

# Physical activity in the prevention and treatment of anxiety and depression

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Anxiety and depressive disorders are major public health problems, and desirable changes in lifestyle, such as physical exercise, can have great potential in prevention and treatment. There is growing evidence that physically active people are at a reduced risk of developing depression, and that exercise interventions are associated with significant benefits for patients with mild to moderate forms of depression as well as in reducing anxiety. These findings have led to the proposal that exercise may serve as an alternative or a supplement to traditional forms of therapy. This paper will present a broad overview of research involving the efficacy of exercise as means to prevent and treat depression and anxiety, and related issues regarding dosage and compliance. Finally, exercise will be discussed in the frame of cognitive-behavioural theory.

• *Anxiety, Depression, Exercise, Prevention, Treatment.*

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Mental disorders are major public health problems, and depression and anxiety disorders are among the most common (1). Together with musculoskeletal disorders, these constitute the major contributors to sick leave and disability pensions (2). Psychological as well as pharmacological therapies have well documented effects, and among the psychological interventions, cognitive-behavioural therapy (CBT) has the largest body of evidence (3). The magnitude of the problem makes it obvious that the healthcare system can never meet the need for treatment. This opens the field for self-help strategies, which people can adopt by themselves or by the help of others, and physical exercise has been proposed as one such strategy.

The purpose of this paper is to present a broad overview of research involving the efficacy of exercise in the prevention and treatment of depression and anxiety. Related issues regarding dosage and compliance will also be discussed, and finally exercise will be analysed in terms of cognitive-behavioural theory.

## Prevention

Anxiety and depressive disorders are often accompanied by a tendency to passivity and withdrawal. It is therefore not surprising that these patient groups often have reduced physical fitness compared with the general population (4). Several epidemiological studies have documented an association between sedentary lifestyles

and depression in men and women, with correlations being strongest for women and adults above the age of 40 (5). The majority of research has focused on adults, but similar trends have also emerged in studies of adolescents (6). Most studies have addressed depression, but the same association is shown in some of the anxiety disorders as well (7).

This cross-sectional evidence is supported by a limited number of longitudinal studies. Following samples of non-depressed subjects over time, the general finding is that physically active people have a reduced tendency to develop depression (8, 9). Although these findings are more compelling, they cannot rule out the potential for self-selection. It is possible that more physically active individuals represent a positive selection of people with more resources, who would be better off, irrespective of their exercise habits. Longitudinal studies on anxiety disorders have not been published.

## Treatment of depression

The first publication in a scientific journal of exercise as treatment for clinical depression was published over a century ago. Franz & Hamilton (10) reported favourable outcomes following exercise in emotional, cognitive and bodily symptoms in two severely depressed patients. Later randomized controlled studies have confirmed this observation and demonstrated that exercise is associated with an antidepressant effect. Among studies comparing

exercise with no treatment, Doyne and colleagues (11) found running and weight-lifting exercise programmes to be superior to a waiting list control group. Martinsen et al. (12) compared aerobic exercise with occupational therapy for depressed inpatients and found exercise to be significantly more effective.

### ***Exercise vs. psychotherapy***

The first randomized controlled study comparing exercise with other forms of treatment was published by Greist and colleagues in 1979 (13). They compared aerobic exercise with time-limited and time-unlimited psychotherapy, finding exercise to be equal to time-limited and better than time-unlimited therapy. In a second study, they compared exercise with group psychotherapy and meditation, finding no significant differences among the conditions at the end of the treatment period (14). At 1-year follow-up, the exercisers had kept their gains in both studies. Later investigators have compared exercise with cognitive therapy (15) and general counselling (16), finding no significant differences between them.

### ***Exercise vs. medication***

Blumenthal and colleagues have performed two well-designed randomized controlled trials. In the first study, supervised group exercise three times a week was compared with antidepressant medication and the combination of the two in the treatment of major depression. Those who received antidepressants improved faster, but at 12 weeks, all groups were improved and there were no significant differences among them (17). Ten months after the exercisers had kept their gains to a larger extent (18). In the second study, antidepressant medication was compared with placebo, supervised group-based exercise and individual home-based exercise, both three times a week. After 4 months, 42% achieved remission, and patients receiving active treatments tended to have higher remission rates. There were no significant differences between the two forms of exercise and antidepressant medication (19).

A large proportion of patients who receive antidepressant medication do not respond adequately. Mather and colleagues (20) studied patients with clinical depression who had not responded to antidepressant medication in adequate doses. These were randomly assigned to exercise and health education classes, and exercise was significantly more effective. Trivedi and colleagues (21) also found exercise to be useful in the management of non-responders to medication.

### ***Comparing various forms of exercise***

An important issue in this research is to contrast the antidepressant benefit of various forms of exercise. Doyne and colleagues (11) found no significant differences

between running and weight lifting in the treatment of clinical depression, and Sexton et al. (22) reported similar results comparing jogging and walking for inpatients with depressive and anxiety disorders. Martinsen et al. (23) found no significant differences between aerobic and non-aerobic forms of exercise in major depression and dysthymic disorder.

### ***Dose response***

A fundamental issue concerns the minimal effective dosage of exercise needed to improve depression. Dunn and colleagues (24) studied the dose-response relation of exercise and reduction in depressive symptoms in patients with major depression who exercised individually. They found that those who exercised, according to the public health recommendations, three to five times a week with a weekly energy expenditure of 17.5 kcal/kg/week, had significantly larger reductions in depression, compared with those who exercised with low intensity and a weekly energy expenditure of 7 kcal/kg/week. The latter regimen had results comparable with a placebo condition with stretching and flexibility exercise.

### ***Evaluation of intervention studies***

The number of studies is limited, and some studies have methodological shortcomings, but research so far indicates that exercise may be an alternative or adjunct to traditional forms of treatment in adult patients with mild to moderate forms of major depression and dysthymic disorder. This is supported by two meta-analyses of clinically depressed patients. Craft & Landers (25) included 30 studies and found an effect size of  $-0.72$ , while Lawlor and Hopker (26) reported an effect size of  $-1.1$  from 14 studies. These effect sizes are in the range of moderate to large. No exercise intervention studies have so far addressed bipolar disorder. There seems to be a small effect in favour of exercise in depressed children and adolescents, but at the moment we do not have conclusive evidence (27). Various forms of exercise seem equally effective, and a general rule is that most of the health gains are achieved with a caloric expenditure of about 17.5 kcal/kg/week. This equals a daily 30-min brisk walk (28). The essential goal of an exercise programme for mental health should be to focus on regular activity of any type that is enjoyable and provides the sense of accomplishment. The ultimate aim should be to establish regular exercise as a life-long habit.

### ***Treatment of anxiety***

The association between exercise and anxiety has received comparatively less attention, and the majority of studies have examined the transient psychological outcomes of single exercise sessions. The general finding is that state anxiety is significantly reduced following

bouts of exercise, both for subjects with normal or elevated levels of anxiety. These reductions are statistically significant within 5–15 min after the cessation of exercise and remain decreased for the following 2–4 h, before gradually returning to pre-exercise values. In contrast, the influence of long-term exercise programmes on trait anxiety is less consistent (29).

### ***Treatment of anxiety disorders***

Orwin (30) used exercise as a form of exposure in patients with agoraphobia, and reported positive results when patients exercised before approaching the feared situations. In a prospective study without a control group, patients with panic disorder and agoraphobia improved following an 8-week inpatient programme, mainly consisting of daily aerobic exercise, but the majority relapsed at 1-year follow-up (31). To date, the only randomized test of exercise for anxiety disorders was conducted by Broocks and colleagues (32), who assigned patients with panic disorder to aerobic exercise, antidepressant medication and placebo tablets for 8 weeks. Both exercise and medication were significantly more effective than placebo, and medication was more effective than exercise. No follow-up data are reported.

Exercise intervention studies in other anxiety disorders are few. In a study without a control group, patients with generalized anxiety disorder improved during an 8-week inpatient programme with daily aerobic exercise, and patients kept their gains at 1-year follow-up. Patients with social phobia experienced no significant changes in anxiety (31). Exercise intervention studies in other anxiety disorders have not been published. Studies in children and adolescents are few, but there seems to be a small effect in favour of exercise in reducing anxiety scores in the general population of children and adolescents (27).

### **The challenge of compliance**

The majority of people know that exercise is beneficial, but this knowledge does not guarantee starting or sticking with an exercise programme (5). A consistently beneficial method for improving exercise compliance has yet to be identified, and researchers continue to examine the motivation to exercise. Prochaska & DiClemente (33) state that motivation is not a stable phenomenon, but a process that evolves through several discrete stages. Their research indicates that to be effective, any behavioural intervention intended to improve exercise compliance must be tailored to the motivational stage of the individual, a technique called treatment matching. Because many persons with depression or anxiety are inactive and low in fitness, they probably are not ready to change, but rather ambivalent to making changes in lifestyle. With treatment matching, these individuals would benefit by having their own specific exercise

barriers and reinforcements identified, an end that can be achieved using psychological questionnaires or by careful interviewing. For persons who have been involved in a regular exercise programme for several months or longer, the focus should be on renewing or redefining goals, in order to make active exercise a life-long habit.

Patients with anxiety or depressive disorders present special challenges for exercise compliance. In addition to the fears that many anxiety patients harbour toward exercise, the exercise setting itself can sometimes be an anxiety-inducing stimulus. Patients with agoraphobia and social phobia may experience anxiety symptoms when in a group or an indoor facility, especially when they do not have quick access to an exit. Exercising in the outdoors or in large spaces may be anxiety provoking for others. In these cases, gradually acclimating patients to both exercise and the fear-inducing aspects of the exercise setting can go far in alleviating anxiety. Exercise professionals who have some knowledge of mental health disorders can serve a central role in educating and supporting patients. They can also help them to recognize and normalize the bodily sensations that occur with exercise (34).

### **Exercise for depression in a CBT perspective**

According to cognitive theory, depression is maintained by negative, automatic thoughts and passive, withdrawn behaviour (35). There is an intense discussion within the field of CBT about which of the two, cognitions or behaviour, is most important to focus on in therapy. During later years, a model called behavioural activation has been developed, with an emphasis on the relationship between activity and mood (36). The model focuses on the patterns of avoidance and withdrawal, which are so typical in depression. In the short term, these behaviours will be associated with a reduction of distress, for example by avoiding contact with persons to whom you have a conflict, but in the long term, avoidance and withdrawal will maintain problems. Individuals who withdraw have reduced opportunities to contact potentially environmental antidepressant reinforcers, and new problems are generated related to the decreased activity. Over time, avoidance and withdrawal will lead to physical inactivity with reduced physical fitness as the result (4).

Behavioural activation seeks to identify and promote engagement with activities and contexts that are reinforcing and consistent with the long-term goals of the individual. Specific behaviourally focused activation strategies include self-monitoring, structuring and scheduling of daily activities, rating of degree of pleasure and accomplishment experienced during engagement in specific daily activities, and exploring alternative behaviours related to achieving goals. A recent study has shown that

behavioural activation was as effective as antidepressant medication and more effective than cognitive therapy in dealing with severe depression. For the less severe forms of depression, there were no significant differences among the treatments (36).

It is easy to see that exercise may fit well into this. Typical behaviours among depressed individuals involve spending much time in inactivity, and these situations are often associated with depressed mood and low levels of mastery and pleasure. One approach to this is to change behaviours systematically, so that more time is allotted to activities that can provide a sense of accomplishment and pleasure, and by spending less time on unrewarding or passive activities, such as watching television. By decreasing passivity and replacing it with active and instrumental behaviours, such as exercise, patients often experience more accomplishment and pleasure, and this may be followed by a reduction in depression. In this manner, depressed individuals also learn that their behaviours affect feelings, and that they can influence how they think and feel by their own efforts

### Exercise for anxiety in a CBT perspective

Both during vigorous exercise and panic attacks, there is an intense activation of the sympathetic nervous system, leading to somatic symptoms such as hyperventilation, tachycardia, palpitations and sweating. Many patients report the bodily symptoms of anxiety to be the most discomforting and avoid exercise because of this. According to cognitive theory of panic, the essential element of panic attacks is that patients interpret the physical signs of anxiety in a catastrophic way (37). They therefore are likely to avoid stimuli that may cause increase in these symptoms, including physical activity. However, we have found that careful and thorough information to patients about the normal signs of exercise can go far in alleviating these concerns. When patients can identify the physical symptoms they will experience during exercise, and how these symptoms are part of normal exertion and not the manifestation of anxiety or signs of physical diseases, their initial fear generally declines and they are more likely to successfully complete an exercise bout. In essence, regular exercise may help patients to interpret bodily symptoms as normal signs of stress, following either anxiety or physical activity, and not as indicators that a physical catastrophe will ensue.

In some patients, the bodily symptoms are most bothersome at rest. The experience of rapid pulse and palpitations while sitting in the sofa is often interpreted as signs of heart disease, while the same symptoms during exercise more easily are interpreted as normal reactions to stress. This may be utilized therapeutically: when you experience palpitations and rapid pulse while

exercising, you interpret this as normal signs of stress. When sitting in the sofa, you believe that the same symptoms are signs of a bodily disaster. What do you think is most stressful to your heart, exercising or sitting in the sofa? Isn't this a strange way of thinking?

This way of using physical exercise within a cognitive-behavioural framework may be a useful approach in panic disorder and agoraphobia.

### Conclusion

Anxiety and depressive disorders are major public health problems, and their costs to both the individual and the society are enormous. Unfortunately, many depressed and anxious individuals either receive inadequate treatment or none whatsoever, and the capacity for treatment falls short of the need. It is therefore of utmost importance to help people take active responsibility for their own health. Substantial mental health gains may be achieved by adopting a habit of regular exercise, and the potentials of exercise may be improved when exercise is integrated with cognitive-behavioural theory.

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