2020

Benefits of Exercise on Mental Health: Literature Review

Angela Ristau
Minnesota State University, Mankato

Benefits of Exercise on Mental Health: Literature Review

Angela Ristau

School of Nursing, Minnesota State University, Mankato

NURS 695: Alternative Plan Paper

Dr. Rhonda, Cornell

May 1, 2020

Abstract

Providers diligently educate patients on exercise to reduce the risk of cardiovascular disease, hypertension, diabetes, and stroke. However, in recent years, providers judiciously educate patients on exercise and its correlation to improving or impacting mental health disorders. Physical activity has been steadily shown to relate to improved physical health, life satisfaction, cognitive functioning, and psychological well-being. A large body of literature examines the impact of physical activity and exercise on mental health. There is a growing interest in the use of exercise in the treatment of depression and anxiety, as a primary option or as an adjunct to pharmacological treatment. A literature review was completed to identify the evidence associated with the impact of exercise on mental health and well-being.

Keywords: exercise, mental health, depression, anxiety, physical activity, mental health disorders, exercise therapy, mental health benefit

Benefits of Exercise on Mental Health: A Literature Review

There is a growing interest in the use of exercise in the treatment of mental health disorders, such as, depression, anxiety, post-traumatic stress disorder (PTSD), and other cognitive disorders. Exercise can be defined as planned, structured, and repetitive bodily movement due to improve or maintain one or more elements of physical fitness (Alexandratos et al., 2012, Carek et al., 2011). Exercise and can be expressed in forms of low intensity, moderate intensity, resistance programs, aerobic, walking, jogging, cardiovascular programs, weight training, yoga, and group-based activities, such as swimming, aqua aerobics, cycling (Alexandratos et al., 2012). "Exercise is a purposeful activity; therefore, may be able to provide people with the opportunity to 'do' exercise, to 'be' and 'become' exercisers, and to 'belong' to an exercise group or culture. The related term 'physical activity' extends not only to exercise,

but also to activities which involve bodily movement and are done as part of playing, working, active transportation, house chores, and recreational activities" (Alexandratos et al., 2012, p. 2). Physical Activity (PA) and exercise have been suggested for the prevention and treatment of numerous ailments and medical illnesses. In addition, exercise and PA have been recommended for the treatment of mental health disorders, such as, depression and anxiety (Carek et al., 2011). In the past 20 years, there has been mounting interest and increasing recognition of exercise as an adjunctive treatment option among individuals with severe mental illness (SMI) including schizophrenia, bipolar disorder, major depressive disorder (MDD), and other mental illnesses, such as, pre/postnatal depression, anxiety, stress disorders, eating disorders, and even substance abuse (Ashdown-Franks et al., 2019).

Society is moving towards a culture of promoting positive mental health within mental health services, and more focus is needed on the positive contribution that exercise can exert on life and recovery from mental illness (Mason and Holt, 2012).

This literature review will describe evidence-based research that explore the benefits of exercise on mental health. It will integrate evidence connected to the relationship between exercise and appropriate treatment of mental health disorders.

Background

The two most common mental health disorders seen in primary care are depression and anxiety (Carek et al., 2011). More than 340 million people worldwide are affected by depression and approximately 16% of the U.S. population meet criteria for major depression in their lifetime, and women are 1.7 times more likely to develop the disorder then men (Carek et al., 2011). By 2020, depression is predicted to be the second largest contributor to international burden and is also the leading cause of disability globally (Carek et al., 2011). Over 30 million

Americans have a longtime history of anxiety, and those anxiety disorders cost an estimated $42 billion per year in the U. S (Carek et al., 2011). Generalized anxiety disorder, panic disorder, social anxiety disorder, and PTSD are of the most common forms of anxiety (Carek et al., 2011). Individuals that suffer from some form of mental illness could experience low self-esteem, have difficulties maintaining relationships, low life satisfaction, and low energy (White et al., 2017).

Multiple treatments have been studied for depression and anxiety, all with varying degrees of efficacy (Carek et al., 2011). According to Carek et al., (2011), in the past 20 years, pharmacologic treatments has developed notably; however, between one- and two-thirds of patients do not respond to the first anti-depressant trialed, and 15-33% do not respond to numerous interventions.

PA and exercise have been shown to be effective in the treatment and prevention of numerous diseases and medical conditions, such as coronary artery disease, type 2 diabetes, hyperlipidemia, osteoporosis, and some cancers (Carek et al., 2011). However, providers are treating mental health disorders and even cognitive disorders with exercise and PA (Carek et al., 2011). According to Stanton and Raeburn (2014), the role of exercise as an adjunct to standard therapies is gaining momentum with many recent studies having demonstrated exercise to be effective in the reduction of depressive symptoms. Dunn and Jewell (2010) report findings that show those who have mental disorders have a life expectancy of 10 to 15 year less than the general population. Major contributing factors include preventable cardiovascular diseases resulting from poor lifestyle choices like physical inactivity (Dunn and Jewell, 2010).

Based on the above phenomena of interest, the following clinical question was developed in a PICO (i.e. population, intervention, comparison, outcome) format to guide a systemic review of literature: *In individuals with mental health disorders (P), does exercise or physical activity*

(I) compared to no exercise or physical activity (C), benefit overall mental health? (O). This PICO question was chosen based on the assumption that exercise has a positive impact on mental health versus no exercise or physical activity.

Methods

An extensive literature search was completed between the dates of 10/6/19 and 11/01/19. Databases searched include CINAHL, Cochrane, ProQuest, PubMed, and Academic Search Premier. Specific databases, including general subjects covered, specific date range, and search restrictions are included in Table 1 of the attached appendix. The search terms used included "exercise," "mental health," "physical activity," "depression," "mental health disorders," "exercise therapy," "mental health benefit." See Table 2 of the attached appendix for the keywords and keyword combinations along with the search results per database. Search restrictions included publication in a peer-viewed journal, published between 2009-2019, full text, research articles, abstract and references available.

A total of 15 studies met the inclusion criteria, including three systemic reviews, two qualitative studies, two quantitative studies, two meta-analyses, three expert opinions, and two cross-sectional studies. Titles were excluded if they indicated that overdoing exercise may harm your health, those that discuss health deterioration and mental health, and the article did not provide adequate information for this research. The **30** titles that were screened for pertinence to the clinical question and are indicated in bold in Table 2 of the attached appendix. This screening yielded 20 articles that were further reviewed for inclusion or exclusion based on the established criteria. Finally, 15 articles met the criteria for inclusion in the literature review. These 15 hits are identified in Table 3 of the attached appendix along with specific rationale for inclusion or exclusion. The highest level of evidence obtained were three level I studies, which

were mixed method systematic reviews (Melnyk & Fineout-Overholt, 2015). Three level I, one level II, five level IV, four level V, and two level VI (see Table 4 in the appendix for further details on the level of evidence and data abstraction of included articles).

Summary of Literature

The 15 articles included one qualitative study, two quantitative studies, three literature reviews, two randomized control trials, one cross-sectional studies, three systemic reviews, one narrative review, one expert opinion, and one meta-analysis. Many of the articles focused primarily on exercise for treatment of depression and anxiety only. Two of the articles focused on physical activity and exercise for treatment of patients with SMI. A few of the articles discussed the impact of exercise to help promote mental health wellbeing.

Clinical Significance for Advanced Practice

The primary care setting is where depression is being managed habitually (Stanton and Raeburn, 2014). Furthermore, in the primary care setting depression and anxiety are the most common psychiatric conditions being seen (Carek et al., 2011). Antidepressants are the first-line treatment for depression; however, exercise is now comparing favorably (Carek et al., 2011). The struggle providers are facing is having to treat patients for depression and finding the appropriate medication to treat their symptoms and lessen dependability on psychopharmacology (Carek et al., 2011). If providers are exposed to research on the impact of exercise on mental health disorders, they will be more likely to prescribe exercise as a treatment option for their patient and this may eliminate the need for medication or lessen the amount of medications a patient consumes.

Exercise Recommendations

Current recommendations for exercise indicate that patients should engage in moderate intensity exercise of 150 minutes per week or five days a week at 30 minutes a day (Stanton et al., 2014). Vigorous activity should be performed at least three days per week for a minimum of 75 minutes per week (Stanton et al., 2014). Almost one third of the world's population fail to achieve the minimum level of PA required to achieve any form of health benefits (Stanton et al., 2014).

Exercise can be defined as planned, structured, and repetitive bodily movement due to improve or maintain one or more elements of physical fitness (Alexandratos et al., 2012, Carek et al., 2011). "PA often results in improved balance, coordination, musculoskeletal strength, and/or aerobic fitness" (Hegberg et al., 2019, p.2). "Cardiorespiratory fitness is one type of physical fitness that refers to the ability to perform large-muscle, dynamic, moderate to high-intensity PA for a prolonged period" (Hegberg et al., 2019, p. 2). Cardiorespiratory fitness is beneficial to musculoskeletal strength, circulation, pulmonary gas exchange, and endurance to rigorous physical activity. Achieving physical fitness benefits mental health and these connections are explored below.

Neurophysiologic Mechanism

Mikkelson et al. (2017) stated that there are several physiological and biochemical hypotheses as to why exercise improves mental health and mood. There are six hypotheses that include endorphin, thermogenic, mitochondrial dysfunction, mammalian target of rapamycin (mTOR), neurotransmitter dysfunction, and hypothalamic pituitary adrenal (HPA) axis, all of which have demonstrated benefits to mental health.

Endorphin

The primary function of endorphins is to assist the body to endure pain during times of stress and pain. It is known that athletes have what is known as the "runners high" after exercising which is known as the feeling of euphoria (Mikkelson et al., 2017). That is due to elevated plasma levels of endorphins and increased levels of endocannabinoids, which has a positive effect on depression (Mikkelson et al., 2017).

Thermogenic

The primary function of the thermogenic response is that mood elevation after exercise is linked to increased body temperature (Mikkelson et al., 2017). When there is an increased body temperature in certain brain regions, such as the brain stem, it is the contributing factor in the decrease of muscle tension and feelings of relaxation (Mikkelson et al., 2017). With this relaxation and mood improvement, comes a reduction in anxiety symptoms (Mikkelson et al., 2017).

Mitochondrial

This contributes to energy production and neuroplasticity. Mitochondria plays a fundamental role in neuroplasticity and is found to contribute to one's mental health and functioning (Mikkelson et al., 2017). Boosting the mitochondrial function through the form of exercise has been documented as a treatment for depression and other mood disorders (Mikkelson et al., 2017).

Mammalian Target of Rapamycin

mTOR plays an imperative role in the development and aging that is associated with memory and antidepressant effects (Mikkelson et al., 2017). Exercise activates the mTOR and can improve mental health disorders by reducing anxiety and depressive symptoms (Mikkelson et al., 2017).

Neurotransmitters

These are known as serotonin, dopamine, noradrenaline, and glutamate that are with in the central nervous system and when those neurotransmitters are imbalanced, people tend to suffer from depression (Mikkelson et al., 2017). In a study with 16 male participants 64 years old that partook in a 16-week aerobic exercise program showed an increase in serotonin and decrease in depressive symptoms (Mikkelson et al., 2017).

Hypothalamic Pituitary-Adrenal Axis

This activates a response to physical and psychological stressors (Mikkelson et al., 2017). HPA dysfunction is seen in patients with depression and anxiety (Mikkelson et al., 2017).

Volume Loss in the Hippocampal Formation

The most commonly associated with depression, are the findings of volume loss in the hippocampal formation. Increased levels of hippocampal brain-derived neurotrophic formation (BDNF) levels are related to decreased anxiety. Brain neurogenesis is increased by anti-depressants and exercise similarly decreases depressive symptoms by increasing brain neurogenesis (Carek et al., 2011).

Impact of Exercise on Depression

Depression is a mental condition and it leaves a person with feelings of sadness, loss of interest or pleasure in doings things, guilt or low self-esteem, disruption in sleep pattern, change in appetite, feelings of fatigue, and poor concentration (Zhang & Yen, 2015). According to Zhang & Yen (2015), in clinical research, PA is shown to be an effective therapy to alleviate mild and moderate depressive symptoms. Also, among individuals with MDD, 60.4 percent of patients in an exercise group no longer meet the Diagnostic and Statistical Manual of Mental

Disorders, Fourth Edition (DSM-IV) criteria for the disorder after four months of exercise (Zhang and Yen, 2015).

Malcolm et al. (2013) reviewed a meta-analysis of 25 studies which included exercise such as running, walking, aerobic training, dance, cycling, and tai chi found that exercise compared to no treatment had a large clinical effect on the treatment of depression. Mikkelsen et al., (2017) reviewed a cross-sectional study of 269 adults with depression and noted that exercise was substantially associated with decreased depressive symptoms such as fatigue, anger, confusion, and decreased vigor mood. Mikkelsen (2017) also reported that in a study with 18 male runners with depression, during exercise withdrawal for two weeks, their depression symptoms returned and when running was resumed, the symptoms alleviated. A study with 91 participants with major depression, dysthymic disorder, and depressive disorder were randomly assigned to aerobic versus non-aerobic regimes for eight weeks and there was a reduction in depression scores in both groups (Mikkelsen et al., 2017). Mikkelsen et al. (2017) conducted another research study with 74 participants with clinical depression that were randomly allocated to running, psychotherapy, or meditation-relaxation therapy for 12 weeks and symptoms of depression considerably reduced in all three groups.

Asztalos et al. (2009) studied the relationship of PA and mental health. Asztalos et al. (2009) state that intervention studies evaluated primarily the effects of aerobic PA on mental health. The study included 1919 participants ages 20-65 years who partook in some form of PA such as, leisure activity, biking, walking, and sports. They spent 2.75 hours a week doing some form of PA. Of those PA interventions, the important findings were linked to relief in symptoms of depression and anxiety, elevated mood, improved self-esteem, enhanced physical self-

perception, self-efficacy, cognitive functioning, greater health-related quality of life, and stress prevention and reduction (Asztalos, 2009).

Impact of Exercise on Anxiety

According to Mikkelsen et al., (2017) anxiety is one of the most common mental health conditions that affects a person's ability to focus, sleep, and carry out daily responsibilities. Mikkelsen et al., (2017) goes on to say that studies reveal that exercise can reduce anxiety levels, whereas those who are physically inactive tend to have higher anxiety levels. In a meta-analysis study of 42,264 persons, it was shown that exercise improved anxiety levels, with exercise being eve more beneficial to those without anxiety (Mikkelsen et al., 2017). In a randomized controlled trial of 79 participants with anxiety, the effects of aerobic (brisk walks or jogging) versus non-aerobic (muscular strength, flexibility and relaxation) exercise routines showed a similar improvement in anxiety scores in both groups (Mikkelsen et al., 2017).

Carek et al. (2011) found that habitual PA and cardiorespiratory fitness are connected to an enhanced level of mental health and alleviate anxious feelings. Carek et al. (2011) also report that although exercise has been shown to lessen anxious feelings, there is less efficacy in reducing symptoms that are associated with anxiety. Carek et al. (2011) conducted a meta-analysis of 25 randomized controlled trial's (RCTs) that compared exercise and a control intervention and found that the groups that exercised has significant improvement in their depressive symptoms when compared to the placebo group.

Impact of Exercise on SMI

A sedentary regime is known to place individuals at an increased risk of illnesses (Tetlie et al. (2009). Compared with the general population, persons with SMI lose 25 years of life expectancy, primarily due to an increased risk of cardiovascular disease. Individuals with SMI

have a tendency to lead unhealthy lives compared to the general population and other mental health patients (Tetlie et al., 2009). Tetlie et al. (2009) conducted an ethnographic study of three individuals with schizophrenia, the study explored the use of exercise as an adjunct therapy for schizophrenia. The study indicated that exercise has the potential to help reduce patients' perceptions of auditory hallucinations, raise self-esteem, and improve sleep and general behavior.

Tetlie et al., (2009), also researched a study completed on patients living with SMI in a secured hospital. The method was a qualitative phenomenological, and all staff and patients gave written consent to participate. Exercise was a mandatory part of the daily routine for all patients. Patients had scheduled exercise programs three times a week between 9am and 12pm as a part of their treatment program. There were indoor and outdoor sessions that ranged from 45-60 minutes. Originally, 29 patients were selected for participation: one patient was excluded due to physical injury, four refused, and nine patients were unable to sign the consent form. There were three females and 12 males, and the study was completed over 12 weeks. The study showed an increase in a therapeutic relationships between staff to patients, patient to staff, and patients to patients. One patient stated that they felt more relaxed when they exercise and sensed that they were getting into less fights with other patients. Patients felt that it was positive to exercise with others and it was a wonderful way to socialize. Staff indicated that the overall mood of patients was more positive once they started the exercise program (Tetlie et al., 2009).

Impact of Exercise on Post Traumatic Stress Disorder

PTSD can develop after an experience to life-threatening and highly stressful events such as military combat, accidents, assault, or natural, or human-caused disasters (Hegberg et al.,

2019). Hegberg et al., (2019) states that there is accumulating evidence to suggest that aerobic exercise may serve as an effective treatment option for persons with PTSD.

Hegberg et al., (2019) researched a study including nine non-exercising community members with diagnosed PTSD. These contributors participated in a 10-week exercise program that included 12 different exercises that were 30-minute moderate-intensity. The participants were interviewed after one month and reported significant reductions in PTSD symptoms after the program. In an additional study researched by Hegberg et al., (2019), there were nine participants who were assigned to a moderate-intensity aerobic exercise program prior to 12 prolonged exposure therapy sessions or prolonged exposure therapy only. The results showed that the group who exercised prior to therapy showed better progress in PTSD symptoms relative to the group only participating in therapy (Hegberg et al., 2019).

Discussion

There are many studies supporting the positive effects of exercise on mental health (Mikkelsen et al., 2017). The general outcome form research suggests that exercise can bring about many physiological changes that results in an improvement in mood, self-esteem, and lower stress and anxiety levels (Mikkelsen et al., 2017). Furthermore, the research continues to indicate that regular PA can significantly improve mental health and lessen symptoms of depression, anxiety, and stress (Mikkelsen et al., 2017).

It is important to understand that while the pharmacological and psychotherapeutic approaches are helpful for many people, they do not result in full remission in all patients Ashdown-Franks et al., 2019). Furthermore, among those who responded well to conventional treatments, some continued to experience residual symptoms, and are at a higher risk of future relapse (Ashdown-Franks et al., 2019).

Researchers also found that patients who participated in exercise as a form of treatment for mental illness, felt a purpose or sense of meaning, a sense of achievement, and satisfaction from the activity (Mason & Holt, 2012). Furthermore, patients that exercised as a means of treatment felt an over-whelming sense of belonging and positivity, as well as a feeling of accomplishment (Mason & Holt, 2012).

Limitations

There are some barriers to keep in mind when asking patients to use exercise as a treatment option for mental health disorder. Some of those barriers include financial costs, fear or anxiety of attending a gym alone, and lack of motivation (Malcolm et al., 2013). Many of the research studies lacked evidence to demonstrate whether frequency, intensity, or time of exercise affects the outcome of mental illness. Also, there was found to be a lack of research about the impact of age, race, socioeconomic status, or gender on mental health outcomes. Many of the research studies had small sample sizes which could also alter the results as opposed to a larger sample size.

In this body of research there was lack of long term follow up on the participants included in the studies. A majority of the 15 articles researched stated that their main limitation was lack of follow up on participants. It was also found that some of the studies that were researched did not indicate if the diagnosis was self-reported or clinically diagnosed. Not all studies had participants disclose their mental health disorder.

While exercise is not without its hurdles, such as limited motivation, self-efficacy, or time, it is an intervention that is largely accessible, low-cost options, and could avoid negative implications associated with traditional mental health treatment (Hegberg et al., 2019)

Implications for Future

Clinicians should be aware of the challenges of initiating and maintaining PA behavior and offer support systems to patients with mental illness (Stanton et al., 2014). Clinicians should also be cognizant of the physical and mental health benefits of PA and its value in reducing depression and anxiety symptoms (Stanton et al., 2014). This may be in the form of referrals to an exercise professional, use of printed resources, and advocacy groups (Stanton et al., 2014).

Providers must also be mindful of the fact that there may be patients that prefer not to be on medications and try alternate therapy as a treatment option. Those designing the exercise program for people with mental health disorders should consider the settings and the social inclusion opportunities available because that can help balance maximizing participation (Malcolm et al., 2013).

White et al., (2017) reported that evidence showed that exercise involving choice of exercise is associated with increased positive affect and enjoyment, compared with no exercise with no choice. That is an important factor to be attentive to when prescribing exercise as a treatment option.

Providers must also conduct a thorough history and physical to know the risks and benefits exercise may have on their patients. PA and exercise have risks involved, such as musculoskeletal injury and that risk of injury increases with obesity, volume of exercise, and participation of competitive sports as a means of exercise (Carek et al., 2011). Being mindful of your patients past or current medical history, such as heart disease, is crucial as this can increase their risk of sudden cardiac death or myocardial infarction (Carek et al., 2011).

Despite the paucity of longitudinal studies on the benefits of PA on mental health, shorter duration studies reveal the importance and efficacy of PA for the prevention of depressive

illness. Further, maintaining a modest approach to PA advancement may contribute to long-term adherence (Stanton et al., 2014).

It would seem that a program of aerobic exercise or PA, individual or combined format, performed three to four times a week, low to moderate-intensity (or participants preference), with sessions lasting 30-40 minutes is beneficial in the treatment of anxiety and depression (Stanton and Raeburn, 2014).

It is important to understand that people with a mental health disorder may have less motivation initially and thus prescribing the minimum amount of exercise may be warranted to encourage better initial compliance (Stanton and Raeburn, 2014). Clinicians must also take into consideration the severity of the patient's mental illness to ensure safety and appropriateness of treatment (Dun & Jewell, 2010). With a greater understanding of the probable benefits of exercise participation, providers may be more likely to consider PA as a treatment option essential to care planning and refer accordingly (Mason & Holt, 2012).

Conclusions

Exercise is known to be an economical, broadly accessible endeavor known to provide multiple health benefits, including cardiovascular health and musculoskeletal health, as well as reduced amounts of comorbidity and mortality (Hegberg et al., 2019). There is growing evidence of the beneficial effects of exercise on mental health disorders, including depression, anxiety, and PTSD symptoms (Hegberg et al., 2019). In general, PA was associated with lower incidence of mental health problems and, in addition, the outcomes of mental health disorders were more positive in individuals who were more active (Ten Have et al., 2011).

This literature review was to describe evidence-based support demonstrating exercise as beneficial to mental health. Integrated research evidence establishes the relationship between prescribed exercise and benefits to mental health disorders for treatment.

References

Alexandratos, K., Barnett, F., & Thomas, Y. (2012). The impact of exercise on the mental health and quality of life of people with severe mental illness: A critical review. *British Journal of Occupational Medicine, 75*(2), 48-60. https://doi.org/10.4276/030802212X13286281650956

Ashdown-Franks, G., Firth, J., Carney, R., Carvalho, A. F., Hallgren, M., Koyankgi, A., Rosenbaum, S., Schuch, F. B., Smooth, L., Solmi, M., Vancamfort, D., & Stubbs, B. (2019). Exercise as medicine for mental and substance use disorders: A meta-review of the benefits for neuropsychiatric and cognitive outcomes. *Sports Medicine*, 1-20. https://doi.org/10.1007/s40279-019-01187-6

Asztalos, M., Wijndaele, K., DeBourdeaudhuij, I., Philippaerts, R., Matton, L., Duvigneaud, N., Thomis, M., Duquet, W., Lefevre, J., & Cardon, G. (2009). Specific associations between types of physical activity and components of mental health. Journal of Science and Medicine of Sports, 12, 468-474. https://doi.org/10.1016/j.jsams.2008.06.009

Carek, P. J., Laibstain, S. E., & Carek, S. (2011). Exercise and the treatment of depression and anxiety. *International Journal of Psychiatry in Medicine, 41*(1), 15-28. https://doi.org/10.2190/PM.41.1.c

Dunn, A. L., & Jewell, J.S. (2010). The effect of exercise on mental health. *Current Sports Medicine Reports (American College of Sports Medicine), 9*(4), 202–207. https://doi.org/10.1537-89OX/O9O4/2O2-2O7

Hegberg., N. J., Hayes, J. P. & Hayes, S. M. (2019). Exercise intervention in PTSD: A narrative review and rationale for implementation. *Frontiers in Psychiatry, 10*(133), 1-13.

https://doi.org/10.3389/fpsyt.2019.00133

Malcolm, E., Evans-Lacko, S., Little, K., Henderson, C., & Thornicroft, G. (2013). The impact of exercise projects to promote mental wellbeing. *Journal of Mental Health*, *22*(6), 519–527. https://doi-org.ezproxy.mnsu.edu/10.3109/09638237.2013.841874

Mason, O. J., & Holt, R. (2012). Mental health and physical activity interventions: A review of the qualitative literature. *Journal of Mental Health*, *21*(3), 274–284. https://doi-org/10.3109/09638237.2013.841874

Melnyk, B. M., & Fineout-Overholt, E. (2015). Evidence-Based Practice in Nursing & health care: A Guide to Best Practice (3rded.). Philadelphia, PA: Wolters Kluwer

Mikkelson, K., Storjonavsky, L., Polenakovic, M., Bosevski, M., & Apostolopoulos, V. (2017). Exercise and mental health. *Maturitas, 106*, 48-56. http://dx.doi.org/10.1016/j.maturitas.2017.09.003

Stanton, R. & Reaburn, R. (2014). Exercise and the treatment of depression: A review of the exercise program variables. *Journal of Science and Medicine in Sport, 17*, 177-182. https://doi.org/ 10.1016/j.jsams.2013.03.010

Stanton, R., Happell, B., & Raeburn, P. (2014). The mental health benefits of regular physical activity, and its role in preventing depressive illness. *Nursing Research and Review, 4*, 45-53. https://doi.org/10.2147/NRR.S41956

Ten Have, M., De Graaf, R., & Monshouwer, K. (2011). Physical exercise in adults and mental health status: Findings from the Netherlands Mental Health Survey and Incidence Study

(NEMESIS). *Journal of Psychosomatic Research, 71,* 342–348. http://www.elsevier.com/wps/find/journaldescription.cws_home/525474/ description#description.

Tetlie, T., Heimsnes, M. C., & Almvik, R. (2009). Using exercise to treat patients with severe mental illness: How and why? *Journal of Psychosocial Nursing*, *47*(2), 31-40. https://doi.org/10.3928/02793695-20090201-14

White, R. L., Babic, M. J., Parker, P. D., Lubane, D. R., Astell-Burt, T., & Lonsdale, C. (2017). Domain-specific physical activity and mental health: A meta-analysis. *American Journal of Preventative Medicine*, *52*(5), 653-666. https://doi.org/10.1016/j.amepre.2016.12.008

Zhang, J., & Yen, S. T. (2015). Physical activity, gender differences, and depressive symptoms. *Health Services Research, 50*(5), 1550-1573. https:// doi.org/10.1111/1475-6773.1228

Appendix

Table 1

Database Search Description

Search engine	Restrictions added	Dates included	General subjects covered[1]
CINAHL	Full text; Academic Journals; references available; abstract available.	2009-2019	nursing and allied health, including cardiopulmonary technology, emergency service, health education, medical/laboratory, medical assistant, medical records, occupational therapy, physical therapy, physician assistant, radiologic technology, social service/health care, and more
Cochrane	Full text.	2009-2019	protocols focusing on the effects of healthcare. Data is evidence-based medicine and is often combined statistically (with meta-analysis) to increase the power of the findings of numerous studies, each too small to produce reliable results individually.
ProQuest	Full text; Scholarly articles; Literature	2009-2019	nursing and allied health, including cardiopulmonary technology, emergency service, health education, medical/laboratory, medical assistant, medical records, occupational therapy, physical therapy, physician assistant, radiologic technology, social service/health care, and more
PubMed	Full text; Abstract available; Review; Systematic Reviews.	2009-2019	Provides citations, abstracts, and selected full text to articles about "medicine, nursing, dentistry, veterinary medicine, the health care system, and the preclinical sciences.
Academic Search Premier	Full text; References available; Scholarly Journals	2009-2019	Provides citations and abstracts to articles, as well as full text of articles from over 4,600 publications, covering almost every academic subject. This resource is provided by the Electronic Library of Minnesota, freely accessible to anyone in Minnesota.

Minnesota State University, Mankato. (2019). *Journal databases.* https://libguides.mnsu.edu/nursing.

Table 2

Data Abstraction Process: Hit Results by Database

Date of search	Key words	Hits in CINAHL	Hits in Cochrane	Hits in ProQuest	Hits in PubMed	Hits in Academic Search Premiere
10/6/2019	"Exercise" and "Mental Health"	**160**	**35**	**242**	**1046**	**806**
10/6/2019	"Exercise" and "Depression"	**194**	**39**	**226**	**1359**	**269**
10/12/2019	"Mental Health" and "Physical Activity"	**298**	**31**	**438**	**0**	**927**
10/19/2019	"Mental health disorders" and "Exercise therapy"	**123**	**10**	**373**	**292**	**74**
10/19/2019	"Physical activity" and "mental health benefit"	**78**	**11**	**313**	**321**	**125**
11/01/19	"Mental Health disorders" and "Exercise"	**46**	**12**	**202**	**562**	**239**

Table 3

Characteristics of Literature Included and Excluded

Reference	Included or Excluded	Rationale
Alexandratos, K., Barnett, F., & Thomas, Y. (2012). The impact of exercise on the mental health and quality of life of people with severe mental illness: a critical review. *British Journal of Occupational Medicine*, *75*(2), 48-60. https://doi.org/10.4276/030802212X13286281650956.	Included	Appreciate that this article did a great job explaining each study and design impeccably.
Ashdown-Franks, G., Firth, J., Carney, R., Carvalho, A. F., Hallgren, M., Koyankgi, A., Rosenbaum, S., Schuch, F. B., Smooth, L., Solmi, M., Vancamfort, D., & Stubbs, B. (2019). Exercise as medicine for mental and substance use disorders: A meta-review of the benefits for neuropsychiatric and cognitive outcomes. *Sports Medicine*, 1-20. https://doi.org/10.1007/s40279-019-01187-6.	Included	Wide range of ages. Explored serious mental health disorders, anxiety, depression, and other mental disorders. It provided excellent research on the impact of exercise and mental disorders.
Asztalos, M., Wijndaele, K., DeBourdeaudhuij, I., Philippaerts, R., Matton, L., Duvigneaud, N., Thomis, M., Duquet, W., Lefevre, J., & Cardon, G. (2009)Specific associations between types of physical activity and components of mental health. *Journal of Science and Medicine of Sports*, *12*, 468-474. https://doi.org/10.1016/j.jsams.2008.06.009.	Included	Differentiates physical activity into five domains. It studied different areas of exercise and how each impacted mental health.
Barha, C. K., Hsu, C. L., Brinke, L. T., & Liu-Ambrose, T. (2019). Biological Sex: A potential moderator of physical activity efficacy on brain health. *Frontiers of Aging Neuroscience, 11*(329), 1-11. https://doi.org/10.3389/fnagi.2019.00329.	Excluded	It focused on biological sex and physical activity versus physical activity.
Carek, P. J., Laibstain, S. E., & Carek, S. (2011). Exercise and the treatment of depression and anxiety. *International Journal of Psychiatry in Medicine*, *41*(1), 15-28. https://doi.org/10.2190/PM.41.1.c.	Included	Refers to American Psychiatric Association (APA) guidelines. It collectively takes information from different studies to gather information and research.
Cooney, G. M., Dwan, K., Greig, C. A., Lawlor, D. A., Rimer, J., Waugh, E. R., McMurdo, M., & Mead, G. E. (2013). Exercise for Depression (Review). Cochrane Database of Systemic Reviews, 9, 1-160. https://doi.org/10.1002/14651858.CD004366.pub6	Excluded	RCT that focused on exercise versus placebo for treatment of depression in adults.
Dunn, A. L., & Jewell, J.S. (2010). The effect of exercise on mental health. *Current Sports Medicine Reports (American College of Sports Medicine)*, *9*(4), 202–207. https://doi.org/10.1537-890X/0904/202-207.	Included	Uses guidelines from National Guideline Clearinghouse. Provides evidence-based research.
Erginer, D. K. & Gunusen, N. P. (2017). Determination of physical health status and healthy lifestyle behaviors of individuals with mental illness. *Perspectives in Psychiatric Care*, *54*, 371-379.	Excluded	Focused on health deterioration with mental illness diagnosis.
Glasper, A. (2016). Improving the physical health of people with mental health problems. *British Journal of Nursing*, *25*(12), 696-697. https://doi.org/10.12968/bjon.2016.25.12.696.	Excluded	This article talked about treating the mind and body as a whole unit, versus, separately. However, focused on mental health nurses only.
Hegberg., N. J., Hayes, J. P. & Hayes, S. M. (2019). Exercise intervention in PTSD: A narrative review and rationale for implementation. *Frontiers in Psychiatry*, *10* (133), 1-13. https://doi.org/10.3389/fpsyt.2019.00133.	Included	I appreciated that this was focused on PTSD. I also chose this article due to its study design.
Kravitz, L. (2019.). Exercise is good for mental health. *Fitness Journal*, 12-14.	Excluded	Not enough information to collect for my research. It also questions if overdoing it does more harm than good which does not support my research.
Malcolm, E., Evans-Lacko, S., Little, K., Henderson, C., & Thornicroft, G. (2013). The impact of exercise projects to promote mental wellbeing. *Journal of Mental Health*, *22*(6), 519–527. https://doi.org/10.3109/09638237.2013.841874	Included	Community approach versus individual approach.
Mason, O. J., & Holt, R. (2012). Mental health and physical activity interventions: A review of the qualitative literature. *Journal of Mental Health*, *21*(3), 274–284. https://doi.org/10.3109/09638237.2011.648344	Included	Focused on effect of physical activity and mental health outcomes.

Reference	Included or Excluded	Rationale
Mikkelson, K., Storjonavsky, L., Polenakovic, M., Bosevski, M., & Apostolopoulos, V. (2017). Exercise and mental health. *Maturitas, 106*, 48-56. http://dx.doi.org/10.1016/j.maturitas.2017.09.003	Included	recognizes the positive effects of exercise on mood states such as anxiety, stress and depression, through physiological and biochemical mechanisms, including endorphins, mitochondria, mammalian target of rapamycin, neurotransmitters and the hypothalamic-pituitary-adrenal axis, and via the thermogenic hypothesis.
Stanton, R., & Reaburn, R. (2014). Exercise and the treatment of depression: A review of the exercise program variables. *Journal of Science and Medicine in Sport, 17*, 177-182. https://doi.org/ 10.1016/j.jsams.2013.03.010.	Included	Articles were excluded if the patient was not tested properly for depression, certain ICD-10 codes were or were not used, and if they did not have diagnosis of depression. Also, compliance was taken into consideration as well.
Stanton, R., Happell, B., & Raeburn, P. (2014). The mental health benefits of regular physical activity, and its role in preventing depressive illness. *Nursing Research and Review, 4*, 45-53. https://doi.org/10.2147/NRR.S41956.	Included.	Focused on effect of physical activity and mental health outcomes.
Ten Have, M., De Graaf, R., & Monshouwer, K. (2011). Physical exercise in adults and mental health status: Findings from the netherlands mental health survey and incidence study (NEMESIS). *Journal of Psychosomatic Research, 71,* 342–348. http://www.elsevier.com/wps/find/journaldescription.cws_home/525474/ description#description.	Included	Large population over 3 years. Focused on whether exercise prevented mental health disorders and if people recover quicker with exercise.
Tetlie, T., Heimsnes, M. C., & Almvik, R. (2009). Using Exercise to Treat Patients with Severe Mental Illness How and Why? *Journal of Psychosocial Nursing, 47(*2), 31-40. https://doi.org/10.3928/02793695-20090201-14.	Included	Used exercise as routine treatment for mental health disorders. It explored the experience and patients views on how they felt.
White, R. L., Babic, M. J., Parker, P. D., Lubane, D. R., Astell-Burt, T., & Lonsdale, C. (2017). Domain-specific physical activity and mental health: A meta-analysis. *American Journal of Preventative Medicine*, 52(5), 653-666. https://doi.org/10.1016/j.amepre.2016.12.008.	Included	Multiple levels of different physical activity domains were researched.
Zhang, J., & Yen, S. T. (2015). Physical activity, gender differences, and depressive symptoms. *Health Services Research, 50*(5), 1550-1573. https:// doi.org/10.1111/1475-6773.1228.	Included	Focused on whether physical activity decreases depressive symptoms more in women or men.

Table 4

Literature Review Table of All Studies Included

Citation	Study Purpose	Pop (N)/ Sample Size (n) /Setting(s)	Level of Evidence/Design	Variables / Instruments	Interventions	Findings	Implications [1]
Alexandratos, K., Barnett, F., & Thomas, Y. (2012). The impact of exercise on the mental health and quality of life of people with severe mental illness: a critical review. *British Journal of Occupational Medicine*, 75(2), 48-60. https://doi.org/10.4276/030802212X13286281650956	Aims to describe the effect of physical exercise intervention on the mental health and quality of life of people with severe mental illness.	QNT: n-10-966 QLT: n-2-12	II: RCT design. nine quantitative designs, six qualitative designs and one mixed method design.			exercise can contribute to improvements in symptoms, including mood, alertness, concentration, sleep patterns and psychotic symptoms. Exercise can also contribute to improved quality of life through social interaction, meaningful use of time, purposeful activity and empowerment.	Future research is warranted to describe the way exercise can meet the unique needs of this population. Studies with a focus on psychological outcome measures would provide greater evidence for its use in therapy
Ashdown-Franks, G., Firth, J., Carney, R., Carvalho, A. F., Hallgren, M., Koyankgi, A., Rosenbaum, S., Schuch, F. B., Smooth, L., Solmi, M., Vancamfort, D., & Stubbs, B. (2019). Exercise as medicine for mental and substance use disorders: A meta-review of the benefits for neuropsychiatric and cognitive outcomes. *Sports Medicine*, 1-20. https://doi.org/10.1007/s40279-019-01187-6	To determine if exercise improves neuropsychiatric and cognitive symptoms in people with mental disorders.	General population with mental health disorders. 27 studies.	V: systematic review/meta-synthesis of qualitative evidence	AMSTAR/+	Exercise or Physical Activity (PA)	Our panoramic meta-overview suggests that exercise can be an effective adjunctive treatment for improving symptoms across a broad range of mental disorders.	- exercise reduced depression in children, adults and older adults. - exercise was more effective than control conditions in reducing anxiety symptoms, and as an adjunctive treatment for reducing positive and negative symptoms of schizophrenia. - Regarding neurocognitive effects, exercise improved global cognition in schizophrenia, children with ADHD, but not in MDD. -limitations were that not every patient exercised the same way or amount of time.

Citation	Study Purpose	Pop (N)/ Sample Size (n) /Setting(s)	Level of Evidence/Design	Variables/ Instruments	Interventions	Findings	Implications
Asztalos, M., Wijndaele, K., DeBourdeaudhuij, I., Philippaerts, R., Matton, L., Duvigneaud, N., Thomis, M., Duquet, W., Lefevre, J., & Cardon, G. (2009)Specific associations between types of physical activity and components of mental health. Journal of Science and Medicine of Sports, 12, 468-474. https://doi.org/10.1016/j.jsams.2008.06.009	Do the different types of physical activity have different benefits to one's mental health?	N-1919 adults ages 20-65 years.	VI: Cross-sectional study done via questionnaire.	(FPACQ)	Five types of physical activity as well as household chores, gardening, and active transportation.	Sports participations showed lower stress levels and less distress.	-housework as a form of physical activity differed from blue collar workers and white collared workers. -This study focused more on demographics and showed that physical activity may benefit a blue-collar workers stress, but not white collar and vice versa.
Carek, P. J., Laibstain, S. E., & Carek, S. (2011). Exercise and the treatment of depression and anxiety. *International Journal of Psychiatry in Medicine*, 41(1), 15-28. https://doi.org/10.2190/PM.41.1.c	Determine if there is a relationship between exercise and mental health.	-N-1,900 healthy subjects aged 25–77 years - N-19,288 adults ages 15–54. - N-22,073 female college students ages 18-24.	V: Expert opinion with supportive studies.	(NHANES I)	Exercise/ Physical activity	Exercise has been shown to reduce symptoms associated with anxiety and depression and has the potential to lessen the dependability on psychopharmacology.	physical activity is associated with improved physical health, life satisfaction, cognitive functioning, and psychological well-being. -age could affect the relationship between exercise and mental health.
Dunn, A. L., & Jewell, J.S. (2010). The effect of exercise on mental health. *Current Sports Medicine Reports (American College of Sports Medicine)*, *9*(4), 202–207. https://doi.org/10.1537-890X/0904/202-207	To determine if exercise can be used for prevention and treatment of mental disorders.	23 trials including 75 studies.	I; Meta-analysis.	Improve diet and increase physical activity.	Physical activity/Exercise.	Increasing support that exercise could be medicine for mental health disorders. Providers should take into consideration patient's comorbidities.	There is little evidence for the use of exercise as an augmentation or adjunct treatment, and this is an area where more research is needed, particularly when one considers the undertreatment of mental disorders.

Citation	Study Purpose	Pop (N)/ Sample Size (n) /Setting(s)	Level of Evidence/Design	Variables/ Instruments	Interventions	Findings	Implications
Hegberg., N. J., Hayes, J. P. & Hayes, S. M. (2019). Exercise intervention in PTSD: A narrative review and rationale for implementation. *Frontiers in Psychiatry*, 10 (133), 1-13. https://doi.org/10.3389/fpsyt.2019.00133	To determine if aerobic exercise exerts a positive impact on PTSD.	N-US veterans (38,883)	V: Narrative review, questionnaires. observational and intervention studies. cross-sectional studies.	DSM-IV, PTSD questionnaires.	Aerobic exercise and resistance training.	aerobic exercise, either alone or in combination with standard treatments, exerts positive mental health benefits among individuals with PTSD	-Multiple health benefits (cardiovascular health and musculoskeletal health). - reduced rates of comorbidity and mortality
Malcolm, E., Evans-Lacko, S., Little, K., Henderson, C., & Thornicroft, G. (2013). The impact of exercise projects to promote mental wellbeing. *Journal of Mental Health*, *22*(6), 519–527. https://doi.org/10.3109/09638237.2013.841874	To investigate whether exercise projects, funded by the time to change anti-stigma program to reduce mental health-related stigma and discrimination in England, can improve (1) wellbeing, (2) participation in physical activity, (3) readiness to disclose mental health problems or (4) perceived reduction in levels of stigma and discrimination.	N-2663 community members. Mean age: 41	IV: quantitative	WEMWBS	Exercise projects/ physical activity x 3 months	Community-based exercise projects have the potential to produce multifaceted positive outcomes for people with mental health problems; however, more methodologically robust studies are needed to adequately determine the effects of exercise.	-low response rate and missing data at three months limits the generalizability of the conclusions which can be drawn from this evaluation. - the volunteer to participant ratio may not have been high enough in some cases to facilitate data collection.
Mason, O. J., & Holt, R. (2012). Mental health and physical activity interventions: A review of the qualitative literature. *Journal of Mental Health*, *21*(3), 274–284. https://doi.org/10.3109/09638237.2011.648344	Examines studies that explore the experiences of mental health service users participating in physical activity programmes.	13 Qualitative Studies	IV: Literature review.	N/A	Physical activity, sports.	Evidence suggests a relationship between physical activity and positive mental health.	- it is rare that health professionals include physical activity as a treatment option in mental health.

Citation	Study Purpose	Pop (N)/ Sample Size (n) /Setting(s)	Level of Evidence/Design	Variables/ Instruments	Interventions	Findings	Implications
Mikkelson, K., Storjonavsky, L., Polenakovic, M., Bosevski, M., & Apostolopoulos, V. (2017). Exercise and mental health. *Maturitas, 106*, 48-56. http://dx.doi.org/10.1016/j.maturitas.2017.09.003	Does exercise have a positive effect on depression, anxiety, and stress?	16 studies	IV: Literature Review.	N/A	Aerobic exercise and/or resistance training	Exercise is effective for the treatment of depression, anxiety, and stress.	-prolonged bouts of strenuous exercise can temporarily suppress or dysregulate immune function for a period of 3–24 h after exercise.
Stanton, R. & Reaburn, R. (2014). Exercise and the treatment of depression: A review of the exercise program variables. *Journal of Science and Medicine in Sport, 17*, 177-182. https://doi.org/10.1016/j.jsams.2013.03.010	Does exercise decrease or improve depressive symptoms?	N-Adults aged 18-65 with diagnosis of depression. -5 RCTS reviewed.	I: Systematic Review. RCT's.	PEDro	Aerobic exercise and/or resistance training	Exercise is effective for the treatment of depression.	-screen patients for co-morbidities prior. -further research warranted.
Stanton, R., Happell, B., & Raeburn, P. (2014). The mental health benefits of regular physical activity, and its role in preventing depressive illness. *Nursing Research and Review, 4*, 45-53. https://doi.org/10.2147/NRR.S41956	Examines the mental health benefits of physical activity	12 studies	IV: Literature Review	N/A	Physical Activity and resistance activity.	The current evidence for the mental health benefits of physical activity and the prevention of future depressive episodes is promising	- determination of mental illness either via self-report or using a multitude of diagnostic instruments, or differing diagnostic cut points in the same instrument, makes interpretation and comparison between studies difficult. - A differentiation between clinical depression and other forms, and between clinically significant and statistically significant findings will also aid in the translation of research to practice.

Citation	Study Purpose	Pop (N)/ Sample Size (n) /Setting(s)	Level of Evidence/Design	Variables/ Instruments	Interventions	Findings	Implications
Ten Have, M., De Graaf, R., & Monshouwer, K. (2011). Physical exercise in adults and mental health status: Findings from the Netherlands Mental Health Survey and Incidence Study (NEMESIS). *Journal of Psychosomatic Research, 71,* 342–348. http://www.elsevier.com/wps/find/journaldescription.cws_home/525474/description#description	Investigated whether physical activity was associated with prevention of mental health disorders.	N-4796 adults ages up to 64 years.	V: Population - based prospective study	Interviews	Exercise/ physical activity	Strong evidence for the beneficial effects of exercise on mental health.	- amount of physical activity was assessed only through the weekly hours of exercise and did not account for frequency or intensity of exercise.
Tetlie, T., Heimsnes, M. C., & Almvik, R. (2009). Using Exercise to Treat Patients with Severe Mental Illness How and Why? *Journal of Psychosocial Nursing*, 47(2), 31-40. https://doi.org/10.3928/02793695-20090201-14	To determine whether exercise be used to treat patients with mental illness.	N-15 patients. (3 men and 12 women). Age ranging 34-48.	VI; qualitative phenomenological study	Exercise programs with PT/OT and nursing.	The exercise always includes aspects of social interaction, games, and play. Aerobic and strength training using multiple-joint and single-joint exercises	Successful outcomes and adherence to exercise programs for patients with SMI in secure settings rely on the therapeutic relationships between the patients and staff.	- more research is needed to identify effective exercise interventions and feasible delivery models for individuals with SMI in secure settings. -Patients do better with praise and therapeutic communications and relationships.

Citation	Study Purpose	Pop (N)/ Sample Size (n) /Setting(s)	Level of Evidence/Design	Variables/ Instruments	Interventions	Findings	Implications
White, R. L., Babic, M. J., Parker, P. D., Lubane, D. R., Astell-Burt, T., & Lonsdale, C. (2017). Domain-specific physical activity and mental health: A meta-analysis. American Journal of Preventative Medicine, 52(5), 653-666. https://doi.org/10.1016/j.amepre.2016.12.008	How does the context of physical activity influence mental health?	N-648,726 mostly adults.	I; Systematic review. Meta-analysis. Quantitative assessment. Cross-sectional, longitudinal, and experimental studies.	Interviews	-Work-related PA. - Transport PA. - Household PA -School sport. -Leisure time PA. -Physical education.	Physical activity is associated with greater mental health and reduced risk of mental illness.	There is a well-accepted relationship between physical activity (PA) and mental health; however, the relationship varies between different PA domains. -the goal was to see if policy guidelines need to be tailored to maximize positive effects.
Zhang, J., & Yen, S. T. (2015). Physical activity, gender differences, and depressive symptoms. *Health Services Research, 50*(5), 1550-1573. https://doi.org/10.1111/1475-6773.1228	To investigate the roles of physical activity (exercise) and sociodemographic factors in depressive symptoms among men and women in the United States.	n-11560 individuals ages 18-99.	IV: quantitative data	Patient Health Questionnaire Depression Scale (PHQ-8)	Physical activity.	Regular physical activity reduces depressive symptoms among both men and women with mild to moderate depression notably among women.	- for individuals with a record of bad physical health, PA or exercise is no longer an effective way to reduce DS, so amelioration of depression would have to be accomplished by (along with) other means

Melnyk, B. M., & Fineout-Overholt, E. (2015). Evidence-Based Practice in Nursing & health care: A Guide to Best Practice (3rded.). Philadelphia, PA: Wolters Kluwer