

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/232494467>

# ~~The role of physical exercise in alcoholism treatment and recovery~~

Article in *Professional Psychology Research and Practice* - February 2003

DOI: 10.1037/0735-7028.34.1.49

---

CITATIONS

41

---

READS

482

2 authors:



Jennifer P Read

University at Buffalo, The State University of New York

137 PUBLICATIONS 6,000 CITATIONS

[SEE PROFILE](#)



Richard A Brown

University of Texas at Austin

189 PUBLICATIONS 10,301 CITATIONS

[SEE PROFILE](#)

Some of the authors of this publication are also working on these related projects:



Marijuana Outcomes Study Team [View project](#)



Cross-cultural Alcohol Study (CAS) [View project](#)

Regular article

## Exercise attitudes and behaviors among persons in treatment for alcohol use disorders

Jennifer P. Read, Ph.D.<sup>a,\*</sup>, Richard A. Brown, Ph.D.<sup>b,c</sup>, Bess H. Marcus, Ph.D.<sup>d,e</sup>,  
Christopher W. Kahler, Ph.D.<sup>b,c</sup>, Susan E. Ramsey, Ph.D.<sup>b,c</sup>, Mary Ella Dubreuil, R.N.<sup>c</sup>,  
John M. Jakicic, Ph.D.<sup>b,e</sup>, Caren Francione, B.A.<sup>c</sup>

<sup>a</sup>*Brown University Center for Alcohol and Addiction Studies, Providence, RI*

<sup>b</sup>*Brown University School of Medicine, Providence, RI*

<sup>c</sup>*Butler Hospital, Providence, RI*

<sup>d</sup>*Brown University Center for Behavioral and Preventive Medicine, Providence, RI*

<sup>e</sup>*The Miriam Hospital, Providence, RI*

Received 9 June 2001; received in revised form 4 September 2001; accepted 14 September 2001

### Abstract

The present study investigated self-reported exercise behaviors and exercise-related attitudes in a sample ( $N = 105$ ) of adults in treatment for alcohol use disorders (AUD) (abuse or dependence). Slightly less than half (47%) of participants reported engaging in regular physical exercise (3 times per week or more). Level of alcohol dependence was not significantly associated with level of physical exercise activity. Level of nicotine dependence was significantly and negatively associated with physical activity level. Nicotine dependence and level of depressive symptoms were both significantly negatively associated with self-efficacy for physical exercise (SPE). Exercise self-efficacy mediated the relationship between nicotine dependence and physical activity level. Tension and stress reduction were among the most strongly endorsed of the perceived benefits of physical activity. Other perceived benefits included more positive outlook and increased self-esteem. Financial costs associated with exercise, lack of motivation, and time constraints were among the most common perceived barriers to exercise in this sample. Together, these preliminary data indicate that exercise-based interventions may be well-received by those early in recovery from AUD. © 2002 Elsevier Science Inc. All rights reserved.

*Keywords:* Exercise; Alcohol; Substance abuse; Fitness

### 1. Introduction

In the past two decades, a number of behavioral health professionals have advocated for a broadened view of alcohol use disorder (AUD) treatment that includes global health and wellness changes as part of the recovery process (Agne & Paolucci, 1982; Hodgeson, 1994; Marlatt & Gordon, 1980). Physical exercise may be one of a number of such lifestyle changes that can facilitate psychological and physical recovery in persons with AUD. Physical exercise is a particularly appealing treatment option for this

population as it is easily accessible, is relatively low cost, and does not require a trained treatment provider or insurance approval. Further, individuals can engage in physical exercise according to their own scheduling needs. A handful of studies have employed physical exercise interventions with substance abuse samples. Findings from these studies have shown physical exercise to be associated with improvements in physical health (Frankel & Murphy, 1974; Peterson & Johnstone, 1995; Sinyor, Brown, Rostant, & Serganian, 1982; Tsukue & Shohoji, 1981), anxiety and depression (Frankel & Murphy, 1974; Palmer, Vacc, & Epstein, 1988; Palmer, Palmer, Michiels, & Thigpen, 1995), self-concept (Gary & Guthrie, 1972), and alcohol outcomes (Sinyor et al., 1982).

Accordingly, many have called for increased attention to the role of physical exercise in AUD treatment and have advocated for the implementation of physical exercise pro-

\* Corresponding author. Brown University Center for Alcohol and Addiction Studies, Box G-BH, Providence, RI 02912, USA. Tel.: +1-401-455-6221.

*E-mail address:* Jennifer\_Read@Brown.edu (J. P. Read).

grams in alcohol treatment facilities (Bartha & Davis, 1982; Murray, 1986; Palmer et al., 1988; Tkachuk & Martin, 1999). Despite the promise of and enthusiasm for exercise-based interventions for AUD populations, very little is currently known about attitudes toward physical exercise or exercise behaviors among persons in early recovery from AUD. Nor, to our knowledge, is there any available literature regarding the extent to which persons in early recovery from AUD might be amenable to participation in this type of intervention.

Information regarding exercise habits and attitudes toward exercise in persons with AUDs represents an important first step toward the development of exercise-based interventions for this population. To this end, we wanted to identify the psychosocial and cognitive correlates of physical exercise and perceived barriers to exercise to provide a focal point for targeted interventions to increase physical activity in early AUD recovery and to enhance exercise-based treatment adherence. We also sought to determine how attractive and feasible an exercise-based intervention would be with this population.

## 2. Materials and methods

### 2.1. Study setting

The setting of this study was an intensive, outpatient, substance abuse day hospital treatment program located at a private psychiatric hospital in northern Rhode Island. Patients are admitted to the day hospital upon completion of detoxification from alcohol and other substances. Treatment is abstinence-oriented and generally focuses on substance abuse as a learned, maladaptive behavior pattern. The treatment is offered primarily in group format, and four treatment groups lasting approximately one hour each are provided during each six-hour treatment day. Time not spent in treatment groups is used for individual meetings with physicians and counselors, or for breaks. Length of stay is approximately five weekdays.

### 2.2. Participants

Participants ( $N = 105$ ) were patients who carried a DSM-IV diagnosis of either alcohol abuse or alcohol dependence. Two-thirds of the sample ( $n = 70$ ) were men, and the overwhelming majority of the participants (94%,  $n = 99$ ) were white. Participants' ages ranged from 18 to 63, with a mean age of 39 ( $SD = 10.7$ ). On average, participants had completed 1 year of college ( $SD = 2.2$ ), with a modal education level of 12th grade. The majority of participants (53%,  $n = 56$ ) worked in jobs that involved manual labor. Approximately 9% of the sample identified themselves as not currently working, either due to being in school, being disabled, or being retired. Sixty-three percent ( $n = 66$ ) of the sample were regular smokers.

### 2.3. Procedure

Participants were recruited from the treatment program by a research assistant. Patients were usually approached for recruitment on the second or third day of treatment. Once recruited, participants completed informed consent and a battery of self-report measures (outlined below). Completion of the questionnaire battery took approximately 30 minutes. All participants received a \$20 gift certificate to a local shopping mall or supermarket for their participation. One hundred twenty-seven patients were invited to participate in this study, for an acceptance rate of 83%.

#### 2.3.1. Substance use characteristics

*2.3.1.1. The Alcohol Dependence Scale (ADS).* ADS (Skinner & Allen, 1982; Skinner & Horn, 1984) was used to measure severity of alcohol dependence. The ADS is a brief (23-item) self-report measure with demonstrated validity (Skinner & Allen, 1982). Between two and four multiple choice response options are provided for each answer. Total scores on this measure ranged from 0 to 44 in the present sample. A score of 9 or more on this scale is thought to correspond to a DSM diagnosis of alcohol dependence.

*2.3.1.2. The Fagerstrom Test for Nicotine Dependence (FTND).* The FTND (Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991) was used to assess smoking status, including average number of cigarettes smoked daily, and as a continuous measure of nicotine dependence. The FTND has shown good internal consistency, a single dimension factor structure, and positive relationships with degree of nicotine intake. The FTND is considered to be a standard instrument for measuring nicotine dependence. Average scores on this measure have ranged from 5 to 7 in nicotine dependent samples (Heatherton et al., 1991; Payne, Smith, McCracken, & McSherry, 1994).

#### 2.3.2. Mood symptoms

*2.3.2.1. The Center for Epidemiological Studies of Depression Scale (CES-D).* The CES-D (Radloff, 1977) was used to assess depressive symptomatology. This well-validated 22-item scale is rated on a 4-point, Likert-type scale, with higher scores indicative of greater depressive symptomatology. In clinical samples, a cutoff of 16 is thought to be suggestive of significant depressive symptomatology (Boyd, Weissman, Thompson, & Meyers, 1982).

#### 2.3.3. Exercise-related variables

*2.3.3.1. Exercise behaviors and attitudes.* A self-report survey designed by the researchers was used to assess current exercise behaviors, as well as attitudes and prefer-

ences toward physical exercise.<sup>1</sup> Items designed to assess exercise behaviors were based on American College of Sports and Medicine (ACSM) guidelines (i.e., at least 20 minutes, 3 times weekly) (American College of Sports and Medicine, 1998) and were designed so as to determine whether participants were meeting minimum recommendations for weekly physical exercise. Specifically, participants were asked, “Do you currently engage in physical exercise of moderate intensity (such as brisk walking/running/cycling) for a minimum of 20 continuous minutes, at least once per week?” Participants who responded “yes” to this question were then queried about weekly frequency and duration of exercise sessions. Exercise frequency was assessed with a single question which asked how many days per week on average the individual exercised. Responses were rated on a 6-point scale, ranging from one day a week to six or more days per week. Average duration of exercise sessions was similarly assessed with a single question. Response options for this question ranged from less than 20 minutes per session to 50 minutes or more.

The self-report survey also assessed level of interest and willingness to engage in a physical exercise-based intervention as part of their recovery from substance abuse exercise, as well as perceived barriers to participation in an exercise program. Regarding interest, participants were asked, “How interested would you be in participating in an indoor exercise program at the hospital after you complete (SUD) treatment?” Responses were rated according to a 5-point Likert-type scale that ranged from not at all interested to extremely interested. Participants who indicated any interest in such a program were then queried about exercise preferences (i.e., individual vs. group, type of exercise preferred).

To assess perceived barriers to engaging in physical exercise, we asked, “What barriers, if any, do you think might prevent you from engaging in an exercise program as part of your recovery from substance abuse?” Ten barriers were provided, and participants were instructed to check all barriers that they foresaw as relevant to them. Additionally, participants were provided with the option to write in additional barriers that had not already been provided in the survey.

**2.3.3.2. Self-Efficacy for Physical Exercise (SPE).** A 5-item, Likert-type self-report measure designed by Marcus, Selby, Niaura, and Rossi (1992) was used to evaluate participants’ confidence in their ability to engage in physical exercise (self-efficacy). Items represent the areas of negative affect, resisting relapse, and making time for exercise. Items are rated on a 5-point Likert-type scale with higher ratings indicating greater SPE. This measure has

demonstrated adequate (i.e., .70 or higher) internal and test-retest reliability in physical exercise intervention trials (Marcus et al., 1992).

**2.3.3.3. Exercise decisional balance.** Decision-making for exercise was measured by a 16-item Decisional Balance instrument (Marcus, Rakowski, & Rossi, 1992). This survey required participants to rate pros and cons of engaging in physical exercise on a 5-point Likert-type scale. Higher ratings indicated the item to be of greater importance to the respondent. Separate scores were calculated for pros and for cons.

### 3. Results

All participants in the study carried an AUD diagnosis (abuse or dependence) according to hospital medical charts. The average ADS score in this sample was 18.8 ( $SD = 9.3$ ). Sixty-six (63%) of the participants in this study were regular smokers, smoking an average of 20.9 ( $SD = 9.9$ ) cigarettes daily, and with an average FTND score of 6.0 ( $SD = 2.2$ ). These scores indicate relatively high levels of alcohol and nicotine dependence, respectively.

#### 3.1. Physical exercise

Forty percent of participants ( $n = 42$ ) reported exercising less than once a week. Slightly less than half ( $n = 49$ , 46%) reported exercising three times weekly or more. The average number of weekly exercise sessions engaged in by participants who exercised was 2.4 ( $SD = 2.4$ ), and participants who exercised did so for an average of 40–49 minutes each session. There were no significant gender differences in physical exercise level. Further, neither age nor education level was significantly associated with physical exercise level.

#### 3.2. Exercise-related variables

The mean score for SPE in this sample was 2.9 ( $SD = .78$ , range = 1–5), indicating a moderate level of self-efficacy. There were no significant gender differences in SPE scores. SPE was significantly and positively associated with self-reported physical activity level [ $r(105) = .37$ ,  $p < .001$ ].

Using the decisional balance for physical exercise questionnaire, mean scores were computed for two subscales (pros and cons). Scale averages ranged from 1 to 5. Overall, participants rated the pros of engaging in regular physical exercise as being more important ( $M = 4.10$ ,  $SD = .68$ ) than the cons ( $M = 2.36$ ,  $SD = .83$ ). We also analyzed individual decisional balance items. Means for these self-reported pros and cons of engaging in physical exercise are presented in Table 1. The most strongly endorsed pros of engaging in regular physical exercise were tension relief, feeling less stressed, and having a more positive attitude. Fatigue at the

<sup>1</sup> A copy of the questionnaire may be obtained by contacting the first author at Brown University Center for Alcohol and Addiction Studies, Box G-BH, Providence, RI 02912.

Table 1  
Mean average ratings of pros and cons of engaging in physical exercise

Decision balance items	Mean (SD)
<i>Pros</i>	
I would have more energy for my family and friends.	3.72 (1.08)
Regular physical activity would help me relieve tension.	4.31 (0.73)
I would feel more confident.	4.02 (1.00)
I would sleep more soundly.	4.15 (0.87)
I would feel good about myself.	4.16 (0.92)
I would like my body better.	4.10 (1.09)
I would feel less stressed.	4.25 (0.91)
I would feel more comfortable with my body.	4.06 (1.07)
Regular physical activity would help me have a more positive outlook on life.	4.25 (0.85)
<i>Cons</i>	
I think I would be too tired to do my daily work after being physically active.	2.21 (1.18)
I would find it difficult to find a physical activity that I enjoy that is not affected by bad weather.	2.42 (1.30)
I feel uncomfortable when I engage in physical activity because I get out of breath and my heart beats very fast.	2.50 (1.35)
Regular physical activity would take up too much of my time.	2.10 (1.15)
I would have less time for my family and friends.	2.35 (1.18)
At the end of the day, I am too exhausted to be physically active.	2.56 (1.25)

Note. Minimum score = 1 (Not important at all), maximum = 5 (Extremely important).

end of the day and poor physical condition were the most strongly endorsed cons of physical exercise.

### 3.3. Relations among substance use, psychological, and exercise variables

We examined associations between substance use and psychological variables and physical activity level. Level of alcohol dependence was not significantly associated with level of physical activity. However, a *t*-test indicated that nonsmokers reported significantly greater levels of exercise than smokers [ $t(102) = 2.69, p < .01$ ] (averaging 3.3 and 2.0 days per week, respectively). Moreover, among those who smoked regularly, number of cigarettes smoked per day was significantly and negatively associated with physical exercise levels [ $r(105) = -.25, p < .05$ ]. Level of nicotine dependence (measured by the FTND) also was negatively correlated with physical exercise levels [ $r(66) = -.26, p < .01$ ]. These data suggest that increased nicotine involvement is associated with lower self-reported levels of physical exercise. Nicotine involvement also showed significant associations with SPE. Greater number of cigarettes smoked per day [ $r(105) = -.25, p < .05$ ] and higher FTND scores [ $r(66) = -.48, p < .001$ ] each demonstrated significant, negative associations with SPE. There were no significant differences between smokers and nonsmokers in terms of interest in initiating physical exercise (as measured by the exercise survey). Relations between depressive symptoms and physical activity level and self-efficacy for exercise mirrored those of nicotine involvement. Higher level of depressive symptoms was negatively asso-

ciated with levels of physical exercise [ $r(105) = -.28, p < .01$ ] and with SPE [ $r(105) = -.24, p < .05$ ]. Level of alcohol dependence was significantly positively associated with number of depressive symptoms [ $r(105) = .27, p < .01$ ].

We used multiple regression analyses to examine relations of number of cigarettes smoked per day and CES-D scores with physical activity level in a multivariate context. Consistent with bivariate correlations, daily number of cigarettes ( $\beta = -.24, p < .05$ ) and level of depressive symptoms ( $\beta = -.28, p < .01$ ) were significantly and negatively associated with physical activity level in this regression model. Together, daily number of cigarettes and level of depressive symptoms accounted for 14% of the total variance in exercise level.

To test for the mediating effects of self-efficacy, we then added SPE to the overall regression model. With this inclusion, the relationship between number of cigarettes per day and physical activity level was no longer significant. Also, when SPE was included in the model, the relationship between CES-D scores and physical activity was diminished, but remained significant ( $\beta = -.21, p < .05$ ). The amount of total variance in exercise level in this regression model was .20. These results suggest that self-efficacy mediates the relationship between nicotine involvement and physical activity level, and at least attenuates (or partially mediates) the relation between depressive symptoms and physical activity level (see Fig. 1).

### 3.4. Interest in and perceived barriers to physical exercise in substance abuse recovery

All participants were asked to gauge the extent to which they would be interested in participating in a physical fitness

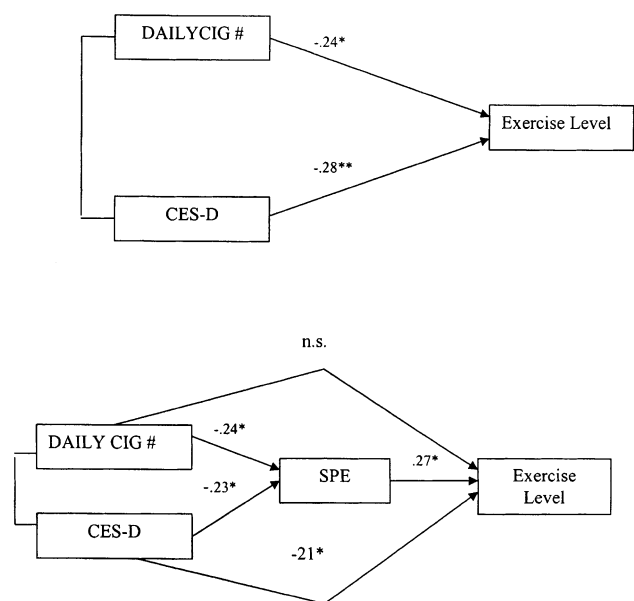


Fig. 1. Mediational role of self-efficacy. Note. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

### Perceived Barriers to Physical Exercise

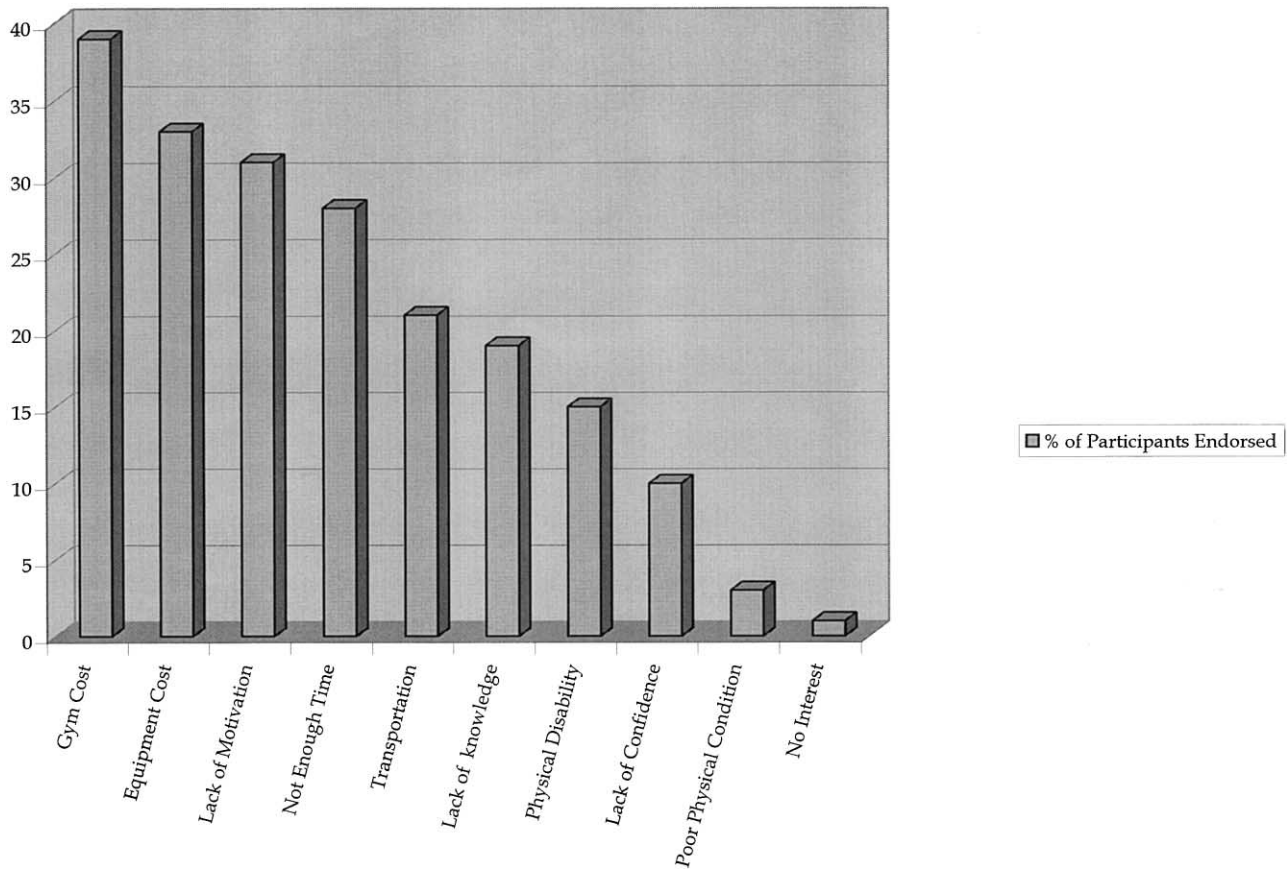


Fig. 2. Perceived barriers to physical exercise.

program as part of their AUD recovery. Over 54% ( $n = 57$ ) of the sample reported they would be very or extremely interested in participating in such a program. Another 21% ( $n = 22$ ) indicated slight or moderate interest. Approximately a quarter of those surveyed (24.8%,  $n = 26$ ) reported having no interest in such a program. In response to a survey question inquiring about *types* of physical activity in which participants would prefer to engage, the most commonly endorsed items were walking (66%), weight lifting (66%), and cycling (59%). Participants were evenly divided regarding whether they would prefer to exercise individually ( $n = 41$ , 51%) or in a group ( $n = 38$ , 48%).

Participants were also asked about barriers that might prevent them from engaging in an exercise program as part of their substance abuse recovery. Participants, both regular exercisers and those who indicated they did not exercise regularly, identified an average of 2.0 ( $SD = 1.6$ ) barriers to engaging in regular physical exercise. There were no differences between exercisers and nonexercisers in terms of the number of barriers identified. Nor were gender differences found. Rates of endorsement of each of these barriers are presented in Fig. 2. Lack of motivation, lack of time, and perceived costs associated with exercise (i.e., gym member-

ship, exercise equipment) were among the most commonly endorsed barriers to exercise participation.

#### 4. Discussion

Overall, our findings indicate that exercise-based interventions may be well-received by persons early in AUD recovery. Participants indicated they saw a number of benefits of engaging in regular physical exercise, and many were interested in initiating or continuing to engage in physical exercise as part of their recovery.

Slightly less than half of participants in our sample reported engaging in at least the minimum amount of physical exercise recommended by the ACSM (at least 20 minutes, 3 times weekly) (1998). This level of physical exercise is relatively high compared to the general U.S. population (Stephens, 1987). Although possibly a function of the way that exercise was measured in our study (see discussion below), this relatively high level of physical activity could reflect the high proportion of individuals in this sample whose work involves some sort of manual labor. Specifically, the rates of exercise endorsed by those in our

sample may represent the extent to which these individuals are physically active throughout the course of their day rather than whether they engage regularly in an exercise regimen for fitness purposes. Indeed, in this sample, poor physical condition was among the least endorsed of the perceived barriers to exercise, suggesting that a substantial portion of those in our sample may already be quite physically active.

Still, our data indicate that even among these relatively active participants, there is room for improvement in fitness and activity level. For example, participants indicated exercising an average of approximately 45 minutes per exercise session, and the average number of exercise sessions engaged in per week was slightly less than 3. This is less than recommended by the ACSM (1998). Accordingly, efforts to engage AUD patients in exercise-based interventions may involve both introducing a new exercise regimen to those who are currently sedentary, and also seeking to enhance current levels of fitness and to improve upon existing exercise regimens among those who are already physically active.

Consideration of the benefits (pros) and costs (cons) of engaging in a behavior have been shown to predict the likelihood of engaging in health change behaviors (e.g., Marcus & Owen, 1992; Marcus, Rakowski, & Rossi, 1992; Velicer, DiClemente, Prochaska, & Brandenburg, 1985). Specifically, the extent to which an individual perceives the benefits of a behavior as outweighing the costs of that behavior is linked to the likelihood of that behavior being adopted. In our study, participants endorsed a number of potential benefits of engaging in regular physical exercise and identified the benefits of adopting such a program as being more important than the costs. Certainly, the intellectual process of evaluating the pros and cons of engaging in an exercise regimen may not translate into the ultimate adoption of regular physical exercise. However, a substantial literature suggests that beliefs about and attitudes toward exercise are associated with actual exercise behavior (Blue, 1995; Steptoe et al., 1997). Thus, the beliefs about the pros and cons of physical exercise endorsed by these individuals may reflect a likelihood that they might ultimately engage in an exercise regimen.

Although the literature has suggested that increased physical activity may be associated with decreased alcohol use (see Sinyor et al., 1982; Murphy, Pagano, & Marlatt, 1986), higher levels of alcohol dependence were not associated with lower levels of physical activity in our sample. This may have been the result of a “ceiling effect”—such that generally high scores on the ADS limited the overall range of scores on this measure. Elevated levels of depressive symptoms were significantly and positively associated with higher ADS scores and were significantly negatively associated with physical activity level. Depression and AUD commonly co-occur (Kessler et al., 1997; Rhode, Lewinsohn, & Seeley, 1991; Swendsen et al., 1998), and these data suggest that

persons with this comorbidity may be at particular risk for inactivity.

The literature has shown an inverse relationship between smoking behavior and fitness levels (e.g., Cheraskin & Ringsdorf, 1971; Hickey, Mulcahy, Bourke, Graham, & Wilson-Davis, 1975). Our data are consistent with this literature and suggest that smoking is a risk factor for physical inactivity, as non-smokers were shown to engage in more exercise than smokers. Moreover, among those who smoked, number of daily cigarettes and level of nicotine dependence were significantly related to physical exercise level. Recent data indicate that physical exercise may aid in the smoking cessation process (Marcus et al., 1999). Thus, getting persons in AUD recovery involved in exercise may also facilitate smoking cessation efforts in this high risk group.

Both theory and empirical work indicate that confidence in one’s ability to perform a particular behavior is strongly related to the likelihood of engaging in that behavior (Bandura, 1977; DiClemente, 1981). Consistent with this literature, findings from our study showed SPE to be associated with exercise activity level. SPE was negatively associated with nicotine involvement and with depressive symptoms. Thus, self-efficacy for exercise may be an important target for intervention by health professionals seeking to facilitate the initiation of physical activity. Further, in light of the mediational role that self-efficacy may play in the relationship between nicotine involvement and physical activity level, persons in AUD recovery who are also smokers may benefit particularly from self-efficacy enhancing interventions (e.g., motivational interviewing) geared toward increasing physical activity level. Our findings regarding the role of SPE in relations between depressive symptoms and physical exercise suggest that self-efficacy may also be an important focal point for individuals experiencing depressive symptoms.

Participants identified a number of barriers to engaging in exercise. Lack of motivation was among the most common of these perceived barriers. The majority of other barriers endorsed were instrumental (e.g., transportation, cost). Lack of interest in physical exercise was the least commonly endorsed of the barriers. For the most part, barriers identified by these patients are remediable. For example, with regard to low motivation, motivational enhancement approaches have been widely used with persons with alcohol and other substance use disorders not only to directly affect substance use behaviors, but also to improve treatment adherence (Martino, Carroll, O’Malley, & Rounsaville, 2000; Walitzer, Derman, & Connors, 1999; Yahne & Miller, 1999). Our data suggest that motivation-based interventions may be useful for engaging AUD patients in an exercise treatment program.

To address instrumental barriers to exercise, skills training (i.e., time management skills) and brief education around less costly types of physical activity (e.g., running, walking, cycling, at-home exercise tapes) are likely to increase interest in and willingness to commit to a regular physical exercise

program. In sum, our findings suggest that specific interventions may help patients overcome some of the most commonly perceived barriers to exercise. Further, knowledge of these barriers will allow exercise-based interventions to be developed such that these barriers are addressed, and hence AUD patients will be more likely to participate.

#### 4.1. Limitations and conclusions

This study had several limitations. As mentioned previously, we relied solely on retrospective self-report data regarding current level of physical activity. As a result, it is possible that participants may have presented themselves as being more physically active than they truly are. A well-validated retrospective approach, such as the 7-Day Physical Activity Recall (Blair et al., 1985), or prospective daily behavioral logs may have served to assess exercise activity more reliably. Corroborating information from friends or family members might also have enhanced the accuracy of the self-report data. Further, a more specific question regarding type of physical exercise and rate of perceived exertion may have helped to clarify the nature of participants' exercise activity (e.g., whether exercise consists of work activity or of discrete exercise sessions).

The cross-sectional design of the study precludes an understanding of temporal relations among the variables of interest. Thus, although our findings indicate some associations among variables (i.e., level of nicotine involvement, level of depressive symptoms, SPE, and physical exercise level), the present design does not allow for the determination of the direction of these associations.

Another limitation is the size and ethnic homogeneity of our sample. A larger and more diverse sample would allow for greater confidence in the extent to which exercise behaviors and attitudes reported in our sample are adequately representative of persons in treatment for AUD.

Despite its limitations, the present study provides what is to our knowledge the first examination of exercise behaviors and attitudes among persons in AUD treatment. The time when individuals enter into treatment may represent a "teachable moment" in which individuals can make a variety of changes to improve their lives and the overall context of their recovery. Adoption of a regular physical exercise regimen is one such change. Our findings indicate that this population may be both interested and willing to participate in exercise-based interventions as part of their substance abuse recovery. Further, our data point to specific areas (i.e. self-efficacy, motivation) that treatment providers may wish to target in order to enhance the likelihood of adoption and maintenance of this lifestyle change.

#### Acknowledgments

The authors gratefully acknowledge the contributions of Lyette Farrell, Sue Sales, David Strong, Brooke Webster,

and Lisa Williams in the collection of data and in the preparation of this manuscript.

#### References

- Agne, C., & Paolucci, K. (1982). A holistic health approach to an alcoholic treatment program. *Journal of Drug Education, 12*, 137–144.
- American College of Sports and Medicine. 1998. Position stand: the recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness and flexibility in healthy adults. *Medicine and Science in Sports and Exercise, 30* (6), 975–991.
- Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review, 84*, 191–215.
- Bartha, R., & Davis, T. (1982). Holism and high level wellness. *Journal of Alcohol and Drug Education, 28*, 28–31.
- Blair, S. N., Haskell, W. L., Ho, P., Paffenbarger, R. S., Vranizan, K. M., Farquhar, J. W., & Wood, P. D. (1985). Assessment of habitual physical activity by a seven-day recall in a community survey and controlled experiments. *American Journal of Epidemiology, 122*, 794–804.
- Blue, C. L. (1995). The predictive capacity of the Theory of Reasoned Action and the Theory of Planned Behavior in exercise research: an integrated literature review. *Research in Nursing and Health, 18*, 105–121.
- Boyd, J. H., Weissman, M. M., Thompson, W. D., & Meyers, J. K. (1982). Screening for depression in a community sample: understanding discrepancies between depression symptom and diagnostic scales. *Archives of General Psychiatry, 39*, 1195–1200.
- Cheraskin, E., & Ringsdorf, W. M. (1971). Predictive medicine: physical activity. *Journal of the American Geriatric Society, 19*, 969–973.
- DiClemente, C. C. (1981). Self-efficacy and smoking cessation maintenance: a preliminary report. *Cognitive Theory and Research, 10*, 319–338.
- Frankel, A., & Murphy, J. (1974). Physical fitness and personality in alcoholism. Canonical analysis of measures before and after treatment. *Quarterly Journal of Studies on Alcohol, 35*, 1272–1278.
- Gary, V., & Guthrie, D. (1972). The effect of jogging on physical fitness and self-concept in hospitalized alcoholics. *Quarterly Journal of Studies on Alcohol, 33*, 1073–1078.
- Heatherton, T. F., Kozlowski, L. T., Frecker, R. C., & Fagerstrom, K. O. (1991). The Fagerstrom Test for Nicotine Dependence: a revision of the Fagerstrom Tolerance Questionnaire. *British Journal of Addictions, 86*, 119–127.
- Hickey, N., Mulcahy, R., Bourke, T., Graham, I., & Wilson-Davis, K. (1975). Study of coronary risk factors related to physical activity in 15,171 men. *British Medical Journal, 3*, 507–509.
- Hodgeson, R. (1994). Treatment of alcohol problems. *Addiction, 89*, 1529–1534.
- Kessler, R. C., Crum, R. M., Warner, L. A., Nelson, C. B., Schulenberg, J. S., & Anthony, J. C. (1997). Lifetime co-occurrence of DSM-III-R alcohol abuse and dependence with other psychiatric disorders in the National Comorbidity Survey. *Archives of General Psychiatry, 54*, 313–321.
- Marcus, B. H., Albrecht, A. E., King, T. K., Parisi, A. F., Pinto, B. M., Roberts, M., & Abrams, D. B. (1999). The efficacy of exercise as an aid for smoking cessation in women. *Archives of Internal Medicine, 159*, 1229–1234.
- Marcus, B. H., & Owen, N. (1992). Motivational readiness, self-efficacy, and decision-making for exercise. *Journal of Applied Social Psychology, 22*, 3–16.
- Marcus, B. H., Rakowski, W., & Rossi, J. (1992). Assessing motivational readiness and decision-making for exercise. *Health Psychology, 11*, 257–261.
- Marcus, B. H., Selby, V. C., Niaura, R. S., & Rossi, J. S. (1992). Self-efficacy and the stages of exercise behavior change. *Research Quarterly for Exercise and Sport, 63*, 60–66.



- Marlatt, G. A., & Gordon, J. R. (1980). Determinants of relapse: implications for the maintenance of behavior change. In: P. O. Davidson & S. M. Davidson (Eds.), *Behavioral medicine: changing health lifestyles*. New York: Brunner/Mazel.
- Martino, S., Carroll, K. M., O'Malley, S. S., & Rounsaville, B. J. (2000). Motivational interviewing with psychiatrically ill substance abusing patients. *American Journal on Addictions*, 9, 88–91.
- Murphy, T. J., Pagano, R. R., & Marlatt, G. A. (1986). Lifestyle modification with heavy alcohol drinkers: effects of aerobic exercise and meditation. *Addictive Behaviors*, 11, 175–186.
- Murray, P. A. (1986). Fitness and recovery. *Alcohol Health and Research World*, 11, 30–32.
- Palmer, J., Palmer, L. K., Michiels, K., & Thigpen, B. (1995). Effects of type of exercise on depression in recovering substance abusers. *Perceptual and Motor Skills*, 80, 523–530.
- Palmer, J., Vacc, N., & Epstein, J. (1988). Effects of type of exercise on depression in recovering substance abusers. *Perceptual and Motor Skills*, 80, 523–530.
- Payne, T. J., Smith, P. O., McCracken, L. M., & McSherry, W. C. (1994). Assessing nicotine dependence: a comparison of the Fagerstroem Tolerance Questionnaire (FTQ) with the Fagerstroem Test for Nicotine Dependence (FTND) in a clinical sample. *Addictive Behaviors*, 19, 307–317.
- Peterson, M., & Johnstone, B. M. (1995). The Atwood Hall Health Promotion Program, Federal Medical Center, Lexington, KY: effects on drug-involved federal offenders. *Journal of Substance Abuse Treatment*, 12, 43–48.
- Radloff, L. S. (1977). The CES-D: A new self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1, 385–401.
- Rhode, P., Lewinsohn, P. M., & Seeley, J. R. (1991). Comorbidity of unipolar depression. KK. Comorbidity with other mental disorders in adolescents and adults. *Journal of Abnormal Psychology*, 100, 214–222.
- Sinyor, D., Brown, T., Rostant, L., & Serganian, P. (1982). The role of a physical fitness program in the treatment of alcoholism. *Journal of Studies on Alcohol*, 43, 380–386.
- Skinner, H. A., & Allen, B. A. (1982). Alcohol dependence syndrome: measurement and validation. *Journal of Abnormal Psychology*, 91, 199–209.
- Skinner, H. A., & Horn, J. L. (1984). *Alcohol Dependence Scale: Users Guide*. Toronto: Addiction Research Foundation.
- Stephens, T. (1987). Secular trends in adult physical activity: exercise boom or bust? *Research Quarterly for Exercise and Sport*, 58, 94–105.
- Steptoe, A., Wardle, J., Fuller, R., Holte, A., Justo, J., Sanderman, R., & Wichstrom, L. (1997). Leisure-time physical exercise: prevalence, attitudinal correlates, and behavioral correlates among young Europeans from 21 countries. *Preventive-Medicine: An International Journal Devoted to Practice and Theory*, 26, 845–854.
- Swendsen, J. D., Merikangas, K. R., Canino, G. J., Kessler, R. C., Rubio-Stipec, M., & Angst, J. (1998). The comorbidity of alcoholism with anxiety and depressive disorders in four geographic communities. *Comprehensive Psychiatry*, 39, 176–184.
- Tkachuk, G. A., & Martin, G. L. (1999). Exercise therapy for patients with psychiatric disorders: research and clinical implications. *Professional Psychology: Research and Practice*, 30, 275–282.
- Tsukue, I., & Shohoji, T. (1981). Movement therapy for alcoholic patients. *Journal of Studies on Alcohol*, 42, 144–149.
- Velicer, W. F., DiClemente, C. C., Prochaska, J. O., & Brandenburg, N. (1985). A decisional balance measure for assessing and predicting smoking status. *Journal of Personality and Social Psychology*, 48, 1279–1289.
- Walitzer, K. S., Derman, K. H., & Connors, G. J. (1999). Strategies for preparing clients for treatment: a review. *Behavior Modification*, 23, 129–151.
- Yahne, C. E., & Miller, W. R. (1999). Enhancing motivation for treatment and change. In: B. S. McCrady & E. Epstein (Eds.), *Addictions: a comprehensive guidebook* (pp. 235–249). New York: Oxford University Press.