Annotated Bibliography

This systemic review paper investigates the relationship between major depressive disorder (MDD) and adult neurogenesis, and the effect exercise has on this relationship. Neurogenesis occurs when new neurons develop and grow in the human brain. It has been proposed that adult-neurogenesis is associated with MDD when there is a decreased rate of neuron growth. Laboratory mice that had increased availability to exercise were shown to have increased stimulation of neurogenesis. This evidence led to the hypothesis that exercise can lead to increased stimulation of adult-neurogenesis in the human brain, therefore decreasing the rate of MDD. B-Endorphins, vascular endothelial growth factor, brain-derived neurotrophic factor and serotonin are molecules within the brain that stimulate neurogenesis. Each of these molecules are increased during exercise and thus, all have a positive impact on neurogenesis in the hippocampus.

Within this systemic review, strong connections were made between the anti-depressant effects of exercise and increased adult-neurogenesis, and this connection was supported by a substantial amount of research. However, the majority of the research data stemmed from nonhuman trials, and thus findings may not be completely transferable to the human population. Therefore, further research is needed to provide the hypothesis with concrete evidence.

This review informs my paper, as it provides a research-supported connection between the effects exercise has on reducing symptoms of MDD, through the stimulation of adult-neurogenesis. It provides a strong source of potential mechanisms of action of the effects of exercise on MDD within the brain.

This randomized control trial was designed to study the effects of a six-month walking intervention on post-menopausal women who were at risk for major depressive disorder. 121 women between the ages of 55-76, who were post-menopausal, physically inactive and did not have depressive disorders, were included in the study. Participants were randomly assigned to either the walking intervention group or control group. Participants in the walking intervention group were required to attend two, 40 minute supervised walking sessions and one non-supervised per week, for six months. The Beck Depression Inventory (BDI) was used to measure depressive symptoms in both the control and the treatment group. At the outset of the trial, the results indicated that depression scores were significantly lower for the walking intervention group than the control group. This was especially true in women who had high baseline adiposity and low subjective health status, both being significant risk factors for depression.

Strengths of this study included both the large sample size and the substantial length of the trial. The inclusion and exclusion criteria were specific, allowing for a well-characterized sample. In addition, being a randomized control trial and the presence of a control group helped to strengthen the validity of the study. However, the study lacked in transferability, as both the prescribed exercise and population were very specific, so the results may not apply to other exercises types/intensities or other populations, such as different sex, ages or ethnicities. In addition, this study did not assess the participant’s history of depression.

This study informs my paper, as it has demonstrated that a moderate-intensity walking program may reduce the likelihood of depression in inactive, post-menopausal women, who are at an increased risk of depression.

This randomized control trial examined the effect of an exercise program in postmenopausal women who were experiencing symptoms of depression and anxiety. There were 60 female participants between 60-70 years old, from Granada, Spain. Baseline scores for the Hamilton Anxiety Scale (HRSA) and the Geriatric Depression Scale (GDS), as well as anthropometric parameters, were taken. The participants were divided into one treatment group (n=30) and one control group (n=30). Those in the treatment group began with two, 50-minute exercise sessions per week and after eight weeks, progressed to three 60 minutes sessions per week. The exercise training varied from aerobic training to muscle training and was done as group sessions for a total of six months. After completion of the six months, all tests were completed again. There was a statistically significant difference in GDS scores between groups. The treatment group showed a 22% decrease in severe symptoms of depression and an 18% decrease in moderate depression.

This study’s strengths include their specific inclusion and exclusion criteria, making the sample well defined and precise. In addition, the bias of the study was well controlled, as the control group did not have any contact or knowledge of the treatment group. However, the sample size was small and the subjects were recruited from a clinic, where they were already seeking treatments for health conditions. In addition, because the population was so well defined, the results may not be transferable to other populations.

This study informs my paper, as it demonstrates a decrease in depressive symptoms as a result of moderate-intensity exercise in post-menopausal women; a group who is at risk for major depressive disorder.
The Use of Exercise in the Treatment and Prevention of Depression in Post-Menopausal Women

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Mental health has become increasingly important in recent years with rates of depression, both moderate and major, on the rise. By 2020, major depressive disorder (MDD) is predicted to be the second most common health issue (Bernard et al., 2015). One particular population, who is at a greater risk for depression, are post-menopausal women (Bernard et al., 2015; Villaverde Gutiérrez et al., 2012). This may be attributed to the extensive hormonal changes in estrogen and progesterone a woman undergoes during menopause, causing shifts in mood, irritability, lack of motivation and energy, depression and anxiety (Bernard et al., 2015). Therefore, it is essential to address the needs of this population, in order to successfully prevent or treat early stages of depression or to reduce the severity of associated symptoms. In addition to the many factors leading to depression in post-menopausal women, such as isolation, disability and an aging body, an identified modifiable risk factor is physical inactivity (Bernard et al., 2015).

This paper will investigate the use of exercise as an alternative therapy for depression in post-menopausal women. This therapy will be assessed by proposing possible mechanisms of action, evaluating two clinical trials involving the use of exercise in post-menopausal women, as well as identifying any adverse effects, interactions or contraindications exercise may pose.

**Mechanism of Action**

MDD, an affective disorder, can become so severe that daily activities, such as eating, sleeping and personal hygiene can become interrupted due to depressed mood (Ernst et al., 2006). The mechanisms of action surrounding the processes of depression within the body are still not fully understood, however, Ernst et al., (2006) propose the process of adult-neurogenesis as a possible explanation. Neurogenesis is the process of new neuron growth within the adult
human brain (Ernst et al., 2006). A lack of, or decrease in neurogenesis has been proposed to be associated with the development of MDD or symptoms accompanying it (Ernst et al., 2006). Patients with MDD have shown to have a decrease hippocampal volume, which is one of the sites where neurogenesis is most commonly observed (Ernst et al., 2006). In addition, many treatments for MDD have shown to have effects on neurogenesis activity in laboratory animals, such as selective-serotonin reuptake inhibitors (SSRIs) and electroconvulsive shock therapy (Ernst et al., 2006). Although increasing neurogenesis is not the primary target of these therapies, they are still shown to have a downstream effect by stimulating the growth of new neurons through serotonergic activation (Ernst et al., 2006). This research shows a potential link between a decrease in neurogenesis causing MDD in the adult human.

A link has been made between exercise and a decrease in depressive symptoms in various populations. Ernst et al., (2006) propose that the mechanism for this action comes from four molecules that are increased as a result of exercise, and in turn, stimulate neurogenesis. These 4 molecules are; B-Endorphins, vascular endothelial growth factor (VEGF), brain-derived neurotrophic factor (BDNF) and serotonin (Ernst et al., 2006). Each of these four molecules have been shown to have a positive correlation with exercise, and in addition, have been shown to impact neurogenesis through stimulating new neuron growth or increasing neuron survival (Ernst et al., 2006). Laboratory animals that participated in bouts of exercise were seen to have increases in neurogenesis in the hippocampus compared to those who did not participate in exercise (Ernst et al., 2006). Although this research was done in laboratory animals, it can warrant further research to be done in human participants to strengthen the link between exercise and adult-neurogenesis.
In addition, there are a variety of psychological explanations, such as the exercise self-esteem and efficacy model, that can explain the mechanisms behind the antidepressant effects of exercise (Bernard et al., 2015). Chu, Buckworth, Kirby & Emery (2009) propose that as self-efficacy increases during exercise, the ability to fight depression is increased as well (as cited in Bernard et al., 2015).

**Adverse Effects of Exercise**

One of the many benefits of exercise is the relatively low risk of associated adverse effects. Of the three studies examined for the purposes of this paper, none addressed any adverse effects associated with exercise as an intervention. This is because with a well-designed exercise program, tailored to the individual and their specific health concerns, exercise is generally risk free. Both clinical trials addressed this issue by having the interventions implemented by qualified exercise trainers, where exercise intensity was determined based on individual characteristics (Bernard et al., 2015; Villaverde Gutiérrez et al., 2012). However, any exercise has the potential to cause muscle soreness, temporary fatigue or dehydration. In addition, exercise and physical activity always carry the risk of muscle, bone, ligament or tendon injury, such as sprains, breaks or tears. In relation to the population of interest, post-menopausal women, there may be an increased risk for injury. With such drastic hormonal changes, osteoporosis and decreased bone density becomes a concern for post-menopausal women (Bernard et al., 2015).

**Interactions**

The three studies addressed for the purpose of this paper did not include any information regarding food or other alternative therapy interactions with exercise. Although exercise is not a pharmacological agent, it is important to note that there is a possibility of drug interactions. Individuals who are on medications known to alter physical performance should take caution
when exercising (Bernard et al., 2015). These medications may include corticosteroids, estrogens, statins or beta-blockers (Bernard et al., 2015). If an individual is on certain medications to control their heart rate or blood pressure, their resting heart rate or blood pressure may be skewed. Therefore, this will alter their exercise heart rate or blood pressure. This is especially important to consider when calculating heart rate intensities, such as heart rate maximum, as a miscalculated heart rate intensity may be detrimental during intense bouts of exercise. An individual on any medication should always consult their physician before beginning an exercise program to avoid any possible risks.

**Contraindications**

Contraindications for exercise involve various medical conditions that could affect an individual’s ability to participate. These contraindications include a clinical history of fractures, orthostatic hypotension, dizziness, vertigo or problems of balance (Villaverde Gutiérrez et al., 2012). In addition, a diagnosis of rheumatoid arthritis, osteoarthritis, ischemic heart disease, previous joint replacement surgery, cerebrovascular disease or a malignant tumor may contraindicate an individual from exercising (Bernard et al., 2015). Any of these features may hinder an individual’s ability to participate, as they may lead to injury, falls or unexpected outcomes while exercising. However, this does not mean that individuals with these conditions should absolutely not exercise. With physician assessment and approval and an exercise specialist’s supervision and expertise, physical activity may prove beneficial to these individuals under a well-controlled exercise program.

**Strengths of the Clinical Trials**

The two clinical trials used for the purpose of this paper were both trials that yielded significant results. Bernard et al., (2015) studied the effects of a six-month walking intervention
on post-menopausal women. These women were physically inactive and did not have depression, but because of their predisposing factors, they were determined to be at risk (Bernard et al., 2015). After six-months of a walking intervention program, a statistically significant decrease in depressive symptoms was seen in the walking intervention group, compared to the control group (Bernard et al., 2015). This was especially true in women who had high baseline adiposity and low subjective health status, both being significant risk factors for depression (Bernard et al., 2015).

Villaverde Gutiérrez et al., (2012) examined the effect of an exercise program on 60 post-menopausal women from Spain, who were experiencing symptoms of depression and anxiety. Exercise sessions were completed in groups, where the participants completed both aerobic training and muscle training (Villaverde Gutiérrez et al., 2012). After six months, the treatment group saw a decrease of 22.2% of negative symptoms in participants with severe depression and an 18% decrease of negative symptoms in participants with moderate depression (Villaverde Gutiérrez et al., 2012).

Both studies were able to conclude that moderate intensity exercise is an effective therapy to prevent or treat depression in post-menopausal women. Both were randomized control trials using a control group to compare results to, increasing the overall validity of their results. Villaverde Gutiérrez et al., (2012) stated that the control group in their study received no information regarding the exercise intervention and did not have contact with the treatment group, therefore eliminating any potential biases. Both studies had very specific inclusion and exclusion criteria, making their sample well characterized and defined, in order to truly understand the impact of exercise on depression in their chosen population. In addition, both trials intervened with their treatment group for six months, which is a substantial length to test
their hypothesis. The study conducted by Bernard et al., (2015) had a large sample size, which further strengthened their study. Villaverde Gutiérrez et al., (2012) had a much smaller sample size, but concluded that relatively small groups were more effective in order to obtain adequate control over the exercise program.

**Conclusion**

Inactive, post-menopausal women are at an increased risk of experiencing symptoms of depression. Therefore, it is important to address therapies that are available for this population to help either prevent or treat depression, in order for nurses to adequately inform their patients. Ernst et al., (2006) proposed adult-neurogenesis as a possible mechanism of action behind MDD and explained how exercise may increase this process, therefore decreasing the occurrence of MDD. Since exercise can be widely used for the treatment and prevention of a variety of diseases and conditions, it is important to specify research trials in order to truly test its effects. Therefore, both Bernard et al., (2015) and Villaverde Gutiérrez et al., (2012) conducted strong clinical trials with a well-characterized population of post-menopausal women with, or at risk for, depression. The results indicated that exercise is significantly effective in the prevention or treatment of depression in post-menopausal women (Bernard et al., 2015; Villaverde Gutiérrez et al., 2012). With the information presented in all three studies, it can be concluded that exercise is a useful alternative therapy in the treatment and prevention of depression in post-menopausal women. Nurses should use this information when discussing possible therapies with their patients, especially in the early stages of depression or when other therapies are not suitable for their patient. With a low risk of adverse effects, contraindications or drug, food or other interactions, nurses should encourage women to participate in moderate-intensity exercise, as the benefits significantly outweigh any harm.
References

