

# Exercise as Treatment for Alcohol Dependence

## - A Pilot Study -

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**O**bjective: The clinical management of alcohol dependence involves evidence-based knowledge on medical treatment, physical training, and psychological management. This pilot study investigates the effect of physical exercise on cardio-respiratory fitness and socio-psychological outcomes. **Design:** 10 alcohol patients are included to 12 times moderate intensity exercise in groups. **Methods:** Aerobic power, anxiety, and depression are measured at baseline and post intervention. Observations of the instructor are described. **Results:** No significant change of aerobic power, but decreased subjective exhaustion. A trend is shown of decreased depression and less concern. Clinical observations showed the testing environment as obstacle and found the communicative role of the instructor crucial. **Conclusion:** Future research with regard of adherence has to concentrate on the social and contextual aspects of physical activity as treatment.

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*Keywords:* exercise, fitness, depression, anxiety, barriers

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## **Introduction**

Alcohol consumption affect overall disease and compared to other countries the Danish population has a large intake of alcohol (Hansen et al., 2011). Evidence-based treatment of alcohol dependence includes different psychological interventions and pharmacological treatment. However, the outcomes are modest (Cutler & Fishbain, 2005; Miller et al., 2002). Therefore is a strong need for keeping on developing new interventions that may prove to increase the effectiveness of treatment.

Physical exercise is known to produce health related benefits for a wide range of target groups (Pedersen & Saltin, 2006). Related to substance abuse, exercise is a quite new but promising treatment option (Read et al., 2001; Moore et al., 2005, Roessler, 2010). It can be used both as early prevention, and as part of a continuous treatment process (Collingwood et al., 2000; Biddle & Mutrie, 2005). As potential benefits of exercise for alcohol abusers, several mechanisms can be named. Exercise, especially moderate exercise (Monti et al., 2000) can decrease the urge to drink. In addition, exercise can offer positive alternatives to alcohol by providing pleasurable states, for example through dopaminergic reinforcement (Read & Brown, 2003). Most important for adherence is probably that exercise improves the psychosocial outcomes such as mood management (Lane & Lovejoy, 2005) and reduces depression and anxiety (Martinsen, 2008; Babyak et al., 2000; DiLorenzo et al., 1999). In addition, resilience factors such as individual and social resources (for example self-confidence) are strengthened by regular physical activity, especially as group activity (Brown et al., 2009; Read & Brown, 2003; Read & Curtin, 2007).

## **Aim and hypothesis**

The purpose of the present pilot study is to evaluate the effect of exercise to an outpatient group of alcoholics. We want to examine whether a short-term exercise intervention has effect on adherence, fitness, anxiety, and depression. We hypothesize that even short time physical exercise with moderate intensity yields improvements.

## **Material and Methods**

Patients of the outpatient clinic for alcohol treatment in Odense, Denmark, were invited to participate in the study. Exclusion criteria included severe psychosis or cognitive impairment and severe physical disabilities or medical problems. Ten patients (7 male, 3 female) agreed to participate. The study protocols and procedures were approved by The Danish National Committee

on Biomedical Research Ethics. After the patients have provided a written and an oral consent the baseline testing was carried out.

*Running program.* Participants followed a 6 weeks program in a training group with a trainings frequency of 2 days per week. The fitness of the participants was tested at baseline (week 0) and post-intervention (week 6) using a max test (Bruce et al., 1963). The exercise program was conducted 2 days per week with brisk walking and running. The training heart rate (HR) is based on percentages of the maximum HR achieved in the exercise test conducted at baseline. The walking and running ramp-up period consisted of 10-15 min of jogging followed by a period of 20-35 minutes with a number of 30 seconds-4 minutes running intervals all depending on individual fitness level and at what stage, the project was on. The duration of the running or jogging intervals increased each week as the participants improved their fitness level. The intensity also increased to reach 35 min with 4 min running intervals (HR = 80 – 90 %) and 1 min rest (moderate walking HR = 50 – 60 %). Heart rate monitors were used during exercise sessions. The patients were asked to exercise at least twice a week and to continue on their own after the supervised exercise program. To enhance the commitment and adherence after the supervised period, the exercise instructor encouraged the participants to find a group member to exercise with.

Table 1

*Running program*

| Week (2x) | Warm up          | Running intervals – Heart Rate $VO_{2\max}$ |
|-----------|------------------|---------------------------------------------|
| 1         | 15 min (jogging) | 20 min: 30 sec > 80 %, 2 min < 50 %         |
| 2         | 15 min (jogging) | 20 min: 1 min > 80 %, 2 min < 50 %          |
| 3         | 10 min (jogging) | 25 min: 2 min > 85 %, 3 min < 55 %          |
| 4         | 10 min (jogging) | 25 min: 3 min > 85 %, 2 min < 55 %          |
| 5         | 10 min (jogging) | 30 min: 3 min > 90 %, 1 min < 55 %          |
| 6         | 10 min (jogging) | 35 min: 4 min > 90 %, 1 min < 60 %          |

*Note.*  $VO_{2\max}$ : maximum oxygen uptake; min: minute

*Outcomes parameter.* The pilot study is a mixed method study (Creswell, 2005), where fitness, depression, anxiety and concern were the main outcomes of the

quantitative part while, observations on socio psychological aspects of the running instructor made the background for the qualitative findings.

*Evaluation instruments.* Cardiovascular fitness was assessed by the Bruce treadmill protocol (Bruce et al., 1963). According to the protocol, the subjects walked/ran on a treadmill until exhaustion. The speed (2,7km/h, 4.0km/h, 5.5km/h, 6.8km/h) and grade (10%, 12%, 14%, 16%) increased every 3 minutes. Oxygen uptake was measured online with a metabolic unit (Amis 2001, Innovision, Odense, DK), and the heart rate by a heart rate monitor (Polar Sportstester, Finland). Blood lactate concentration was measured 2 min after the completion of the test by a Lactate Pro (LP, Arkrey KDK, Japan) and a Borg scale (1-20) to express the subjective exhaustion. The maximal oxygen uptake ( $VO_{2max}$ ) was taken as the highest value over 30 sec periods during the last part of the test. One of the subjects was not able to maintain the mouthpiece during the whole test and in that specific case we estimated the  $VO_{2max}$  from time to exhaustion (Foster et al., 1984).

Anxiety and concern were assessed by the Screening Questionnaire of Common Mental Disorders (CMD-SQ) consisting of 37 items in validated subscales (SCL-SOM, Whiteley-7, SCL-ANX-4, SCL-8, SCL-DEF-6, CAGE) measuring anxiety, depression, use of alcohol, and somatisation. The patients respond on at five point Likert scale (Christensen et al. 2005). A normal score is  $\leq 4$  in somatisation (SCL-SOM) and 2-3 in the other scales.

Depression was defined by the Becks Depression Inventory (BDI) (Beck et al., 1996). BDI is a self-report inventory, widely used for measuring the severity of depression. The patients respond on 21 items on a four point Likert scale, scoring between 0 and 3 points (max 63 points). A normal score is  $< 13$ , and depression will be graded into mild (14-19), moderate (20-28) and severe ( $> 29$  point).

*Statistics.* For investigating the fitness, we used Wilcoxon rank test if the data were not normally distributed and a paired t-test if they were. All statistical analyses are done using Stata (StataCorp. 2001. Statistical Software: Release 11. College Station, Texas) and a p-value  $< 0.05$  is significant.

## Results

10 patients participated in the baseline testing. One female dropped out after testing, nine started and seven finished the intervention (Table 2).

Table 2

*Participants (N=9) at baseline*

|                       |                     |
|-----------------------|---------------------|
| Gender                | 7 male, 2 female    |
| Age                   | Mean 46.1 (SD 5.9)  |
| Body Mass Index (BMI) | Mean 26.2 (SD 4.3)  |
| Weight (kg)           | Mean 80.1 (SD 12.4) |

The data (see table 3) show a trend that exercising influence the patients state of anxiety, concern, depression and somatisation. For getting significant results the sample size in a future study must include 86 participants with a power of 0.80 and a p-value < 0.05 to get a significant different in all the subscales of CMD-SQ. This sample size is calculated with the back ground in the pilot participants' result of concern. The patients completed the first self-report before the first running session and the second after 6 weeks of training (see table 3). Two patients did not complete the self-report pre intervention. In the pre intervention self-report 3 patients showed a normal score (no or minimal depression), one patient a moderate and one patient a severe depression. All patients report a normal score afterwards.

There was no significant physiological change (see table 3) for the whole group. Looking at the individual results, values for the participants, who trained more then eight times increased, while the values of the participants with lower participation decreased. The Borg scale was almost significant ( $p=0.05$ ), so the subjective exhaustion was less than at baseline.

The adherence of the patients was high. Four patients participated 8-10 times, two patients came 6 times and one patient participated 3 times. Overall the patients participated 59.6% of all sessions with a mean of 6.56 and SD of 2.9. The two patients who reported the highest change in the depression scale from moderate and severe to no or minimal depression participated over 90% of all sessions.

*Clinical observations.* The participants were not used to be physical active and reported a number of barriers. First obstacle was the fitness test. Coming to a lab at the University, stepping up on a treadmill, being watched and measured, created insecurity for some of the participants. Finding extra energy in their everyday life for running showed to be another obstacle.

Table 3

*Common Mental Disorders (CMQ): sum scores baseline and post intervention, and results from fitness test (exhaustion, Borg scale,  $VO_{2max}$ , heart rate and blood lactate)*

|                     |                                                     | Baseline     | 6 weeks<br>post intervention | Differences baseline<br>and post intervention* |
|---------------------|-----------------------------------------------------|--------------|------------------------------|------------------------------------------------|
| Variable            |                                                     | Mean (sd)/n  | Mean (sd)/n                  | p-value                                        |
| CMD-SQ              | Depression<br>(0 - 6)                               | 3.2 (2.3)/5  | 2.2 (2.2)/5                  | p=0.09                                         |
|                     | Concern<br>(0 - 7)                                  | 2.6 (2.1)/5  | 1.8 (1.6)/5                  | p=0.34                                         |
|                     | Anxiety<br>(0 - 4)                                  | 2.5 (1.8)/6  | 1.2 (1.3)/6                  | p=0.11                                         |
|                     | Somatoform disorders<br>(0 - 12)                    | 5 (1.8)/6    | 3.2 (1.9)/6                  | p=0.06                                         |
|                     | Emotional disorders<br>(0 - 8)                      | 4.7(2.3)/6   | 2.3 (3.0)/6                  | p=0.05                                         |
| Physiological test  | Borg scale                                          | 18.1 (1.1)/7 | 16.2 (2.9)/7                 | p= 0.05                                        |
|                     | Time to exhaustion, min                             | 10.35(4.3)/7 | 11.06(4.2)/7                 | p=0.32                                         |
|                     | $VO_{2max}$ , ml min <sup>-1</sup> kg <sup>-1</sup> | 37.1(2.8)/7  | 38.2(4.6)/7                  | p=0.82                                         |
|                     | Blood Lactate max, mmol L <sup>-1</sup>             | 10.2(1.7)/7  | 11.8(4.3)/7                  | p=0.63                                         |
|                     | Heart rate max, beats min <sup>-1</sup>             | 176(9.0)/7   | 173 (12.0)/7                 | p=0.30                                         |
| *Wilcoxon rank test |                                                     |              |                              |                                                |

Observations and informal conversations with the patients showed to be very important to create a motivational environment around the project and the running sessions. It was of high importance that the instructor (as a person who is not employed at the alcohol treatment center) was receptive for all the patients' questions, problems and stories. The primary focus was the running, a very concrete target. But participating in a group intervention different group dynamics occurred.

According to adherence two other factors (in addition to the instructor's role) showed to be of high importance. Two group processes were seen in a group intervention with focus on a change in behavior: *feedback* and *suffering*. Feedback was related to the climate in the group. The participants experienced the running situation as social context. In the empathic and safe environment, the level of honesty in the feedback was high. The participants expressed a positive influence on the social relations, and the feedback of the instructor and the other group members increased the dedication and commitment. In this project, the group size is dependent on the participants who attend to the running sessions twice per week. Therefor feedback among the participants and between the instructor and the participants is important for commitment.

The common experience of alcohol misuse was another aspect that occurred in the group. Even if alcohol was not discussed explicit in the group, it was a common experience creating this specific community. One participant expressed: "I would never talk to group led by a psychologist about my alcohol problem. But when running together, I can express myself and have a little talk about my life" (male participant, 36 years). The participation gave hope to change a lifestyle, and some of the patients are still running.

## **Discussion**

When working in the field of substance abuse, drop out, lack of adherence or relapse show to be a major problem (Cutler & Fishbain, 2005; Pedersen & Hesse, 2009). First barrier is to involve participants in life style change and to increase their compliance. Our ten recruited patients participated on voluntary basis and had expressed high interest in advance of the study. However, 30 per cent dropped out. One female never started the running program. She got very upset at the fitness test at baseline because of her poor results and she refused to start. Another two patients dropped out due to lack of energy. One could not overcome the training because of time issues and lack of energy, while the other one dropped out half way through. He was in the worst shape to begin with, including a high heart rate even when still walking. One of the seven participants, who completed the running sessions, was not able to complete the second running test. He felt uncomfortable with the mouthpiece from the oxygen measure machine and kept taking it out of his mouth.

The experiences of this pilot study are typical for implementing studies using physical activity. Lack of energy and motivation or injuries are often mentioned as barriers for change of behavior (Biddle & Mutrie, 2005). In addition, might addicts be special vulnerable according to their lack of self-control and higher level of depression (Martinsen, 2008). International research studies stress in

particular the social element and the physical fitness (Ussher et al., 2000). In our study half of the patients increased their fitness, while the other half had no changes. All participants reported a reduced subjective exhaustion. This might be positive reinforcement (Read & Brown, 2003) and a good predictor for continued activity.

However, also this pilot study shows the central aspect of social relationships and interpersonal learning. The organized and time-scheduled training and the engagement of the instructor helped the participants to comply with the study. The training group acted as place for interpersonal learning and positive feedback (Roessler, 2011). Another social aspect might be the establishment of a secondary network. The peer group influence is central for maintenance of motivation; same is the relationship to a trustworthy instructor.

Exercise alone can surely not change a lifelong addiction problem; it has to be an add-on to usual treatment, such as medical treatment and counselling. However, exercise can help to get patients more independent and healthy. Exercise can distract thoughts, can become a “self care” strategy (Collingwood et al., 2000) and provide a possibility for self-control through body control.

## Conclusion

We have to be aware that health interventions using exercise to change lifestyle might end as a failure because of high drop out and low adherence of a vulnerable patient population. Therefore, future studies should focus more on the central role of the instructor and group, and in addition the education of the social network of the patients (partner, friends) to maintain compliance. Most central is also the question of how to integrate a new behavior in the local community of the participants.

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