Exercise as a Treatment for Depression
.5 hr. CEU

Depression is a common psychological disorder and can appear or increase following injury, especially when a patient is removed from regular exercise. This article will review the evidence for the inclusion of exercise as a treatment for and protective measure against depression.

List of Objectives

1. The participant will be able to recognize the benefits of exercise as a treatment for depression in their patients.
2. The participant will be able to understand the need to maintain or improve fitness levels in injured or immobile athletes in order to decrease the potential onset of depression.
3. The participant will be able to explain the basic exercise prescription that will help in the reduction of symptoms of depression.
4. The participant will be able to understand the physiologic and psychologic mechanisms through which exercise may reduce symptoms of depression.

Importance of the Problem

Psychological problems have a prevalence of 10% to 20% in national estimates.\(^1\) Depression is one of the most common psychological disorders, being recognized as the 4th most important disease in terms of disease burden.\(^2\) Unipolar depression is second to ischemic heart disease in terms of life years lost due to premature death and disability.\(^3\) Total cost to society of depression is approximately $44 billion a year.\(^4\) With such a significant impact on the population, there is a need for a cost-effective treatment regimen that effectively reduces occurrence.

Current therapies including pharmacological treatment, cognitive rehabilitation are limited in their scope of effectiveness and increase expense to individual consumers, providers and society. Exercise is an intervention that is inexpensive, has few negative side effects and does not carry the negative social stigma that many pharmacological treatments have.\(^5\)

More than 20% of collegiate Division I athletes experience general symptoms of depression.\(^6\) Depression has been shown to increase following injury\(^7-9\); while the existence of depression in the non-injured athlete may be a potential predictor of future injury.\(^10-11\) Working with a physically active population, athletic trainers and sports medicine professionals are often faced with the removal of an athlete from sport participation while rehabilitating an injury. This time away from exercise, while valuable for the appropriate treatment of their injury can be the cause for an increase in depressive episodes. Greater depression symptoms may be experienced by the injured athlete up to 2 months following injury.\(^12\)
A study on 40 non-injured regular exercisers demonstrated that exercise withdrawal of as little as 1 week can lead to a significant increase in symptoms of depression. Regular exercisers participating in 30 minute sessions, three to four times per week were randomized to two groups and either forced to stop exercising for two weeks or continue their regular activities. Depressive symptoms increased after just one week of exercise withdrawal as evidenced by increased negative and depressive moods while the control group demonstrated improved mood and depression scores. Therefore it is important for the athlete to remain as active as possible during his or her injury rehabilitation.

**Exercise as a Treatment for Depression**

Exercise as a treatment intervention for depression has been investigated in a number of trials. The use of exercise provides a relatively safe intervention with few negative side effects and a host of possible positive side effects for the patient. Exercise, especially aerobic activity over 6-12 weeks is an extremely cost-effective alternative to current treatment protocols for mild-to-moderate depression and anxiety. A number of studies have shown physical activity to be comparable to other depression treatments including pharmacotherapy and cognitive rehabilitation.

The effect of exercise on depressed adults has been addressed in many individual studies. In a 10-year cohort study of 424 participants recruited from different health care agencies, it was identified that higher physical activity was associated with less depression at 4 different assessment periods that spanned the course of the study. The authors also suggest a positive feedback loop in which more frequent exercise leads to less depression.

In a cross-sectional prospective study of 2,029 elderly participants, the association of exercise and a depressed mood was assessed. The community based sample of older men and women who were not clinically depressed or physically active at baseline demonstrated significant positive benefits from involvement in an exercise program. It was concluded that increased intensity and frequency of exercise led to lower scores on the Beck Depression Inventory (BDI).

A study of nine participants with mild post-traumatic stress disorder exercised two to three times per week for 10 weeks. The exercise prescription for each session included 30 minutes of moderate intensity exercise (60-80% maximum heart rate) on a treadmill. For those that completed greater than 12 exercise sessions over the 10 weeks there were significant decreases in depression scores on the BDI. These individuals demonstrated a reduction from a moderate to a minimal level of depression. These reductions in depression scores remained during a one month follow-up.

Increasing the intensity of the exercise was also shown to lead to decreased depression scores in an efficacy and dose response report for physical activity. Eighty participants were randomized into either exercise treatment or exercise placebo groups. The exercise treatment
group was divided between high dose (17.5 kcal/kg/wk) and low dose (7 kcal/kg/wk) groups and high frequency (5 days/wk) and low frequency (3 days/week) exercise. Changes in the 17-item Hamilton Rating Scale for Depression (HRSD) were evaluated over a 12 week period. This study concluded that exercise participation showed improvement in depression scores and that improvement was greater for those in the high dose group. There was no difference seen between high and low frequency groups. These outcomes led the authors to conclude that the determining factor in the success of exercise as a treatment for depression was total energy expenditure. The high dose group received exercise doses consistent with public health guidelines for physical activity.16

In a study of 37 older adults with minor depression, the effects of an exercise program, sertraline administration and usual care was evaluated.15 After randomization, the exercise group was involved in three weekly 60 minute sessions involving both aerobic and resistance training. The exercise and sertraline groups showed significant improvement over 16 weeks on measures of depression and quality of life. This study lends support that exercise can be as effective as pharmacologic treatments of depression. This element is important in that exercise participation carries less negative and more positive side effects which may make it a more suitable form of treatment.

**Mechanisms of the Treatment of Depression with Exercise**

There are many possible mechanisms for exercise to decrease depression in adults. Mechanisms for the development and subsequent treatment of depression truly follow a psychobiological model. However, research on the physiologic reasons behind symptom reduction due to exercise is extremely limited.

Physiologically, physical activity can positively influence cerebral plasticity by facilitating neuron-generative, adaptive and protective processes. The adaptation of the central nervous system after physical activity has implications for changes in the autonomic nervous system and in turn, depression. It is thought that there are increases in afferent impulses arising from muscular and autonomic activity during exercise.21 Exercise has been postulated to attenuate the brain responses to stress in the pathways that are responsible for the regulation of peripheral sympathetic activity.22

Exercise has also been shown to enhance brain aminergic synaptic transmissions involving the neurotransmitters noradrenaline, dopamine and serotonin and their influence on depression and anxiety. Post-exercise there is an increase in the urinary excretion of amine metabolites. Although oversimplified, this is a reasonable explanation of the antidepressant benefit of exercise.21 Another hypothesis presented is that endorphins released after exercise may be responsible for decreases in depression ratings.21

There are also a number of psychologic influences resulting from physical activity. Exercise may act as a distraction from the unpleasantness associated with depression. Achievement or mastery/command of a challenging pursuit, through exercise may result in self-
efficacy and increased self-esteem among participants. Finally the social support and relationships often established around an exercise regimen can act as a catalyst for the regression of depressive symptoms.\textsuperscript{21}

**Summary**

In summary, the literature identifies many benefits of exercise as a treatment for and preventative measure against depression. This is important for the athlete whose sport participation is ending due to entering the off-season, experiencing a participation limiting injury or retiring from sport all together.

Aerobic exercise over the course of 6-12 weeks has been shown to decrease symptoms of depression and anxiety. An exercise prescription of as little as three 30-minute aerobic exercise sessions per week at a moderate to vigorous intensity (60-80\% of maximum heart rate) is supported by the available evidence.\textsuperscript{23} It also appears that the greater the amount of physical activity, the greater the reduction in depression symptoms. Increasing the intensity and frequency of exercise beyond the basic prescription is thought to further decrease symptoms of depression across the populations studied. Improved or maintained fitness levels may help to prevent the onset of depression symptoms related to exercise withdrawal that often occurs post-injury. To decrease the possibility of experiencing or increasing depressive symptoms an athletic trainer should encourage their athletes to participate in regular aerobic exercise while injured as their diagnosis permits. Alternatives to participation in sport practice while injured may include the use of treadmills, ellipticals, stationary bicycles, upper-body ergometers, ski ergometers and aerobic water training or a combination of these based on injury, athlete preference and equipment available. Finally, the positive effects of regular exercise are equivalent to current therapies including pharmacologic treatment without substantial financial burdens or negative side-effects.

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**REFERENCES:**


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Exercise as a Treatment for Depression

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Record answers below. CLEARLY CIRCLE ONE ANSWER.

1.  A  B  C  D

2.  A  B  C  D

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4.  A  B  C  D

5.  A  B  C  D

6.  A  B  C  D

7.  A  B

8.  A  B  C  D

9.  A  B

10.  A  B  C  D

11.  A  B
Mark Answers Above.

1. How long are the minimal exercise sessions that are reported to be effective at reducing depression?
   a. 10 minutes
   b. 20 minutes
   c. 30 minutes
   d. 60 minutes

2. What type of exercise has been shown to best reduce symptoms of depression?
   a. Aerobic exercise
   b. Anaerobic exercise
   c. Resistance exercise
   d. Mobility exercise

3. Psychologic influences arising from exercise participation include which of the following:
   a. Social support provided by the relationships established around an exercise program.
   b. Achievement of a challenge
   c. Distraction from unpleasantness related to depression
   d. All of the above

4. Which of the following statements are false?
   a. Exercise has few negative side-effects.
   b. Exercise can be inexpensive compared with cognitive rehabilitation and medications.
   c. Exercise is not a cost-effective treatment option.
   d. Exercise does not carry a negative social stigma.

5. What is the minimal recommended number of days per week an individual should exercise in order to decrease symptoms of depression?
   a. 2 days
   b. 3 days
   c. 4 days
   d. 5 days

6. Exercise may improve through which physiologic mechanism?
   a. Improved brain transmission involving noradrenaline, dopamine and serotonin
   b. Reduction in availability of endorphins
   c. Neuro-degeneration of brain neurons
   d. Distraction from unpleasantness related to depression

7. Increasing the intensity of exercise will further decrease symptoms of depression.
   a. True
   b. False

8. Symptoms of depression are present in what percentage of collegiate athletes?
   a. 5%
   b. 20%
   c. 30%
   d. 45%
9. Exercise has been shown to be less effective at reducing depression than pharmacologic treatments such as through administration of sertraline.
   a. True
   b. False

10. The prescription of exercise for the reduction of depression may be useful in which of the following clinical cases?
    a. An athlete who cannot participate in practice due to injury
    b. An individual that is retiring from sport
    c. An athlete that has finished their competitive season and entering an off-season period
    d. All of the above

11. Moderate to vigorous intensity exercise (60-80%) is recommended for the reduction of depression.
    a. True
    b. False