting as much as 20% of the U.S. population (Kessler, McGonagle, & Shanyang, 1994). A number of psychological treatment approaches for AUD have been shown to be effective, including cognitive–behavioral therapies, 12-step programs, skills training, and psychopharmacological medications (W. R. Miller & Hester, 1995; Read, Kahler, & Stevenson, 2001). However, despite the success of these approaches in facilitating initial treatment gains, relapse remains a major problem, with relapse rates ranging from 60% to 90% (Brownell, Marlatt, Lichtenstein, & Wilson, 1986). In light of this, and consistent with a broadening view of substance abuse treatment that includes global lifestyle changes as part of the recovery process (Agne & Paolucci, 1982; Hodgson, 1994; Marlatt, 1985), some behavioral scientists have suggested that physical exercise may be a viable adjunct treatment approach or relapse prevention strategy for AUD (Taylor, Sallis, & Needle, 1985; Tkachuk & Martin, 1999).

Physical exercise (defined as any activity that involves the expenditure of caloric energy) is widely known to produce myriad physical health benefits (Boutcher, 1993; Bovens et al., 1993; Kohl, LaPorte, & Blair, 1988; Oberman, 1985; Pinto & Marcus, 1994; U.S. Department of Health and Human Services [USDHHS], 1996). Overwhelming evidence has also accumulated over the past two decades showing exercise to be associated with psychological health benefits as well, as exercise-based interventions have demonstrated enhanced mental health outcomes in the areas of anxiety, depression, and self-concept (e.g., DiLorenzo et al., 1999; Hughes, 1984; Martin & Dubbert, 1982; Taylor et al., 1985). A small body of research has examined physical exercise interventions as applied to addictive behaviors (i.e., smoking and alcohol) and has suggested promise for such interventions. To date, however, exercise-based interventions have rarely been applied to this population. Though the literature is still in its naissance, a number of theoretical and instrumental factors suggest that this type of approach may be beneficial to those recovering from alcoholism. Accordingly, the primary purpose of this article is to examine the potential role of exercise in recovery from AUD. To this end, we review both theoretical and empirical evidence for exercise applications in AUD, and we discuss the many ways in which exercise interventions may be uniquely suited to the treatment of alcoholism. Finally, we discuss future directions for research in the area of exercise and AUD and ways that treatment providers may incorporate physical exercise into AUD treatment.

## Exercise and Alcohol Use: Potential Mechanisms of Action

### *Achieve a Pleasurable State Without Use of Drugs*

Recent research has explored the neurological processes underlying alcohol addiction. Currently, it is widely believed that activation of the endogenous opioid system induced by alcohol may mediate alcohol's reinforcing properties and contribute to excessive alcohol use (Froelich, 1997; O'Malley, Jaffe, Chang, & Schottenfeld, 1992). Specifically, two of the enkephalins (leu-enkephalin and met-enkephalin) and one of the endorphins (beta-endorphin) have been shown to produce these mediating effects (Froelich, 1997) and appear to serve as natural positive reinforcers. Behaviors (i.e., drinking) that increase the release of these substances generally lead to a positive response within the body and thus reinforce the behavior associated with this positive response. Dopaminergic reinforcement mechanisms in the neural system that

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are activated by substances such as alcohol are also activated during exercise (Carlson, 1991; Cronan & Howley, 1974; Thoren, Floras, Hoffmann, & Seals, 1990). Therefore, exercise may produce similar pleasurable effects to those experienced via alcohol consumption. This was exemplified by T. J. Murphy, Pagano, and Marlatt's (1986) observation that some participants in their study reported experiencing a high associated with exercise. Thus, exercise may facilitate better substance use outcomes by providing a natural way for the alcohol-dependent individual to achieve a mild, pleasurable state that does not require the use of exogenous substances.

### *Improve Mood*

Major depression and AUD commonly co-occur (Brown & Ramsey, 2000; Kessler et al., 1997; Rhode, Lewinsohn, & Seeley, 1991; Swendsen et al., 1998). Although the relationship between alcohol use and depression is complex (Hodgins, el Guebaly, Armstrong, & Dufour, 1999), a number of studies in recent years have indicated increased depressive symptoms to be a risk factor for poorer alcohol-associated outcomes (Greenfield et al., 1998; Hodgins et al., 1999; Rounsaville, Dolinsky, Babor, & Meyer, 1987).

Exercise has been shown to have a positive impact on depressive symptoms (Byrne & Byrne, 1993; Doyne, Chambless, & Beutler, 1983; Doyne et al., 1987; McCann & Holmes, 1984) and to result in acute improvements in mood (e.g., Berger & Owen, 1992; Bock, Marcus, King, Borrelli, & Roberts, 1999). Furthermore, a number of controlled studies have shown aerobic exercise to be associated with positive outcomes for depression when compared both with no-treatment control conditions (Doyne et al., 1983, 1987) and with more traditional treatments for depression, such as cognitive–behavioral therapy (Freemont & Craighead, 1987) and antidepressant medication (Babyak et al., 2000). Thus, exercise may serve to alter mood and depressive symptoms.

Positive effects of exercise on psychological health have also been shown in individuals with substance use disorders. Both aerobic and strength training exercise programs during the course of alcohol treatment have resulted in decreased depressive and anxiety symptoms (Frankel & Murphy, 1974; Palmer, Vacc, & Epstein, 1988; Palmer, Palmer, Michiels, & Thigpin, 1995). Similar findings have emerged with smokers attempting cessation (Bock et al., 1999; Kawatchi, Troisi, Rotnitzky, Coakley, & Colditz, 1996) and generally suggest that positive psychological health consequences of exercise extend to individuals in treatment for and in recovery from substance use disorders. Just as it has been found that improved drinking outcomes in alcohol-dependent patients receiving cognitive–behavioral treatment for depression were mediated by reduction of depressive symptoms, so may exercise lead to improved drinking outcomes as a result of reductions in depressive and anxiety symptoms (Brown, Evans, Miller, Burgess, & Mueller, 1997).

### *Increase Self-Efficacy*

Bandura (1977, 1986) viewed self-efficacy (operationalized as a belief in one's ability to master particular skills) as a cognitive mechanism that affects behavior. Thus, alteration of this cognitive mechanism (i.e., enhancing self-efficacy) could result in helping also to change behavior. Some researchers have suggested that, through a process known as the *mastery hypothesis* (Tuson & Sinyor, 1993), individuals may acquire necessary exercise skills (e.g., self-efficacy for exercise; McAuley, Courneya, & Lettunich, 1991; Williams & Cash, 1999) that may then generalize to other areas such as self-efficacy for implementing coping strategies necessary for the maintenance of long-term sobriety (see Peterson & Johnstone, 1995).

### *Group Activity and Social Support*

The role of social support in drinking and recovery has been noted (Humphreys, Moos, & Finney, 1995; Longabaugh, Wirtz, Zweben, & Stout, 1998). Exercise as a group activity may help to increase social support as well as to create a sober network for recovery. Further, evidence suggests that group-based exercise may increase adherence to an exercise protocol and may offer psychological benefits as well. For example, in a summary of the literature on exercise and behavioral medicine, Martin and Dubbert (1982) noted that social support for exercise has consistently been linked with better adherence to exercise regimens. Moreover, research suggests that many individuals prefer to exercise in groups rather than individually (Heinzelmann & Bagley, 1970; T. J. Murphy et al., 1986). Thus, a group exercise program may increase ongoing exercise participation.

In terms of psychological outcomes, the controlled study by Palmer and colleagues (1995) pointed to the potential role of social interaction in exercise and substance abuse recovery. In this study, an exercise effect was found for depression among substance-abusing inpatients in a body-building condition but not in circuit-training or aerobic step conditions. The authors of this study hypothesized that some of the effect of the body-building condition may have been a function of the fact that those in that condition were exercising in dyads or threesomes whereas those in the other conditions exercised individually. Group-based exercise allows those in recovery to experience group interaction that does not involve alcohol or other drugs and thus can help to build or strengthen nondrinking social support networks.

### *Provide Positive Nondrinking Alternative*

Smith and Meyers (1995) suggested that it is critical for persons in treatment for AUD to develop rewarding and enjoyable social and recreational activities that do not revolve around drinking. Exercise can serve as just such an activity. Moreover, many persons early in recovery may find themselves with a good deal of unstructured time that was once spent using substances. In such cases, physical exercise can also serve as a substitute behavior (see Marlatt, 1985) in which to engage instead of drinking. In fact, Bartha and Davis (1982) suggested that involvement in physical exercise may help to educate the individual recovering from AUD about the benefits that they describe as "high-level wellness." This allows the patient to embrace a general better quality of health and fitness as part of the decision to stop problematic drinking.

### *Decrease Stress Reactivity and Improve Coping*

Some cognitive social learning theorists have posited that alcohol-involved individuals drink at least in part because they lack certain basic coping skills necessary for dealing with stressors associated with daily living (W. R. Miller et al., 1995; Monti,

Rohsenow, Colby, & Abrams, 1995). Consistent with this theoretical formulation, it has been suggested that exercise can serve to reduce stress reactivity and to supplant drinking as a primary coping mechanism (Hobson & Rejeski, 1993; Keller, 1980). Several studies have provided empirical support for this viewpoint. For example, Calvo, Szabo, and Capafons (1996) examined the relationship between participation in an exercise program (of strength, flexibility, and endurance) and emotional reactivity to stressful conditions and found that exercise was associated with reduced reactivity to psychological stress. Similarly, Sinyor, Schwartz, Peronnet, Brisson, and Serganian (1983) reported that individuals who participated in aerobic exercise (using an exercycle) demonstrated decreased reactivity to psychosocial stress on both subjective and physiological measures. Rejeski, Gregg, Thompson, and Berry (1991) reported that participation in aerobic exercise (cycling) appeared to have a buffering effect against mental stress among 12 adult participants. This buffering effect may decrease the likelihood that an individual will feel the need use drinking as a way of coping with stress.

## Exercise Applications in AUD

To our knowledge, only two controlled studies have examined the effects of an exercise intervention on alcohol use outcomes. The first of these was conducted by Sinyor, Brown, Rostant, and Seraganian (1982). In this study, 58 men and women receiving inpatient alcohol rehabilitation treatment engaged in 6 weeks of "tailored" exercise, consisting of progressively more rigorous physical exercise including stretching, calisthenics, and walking/running. Exercise participants demonstrated better abstinence outcomes posttreatment than did nonexercising participants from two comparison groups. Significant differences between exercisers and nonexercisers continued at 3-month and 18-month follow-up. Exercisers also experienced significant reductions in percentage of body fat and increases in maximum oxygen uptake during the course of the intervention.

The Sinyor et al. (1982) study appears to be the first and only study to have examined an exercise intervention with alcoholics in treatment. Yet, methodological shortcomings limit the extent to which conclusions may be drawn from this study. For example, participants were not randomly assigned to exercise or comparison conditions. Rather, participants in the exercise condition were compared with two small (*n*s = 9 and 12) comparison groups, one consisting of exercise participants from the exercise condition who did not fully participate and the other consisting of unmatched controls from another treatment facility. Thus, enhanced drinking outcomes experienced by exercise participants could have been a function of factors other than exercise.

A later study by T. J. Murphy and colleagues (1986) randomly assigned heavy drinking college students to running, meditation, or no-treatment control conditions. Participants tracked their exercise and drinking behavior using daily self-report journals over 8 weeks. At postintervention, participants assigned to either of the intervention conditions (running or meditation) demonstrated significant decreases in quantity of alcohol consumption compared with control participants. Findings from both studies are consistent in supporting a positive relationship between physical exercise and drinking outcomes.

Despite its overall methodological rigor, the T. J. Murphy et al. (1986) study was limited by small sample size (e.g., $n = 13$ in the running condition; less than $n = 20$ in any condition), reliance on self-report measures of exercise behavior, and high dropout of participants due to dissatisfaction with their group assignment. Although limited by methodological weaknesses, these studies nonetheless suggest the potential for positive outcomes to be achieved with exercise interventions for alcohol-dependent patients.

## Viability of Exercise as an Intervention: The Example of Smoking

Recent research has investigated the application of exercise interventions to the treatment of substance use disorders (see Murray, 1986; Tkachuk & Martin, 1999). The effect of exercise on nicotine dependence has received the most empirical attention. Correlational studies have shown increased fitness levels to be significantly associated with decreases in smoking behaviors (Cheraskin & Ringsdorf, 1971; Hickey, Mulcahy, Bourke, Graham, & Wilson-Davis, 1975), suggesting a potentially therapeutic effect of exercise on smoking cessation.

Further, experimental research has increasingly examined the effects of exercise on smoking outcomes (e.g., Martin et al., 1997). A number of positive effects of exercise for smoking cessation have been demonstrated, including decreased craving and reduced nicotine withdrawal (Bock et al., 1999; Pomerleau et al., 1987) and effects on initial smoking cessation and maintenance of long-term nonsmoking status (Marcus et al., 1999; Marcus, Albrecht, Niaura, Abrams, & Thompson, 1991; Marcus et al., 1995). The literature on exercise and smoking is relatively modest in amount, and more studies are needed to provide stronger support for exercise as a smoking cessation intervention (see Ussher, Taylor, West, & McEwen, 2000); however, research to date suggests that exercise may be a useful component of such interventions.

In light of possible overlapping etiologies for both tobacco and alcohol use disorders (Gulliver et al., 1995; Sher, Gotham, Erickson, & Wood, 1996), the literature on exercise and smoking cessation may provide a template for understanding how exercise might be applied to AUD. More research is clearly needed that applies exercise interventions in the treatment of alcohol-involved patients.

## Viability of Exercise as an Intervention: AUD

Researchers have recently been called on to demonstrate not only the efficacy of a particular treatment intervention (i.e., how well the intervention works in a controlled clinical trial) but also the treatment's effectiveness (the viability of implementing the intervention in a real-world setting). Fitness-based interventions may not only have positive effects on substance use and related outcomes but may also provide a potentially cost-effective and accessible adjunct to traditional treatment.

Increasingly, decisions about the provision of treatment for substance use disorders are based not only on clinical benefit but also on evidence of cost effectiveness (Holder, Longabaugh, Miller, & Rubonis, 1991). Using data derived from Project MATCH, Cisler and colleagues (Cisler, Holder, Longabaugh, Stout, & Zweben, 1998) estimated that the cost of implementing three common types of outpatient alcohol treatment (cognitive–behavioral, motivational enhancement, and 12-step facilitation therapies) ranged from $281 to $585 per treatment. More intensive

treatments such as residential services can be much more expensive, costing over $1,000 per treatment (French, McCollister, Cacciola, Durrell, & Stephens, 2002). Research suggests that adjunct or follow-up treatments are an important component of treatment for individuals with substance use disorders and may enhance the efficacy of an initial intervention (Humphreys & Moos, 2001; Lash, Petersen, O'Connor, & Lehmann, 2001; N. S. Miller, Ninonuevo, Hoffman, & Astrachan, 1999). Yet such continuing care potentially compounds the initial treatment cost over what is likely a longer period of time. Many forms of exercise (e.g., running, exercising to fitness videotapes, swimming) require minimal expense and, as adjunctive treatments, could represent an overall cost saving as compared with traditional aftercare treatment.

Exercise offers the additional advantages of flexibility and accessibility. As the current literature does not suggest the superiority of any particular *type* of exercise in reducing drinking or bringing about other positive consequences (e.g., Correia, Carey, & Borsari, 2000; T. J. Murphy et al., 1986; Sinyor et al., 1982), individuals may choose the mode of exercise best suited to their preferences and practical needs. Further, exercise does not require a trained clinician or an identified treatment facility. Thus, those seeking to engage in exercise can do so according to their own schedule and location, without being limited to the schedule, hours, and availability of a treatment provider. Participation in exercise is not contingent on approval from an insurance provider, and individuals engaging in physical exercise programs are not limited to a prespecified number of sessions to achieve their desired outcome.

Side effects are a major consideration in choosing a primary or adjunctive treatment for AUD. Broocks et al. (1998) found medication and exercise both to be effective treatments for anxiety disorders; however, participants in the medication group (clomipramine) reported significantly more side effects than did exercise participants. Disulfiram (Antabuse) and naltrexone are currently the only two approved medications in the United States for the treatment of alcohol dependence. Although side effects of naltrexone are less than for disulfiram, both medications have potentially dangerous side effects (Medical Economics Company, 2001; Schuckit, 1996). Although vigorous exercise has been associated with a transient but increased risk for cardiovascular complications such as myocardial infarction, the incidence of such occurrences is quite low (approximately 1 incident per 2,897,057 hr of exercise; American College of Sports Medicine [ACSM], 2000). Of course, exercise has the potential for exercise-related injuries, but with proper preventive strategies (such as appropriate warm-up and cool down procedures; ACSM, 2000), the risk of such injuries is likely to be minimal.

Rehabilitation from AUD requires physical as well as psychological recovery. Numerous studies have documented the deleterious effects of excessive alcohol use on the cardiovascular system, including increased blood pressure (Puddey, Beilin, & Vandongen, 1987; Puddey, Beilin, Vandongen, Rouse, & Rogers, 1985), degeneration of contractile functioning (Thomas, Rozanski, Renard, & Rubin, 1994) and structural changes in the heart (Rubin & Urbano-Marquez, 1994; Thomas et al., 1994). Physical exercise has been associated with *improved* cardiovascular health in alcohol-dependent samples (Frankel & Murphy, 1974; Gary & Guthrie, 1972; J. B. Murphy, 1970; Peterson & Johnstone, 1995). Other positive health changes reported in alcoholic samples as a result of exercise include significant decreases in body fat (Sinyor et al., 1982) and weight (Frankel & Murphy, 1974) and increases in muscular strength and flexibility (Peterson & Johnstone, 1995; Tsukue & Shohoji, 1981). Thus, exercise can facilitate positive changes in both physical and psychological health among alcoholics. Further, significant fitness improvements may be possible in this population despite previous physical deconditioning or impairments (Sinyor et al., 1982).

Those interested in exercise as a part of their AUD recovery do not necessarily have to commit to an intensive fitness regimen. Although participation in physical exercise has been associated with positive changes in mental health, evidence suggests that improvement in fitness outcomes is not a necessary requirement for this to occur (Berger & Owen, 1992; Doyne et al., 1987). Moreover, many studies have found that anaerobic exercise (e.g., weight training, flexibility training) also produces positive mental health changes, such as decreased depressive (Martinsen, Hoffart, & Solberg, 1989; Palmer et al., 1995) and anxiety symptoms (Berger & Owen, 1983) and increased self-concept (Williams & Cash, 1999). These encouraging findings suggest that psychological change is possible for those with differing fitness abilities and interests and that patients may benefit psychologically even from suboptimal training levels. Thus, although a specific frequency and quantity of aerobic exercise may be necessary to achieve desired physical health benefits (USDHHS, 1996), this may not be the case for positive mental health benefits.

Finally, preliminary evidence suggests that early recovery may represent a time in which individuals are open to making a variety of changes, including physical exercise, to improve their lives and the overall context of their recovery. A recent study (Read, Brown, et al., 2001) examined attitudes toward exercise in a sample of 105 individuals in intensive outpatient treatment for alcohol and other substance use disorders. Findings revealed that exercise-based interventions may be well received by persons early in AUD recovery, as participants identified a number of benefits to engaging in regular physical exercise, and many reported interest in initiating or continuing to engage in physical exercise as part of their recovery.

Despite the viability of exercise as an intervention for the treatment of AUD, some inherent risks are posed by promoting physical exercise in this population. Specifically, although exercise at moderate intensity is safe for most individuals, health risks of more vigorous exercise have been identified, particularly among sedentary individuals (ACSM, 2000). Because alcohol misuse has been associated with numerous deleterious health consequences (Wood, Vinson, & Sher, 2001), persons with AUD may be at particular risk and should undergo careful medical screening prior to beginning an exercise regimen.

## Directions for Future Research and Clinical Applications

### *Research Directions*

Existing studies have offered preliminary support for exercise as a viable and promising intervention for these alcohol-involved patients. However, there clearly is a need for more empirical investigation of exercise in individuals with AUD. Studies to date have relied on very small sample sizes (e.g., T. J. Murphy et al., 1986; Palmer et al., 1995; Sinyor et al., 1982), limiting generalizability and limiting statistical power to detect treatment effects.

Further, exercise studies with substance abuse populations have rarely consisted of controlled trials (see Folkins & Sime, 1981; Taylor et al., 1985; Tkachuk & Martin, 1999). Instead, studies have relied on convenience samples (e.g., persons already involved in treatment with an exercise facility available), in which participants are not randomized to condition (e.g., Palmer et al., 1988; Tsukue & Shohoji, 1981; Sinyor et al., 1982). Conclusions regarding the effects of exercise on the treatment of AUD must await the conduct of carefully controlled, randomized clinical trials.

Further, the existing literature on exercise and substance abuse outcomes has focused largely on the effects of *aerobic* exercise to the relative exclusion of other types of exercise. Although anaerobic exercise (e.g., weight training, yoga) has been shown to produce positive mental health outcomes (Berger & Owen, 1983; Palmer et al., 1995; Williams & Cash, 1999), only one study to our knowledge (T. J. Murphy et al., 1986) has examined the effects of anaerobic exercise on substance abuse outcomes.

Finally, only two of the studies of the effects of exercise among alcoholics have examined substance use as an outcome variable. Future studies should incorporate measures of substance use at posttreatment and over follow-up intervals to determine the impact of the exercise intervention on the reduction or elimination of drinking and drug use.

### *Clinical Applications*

Much is yet unknown regarding the effects of physical exercise on alcohol use and other outcomes among those in recovery from AUD. Yet the available evidence suggests that physical exercise likely is a beneficial and easily utilized adjunct treatment or relapse-prevention strategy for this population, and is consistent with a global wellness perspective that has been advocated by some researchers (e.g., Hodgson, 1994; Marlatt, 1985). There are a number of ways that treatment providers can help clients with AUD to initiate and continue in a physical exercise regimen. To begin with, clinicians should share information about the positive physical and psychological health benefits of exercise, particularly as they may pertain to substance abuse recovery. Specific connections drawn in this article and elsewhere (e.g., Bock et al., 1999; T. J. Murphy et al., 1986; Sinyor et al., 1983) between exercise and outcomes such as mood, self-efficacy, and decreased substance use should be articulated to the AUD client, so that he or she may see directly the benefits of physical exercise to recovery from an AUD.

A number of behavioral and cognitive–behavioral interventions for substance abuse have components that can be easily tailored for exercise adoption with those with AUD. These include using coping skills, planning pleasant activities, building positive social support, and drawing behavior contracts (Longabaugh et al., 1998; W. R. Miller & Wilbourne, 2002; Monti et al., 1995). Specifically, coping skills can include time-management skills, such as balancing exercise and recovery commitments, or anger-management skills, such as using physical exercise to work through painful or unpleasant emotions. Clinicians working with AUD clients frequently highlight the importance of positive behavioral alternatives to alcohol or other drug use (e.g., Dimeff & Marlatt, 1995; Glasser, 1976; Monti et al., 1995). Physical activity is just such an alternative activity. The importance of social networks that are supportive of an individual's AUD recovery has been well documented (Humphreys et al., 1995; Longabaugh et al., 1998). As individuals with AUD begin to seek out and build such networks, they may also seek out networks that are supportive of broader health behaviors such as physical exercise. Finally, just as clinicians commonly draw behavior contracts with clients around recovery activities such as 12-step meetings, clinicians may also include exercise activities for clients interested in incorporating exercise into their recovery.

Data suggest that low motivation may be a substantial barrier to engaging in physical exercise among persons with alcohol and other substance use disorders (Read, Brown, et al., 2001). Motivational enhancement approaches have been used successfully with persons with substance abuse populations not only to affect substance use behaviors but also to improve treatment adherence (Martino, Carroll, O'Malley, & Rounsaville, 2000; Walitzer, Derman, & Connors, 1999; Yahne & Miller, 1999). Accordingly, clinicians may use such motivation-based interventions to engage AUD individuals in an exercise program.

Treatment providers also may refer AUD clients to self-help manuals and workbooks designed to facilitate more active lifestyles (e.g., Blair, Dunn, Marcus, Carpenter, & Jaret, 2001; Hays, 1999). These manuals are easily accessible, are appropriate for a range of fitness levels, and offer step-by-step suggestions for increasing physical activity. Although not geared specifically toward individuals with alcohol or other substance use disorders, these materials may easily be adapted for this population.

Although research in this area is still in its infancy, both theory and empirical evidence suggest a role for exercise in producing positive outcomes for persons with AUD. However, more research is needed to address methodological limitations of existing studies, to expand current knowledge of person-specific and exercise-specific factors that may influence substance abuse outcomes, and to establish the efficacy of exercise interventions in the treatment of AUD. Exercise interventions of established efficacy would add an important adjunct treatment option for persons with AUD, thereby providing a healthy, accessible, and affordable means of achieving and maintaining long-term sobriety.

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