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The Effects of Movement and Exercise on Depression

In the United States, Major Depressive Disorder (MDD) is listed by the National Institute of Mental Health as the leading cause of disability impacting individuals between the ages of fifteen and forty-four (“The Numbers Count: Mental Disorders In America”). Depression is a prevalent disorder in American society with both social and financial stresses, indicated to be fourth in the study done by the Global Burden of Disease Project. According to Oh et al. the United States exceeds \$80 billion annually on the cost of depression (1). Despite this huge financial burden, only 32% of those receiving treatment report symptom cessation, and only 27.5% of individuals report remission upon initial pharmaceutical intervention (Rethorst et al. 492). Standard interventions typically include psychotherapy, antidepressant medications, or a combination of the two, but recent evidence suggests exercise could be equally effective, either as a complementary or alternative treatment. Current research suggests that exercise could provide the accessible and cost-effective treatment modality alternative that seems to be necessary for the treatment of depression. After researching the neurology of exercise as a depression treatment and the effect of aerobics, running, yoga and Qigong on patients with depression, it is clear studies support that exercise and mindful movement interventions create antidepressive effects on patients, which explains their role in symptom reduction.

One widely acknowledged cause of depressive disorders is a lack or dysregulation in serotonin levels. Serotonin is a neurotransmitter that, among other responsibilities, contributes to the modulation of mood, appetite, sleep and cognition, making its connection to depression apparent. Selective Serotonin Reuptake Inhibitors (SSRI's) are a popular category of antidepressant medications, and provide a similar adjustment to serotonin secretion that is found from the use of exercise in treatment. Exercise stimulates serotonin synthesis, which

leads to an increased secretion of the neurotransmitter (Rethorst et al. 503). Exercise is also found to cause positive changes in sleep patterns of depressed patients, which also supports the regulation of serotonin levels, resulting in increased mood and wellbeing. Exercise decreases REM sleep cycles, which have been found to inhibit the discharge of serotonin (Rethorst et al. 503).

An increase in serotonin is associated with the stimulation of neurogenesis, which refers to the process through which neurons are generated. Reduced neurogenesis is also linked to depressive disorders, particularly with regard to older adults. A lack of neurogenesis presents as declining cognitive abilities, but chronic exercise is connected with reversing this effect. Exercise was also documented to have neuroprotective effects and contribute to early intervention and prevention regarding cognitive decline throughout the life cycle (Knapen et al. 82). Research suggests that exercise facilitates neurogenesis because of the associations with exercise and increased beta-endorphins and brain derived neurotrophic factors (BDNF). BDNF is believed to be a critical factor in the development of neurons, and is therefore essential to improved neurogenesis. Rethorst et al.'s meta-analysis found BDNF to increase in just two days when exercise was combined with pharmaceutical intervention, as opposed to the standard two weeks when using the medication alone (Rethorst et al. 503). Similarly to many synthetic antidepressants, exercise is connected with the improvement of hippocampal neurogenesis, therefore providing further evidence for its role as a course of treatment (Rethorst et al. 503).

Another biological antidepressive effect of exercise is seen in the modulation of the hypothalamic-pituitary-adrenal (HPA) axis. The HPA axis is impacted in those experiencing depression. It must readjust itself for recovery to occur, as it plays a critical role in the neuroendocrine response to stress (Tsang et al. 891). People with depression typically have increased stress levels, as well as reduced capacity to cope with and regulate stress, which is linked to heightened levels of corticotropin releasing hormones (CRH) and increased cortisol secretion (Tsang et al. 891). Exercise, especially in studies focused on the implementation of

Qi-gong, reduces CRH and regulates the HPA axis, providing further evidence for its usefulness as a treatment option.

Along with the biological and neurological antidepressive effects, there is additional research that exercise and mindful movement address certain psychosocial factors of depression as well. Sedentary lifestyles are common among people experiencing depression, and this was improved by the implementation of exercise. For patients with mild to moderate depression in this situation, the implementation exercise was found to be extremely effective, even as a singular treatment method (Sarris 32). Exercise is also documented to provide feelings of mastery, self-efficacy, distraction from symptoms, reduced negative patterns of thinking, and a designated space for social interaction (Knapen et al. 82). All of these components have been linked to depression in some capacity, indicating the array of areas in which exercise can be beneficial in the treatment of depression. Furthermore, studies focused on clinically depressed female patients found the introduction of exercise therapy to lead to improved self-esteem and positive body image. These also were connected to a reduction in depression symptoms and negative mood (Rethorst et al. 510).

In Borowsky et al.'s study regarding inpatients diagnosed with severe depressive disorders, it was also found that exercise had a positive influence concerning sleep regulation, contributing to a reduction in symptom severity. In this study, overall quality of life was also reported as improved at the end of the hospitalization in the patients who opted for exercise therapy along with psychotherapy and medication interventions (Borowsky et al. 617).

Exercise also promotes physical health and wellbeing; the lack of this is another cause of depression when approaching the disorder from a whole person model. Depressive disorders are commonly diagnosed alongside physical illness, particularly heart disease, osteoporosis and diabetes (Knapen et al. 78). These somatic illnesses are often associated with a sedentary lifestyle, which can be both a cause and manifestation of depression. Exercise based

intervention for these patients can address both the needed lifestyle changes, and have positive side effects in the treatment of and prevention of additional co-occurring physical diagnoses.

Three different studies cited a 2009 Cochrane review that analyzed the effect of exercise on patients with symptoms of depression compared with those who did not exercise (Kruisdijk et al. 2; Gill, Womack, Safranek 530; Callaghan et al. 1). These studies examined exercise as an effective treatment; one studied the effects of exercise in addition to usual care, one looked at replacing usual care altogether, and one looked at preferred versus prescribed exercise treatment.

The Kruisdijk et al. study examined the effectiveness of exercise therapy, running therapy, or Nordic walking on depression in adults in addition to usual care treatment. Usual care meant that the participants in both groups were asked to follow the advice of their primary care health professional for their depression and were able to take advantage of available treatment options including counselling and use of antidepressants (Kruisdijk et al. 3). The intervention group received supervised exercise therapy for one hour per week and were asked to train unsupervised for an additional hour per week for six months, in addition to their treatment as usual. Patients used running therapy unless prevented for a medical reason or showed a strong aversion to running. The control group received treatment as usual, without exercise. Both reduction in depressive symptoms and cardiorespiratory fitness were measured as well as quality of life and cost-effectiveness. This was the first study of its kind and can therefore contribute to stronger evidence for exercise intervention. This study included severely clinically depressed patients while other studies excluded these patients, focusing solely on those with mild symptoms of depression. Since depression is also associated with obesity, heart disease, quality of life and chronic pain, findings in this study showed that exercise may be prescribed to improve and prevent these conditions in addition to reducing depressive symptoms (Kruisdijk 7).

The Gill, Womack and Safranek study also concluded that exercise was an effective therapy for reducing symptoms of depression yet went one step further and showed that exercise therapy was just as effective as cognitive behavioral therapy or using antidepressants. It was found that resistance exercise and mixed exercise (resistance and aerobic) worked better than aerobic alone; high-frequency exercise was more effective than low-frequency exercise; and “mindful” exercise (meditation, tai chi, yoga) was just as effective at reducing depressive symptoms. Recommendations based on this study stressed structured, supervised exercise programs, three times a week for 45-60 minutes over 10-14 weeks to treat mild depression. It recommended exercise for 30 minutes three to five days a week to decrease major depressive symptoms. (Gill, Womack, and Safranek 531).

If a patient uses exercise to alleviate depressive symptoms, adherence to an exercise regimen is very important. To determine conditions that reduce attrition rates, the Callaghan et al. study compared preferred exercise intensity vs. prescribed exercise intensity. Is it better to let patients dictate their own exercise regimen in terms of how long and hard they work out? Should exercise be prescribed in its duration and intensity? The Callaghan et al. study focused specifically on testing exercise treatment of depressed women. The preferred group did 12 sessions of treadmill aerobic exercise of preferred intensity three times per week for four weeks. The prescribed group did 12 sessions of treadmill aerobic exercise of prescribed intensity based on the national recommendation guidelines three times per week for four weeks. Each group had support and supervision. Although the intensity levels of the two groups were the same at the beginning, by the end of the study the preferred group who could choose their level was closer to the recommended national level than the prescribed group (Callaghan et al. 6). Moreover, preferred intensity exercise was found to improve psychological, physiological and social outcomes of depressed women. They showed lower levels of depression as well as higher self-esteem and improved quality of life. Both groups had increases in general health and perceived social support. The preferred intensity group had a higher adherence rate (66%

compared to 50%), a very important factor in determining treatment success (Callaghan et al. 6).

Callaghan et al. reiterated that exercise improves depressive symptoms, general health, and wellbeing. It also showed that participants who have control over the intensity, type and duration of their exercise are more likely to enjoy and adhere to an exercise regimen (Callaghan et al. 7). If a woman chooses an exercise that she loves, she is more apt to stick with it. However, national guidelines continue to recommend frequency and intensity levels that are overly ambitious among middle-aged women coping with depression. Moreover, the Callaghan study concluded that an exercise intervention must be accompanied by supportive psychosocial interventions (6). “Mentored” exercise, which included group motivational support, was key to increased adherence rates. Vouchers for a local gym given to largely sedentary depressed women as treatment by a primary care doctor has limited effectiveness. Instead, “exercise must be accompanied by supportive psychosocial interventions” (Callaghan et al. 6). Utilizing exercise as a complementary treatment for depression should be reinforced and supported thereby transforming it into a natural habit increasing brain plasticity, decreasing cortisol levels and increasing natural dopamine and serotonin levels.

As stated above, recent studies have demonstrated the effectiveness of exercise for patients with depressive symptoms improving both physical and mental health outcomes (Gill, Womanck, and Safraneck 531, Callaghan et al. 6). However, a study done by Herring et al. evaluated the effects of exercise on depressive symptoms among chronically ill patients who did not have a diagnosis of a depressive disorder. For patients who suffer from chronic illness, physical inactivity and comorbid depressive symptoms are often common occurrences. Exercise training can alleviate depressive symptoms among patients with chronic pain (Herring et al. 101). The relationship between chronic illness and depression is bidirectional (Herring et al. 101). Several chronic illnesses increase the risk of depression, whereas depression is often associated with a higher risk of chronic illness. The poor health outcomes associated with

chronically ill patients who suffer from depressive symptoms include reduced adherence to medical treatments prescribed, lower health-related quality of life, functional impairments, disability, and increased use of health care services (Herring et al. 101). Types of chronic illnesses studied included: cardiovascular disease, chronic pain, obesity, neurologic disorders, cancer, multiple sclerosis, pulmonary disease and psychological disorders other than depression. Exercise training consisted of three sessions per week, each 42 minutes, for 17 weeks. The mean adherence was 77% of the prescribed sessions (Herring et al. 102). Exercise training significantly reduced depressive symptoms among chronically ill patients. Results improved when “baseline depressive symptoms were higher” (depressive symptoms were indicative of mild-to-moderate) and patients adhered to the recommended physical activity levels. Depressive symptom reduction was significantly larger among patients who followed moderate or vigorous physical activity recommendations (Herring et al. 108-109). The results demonstrate that physicians and clinicians should recommend exercise as a meaningful tool to reduce depressive symptoms in several of the patient populations listed above. It is a potential low-risk treatment for depressive symptoms that can develop during chronic illness.

After looking at four studies that specifically addressed exercise training to reduce depressive symptoms, it is clear that exercise training was found to reduce depressive symptoms. Moreover, exercise has its own beneficial “side-effects” including increased self-esteem and energy, increased physical health and increased positive social interaction. Additional investigation is needed as to the “curative effect” of exercise on depression as well as the sustainability of the effects after exercise therapy has ended. Supplementing any form of our researched exercise methods to treat depression is ultimately in the individual and health care provider’s decision making process.

Two additional methods to alleviate signs and symptoms of depression are Qigong and yoga. Qigong is a traditional mind-body medicine that dates back more than 1000 years. There are two primary types of Qigong, external and internal. External Qigong is an energy medicine

where the practitioner sends Qi energy to a patient for the treatment of the patient's illness (Oh et al. 1). Internal Qigong focuses the participant in meditation, breathing, and gentle exercise. This exercise promotes balance and combats energy blocking by promoting the flow of vital energy (Oh et al. 1). In Chinese medical theory, there is only one cause of illness—a 'disbalance' between the yin and yang. When the human energy system is functioning properly, then the yin and yang are in balance. When energy flow is blocked, then there is disharmony. Clinically this would be called disease, illness or dysregulation ("What is Qigong" 1). Qi, or energy in Chinese, flows through the body at all times. The practice of Qigong greatly enhances the flow of the Qi and creates a balance. Qigong is both a physical and a meditative practice. The practice of Internal Qigong has been researched and shown to be effective in treating depression (Oh et al. 1).

In Oh et al.'s 2013 systematic review study, researchers looked at the mindful and non-mindful physical exercise and found them to be effective in the treatment of depression or depressive symptoms in the short term (2). "Qigong in the treatment of depression was supported by the bio-psychosocial model, relaxation response theory, and evidence on the positive effects of exercise" (Oh et al. 6).

Qigong was found to be a "safe and feasible intervention for patients with major depressive disorder" (Oh et al. 2). One of the most significant findings from Oh et al.'s 2013 systematic review study was that, unlike other studies focused on the use of physical activity to treat depression, Qigong participants did not report any psychotic reactions (6).

Oh et al. did find that future studies are needed to further support the use of Qigong as a treatment for depression. Many of the articles they utilized in their systematic review did not align the length, frequency and intensity of the intervention (Oh et al. 6). Further research is also needed to investigate the effects of Qigong on the brain to decipher the similarities and differences between Qigong and physical exercise on the brain (Oh et al. 6).

Tsang et al. focused their research on the effects of Qigong exercise on the elderly with depression. With 25-40 percent of elderly people suffering from diagnosed depression and depressive symptoms, there has been a great deal of research focused on finding treatments alternative to antidepressants and cognitive behavior therapy (Tsang et al. 890).

The 82 participants who completed the study were recruited from non-government care homes in Hong Kong and practiced with a Qigong practitioner for 16 weeks, three times a week with each session lasting 40-45 minutes, and asked to practice daily on their own for 15 minutes (Tsang et al. 890). Several instruments were utilized to measure the effectiveness of Qigong, including the Geriatric Depressive Scale, the Chinese General Self-efficacy Scale, and the Personalized Well Being Index to name a few (Tsang et al. 892). The results from this study were amazing.

“After eight weeks of Qigong practice, the intervention group participants outstripped themselves in improvement in mood, self-efficacy and personal wellbeing, and physical and social domains of self-concept when compared with comparison subjects. After 16 weeks of practice, the improvement generalized to the daily task domain of the self-concept” (Tsang et al. 890). The participants perceived that they had improved their personal health, ADL cholesterol numbers, psychological health, and social relationships (Tsang et al. 893). Just like the Oh et al’s Systematic Review, the results supported the biopsychosocial model of health and wellness. However, the results were not permanent. The effect did not continue once the program was completed. Tsang et al suggested that Qigong practice must be ongoing by the participants and more effective with monitoring from rehabilitation professionals (Tsang et al. 896).

The elderly, as studied in Tsang et al.’s research, are not the only population that found Qigong effective in treating depression. Saeed, Antonacci and Blotch examined the effectiveness of Qigong on patients 11-19 years of age that had been clinically diagnosed with

depression. “All reviews reported that exercise produces meaningful reductions in depression symptoms that are comparable with cognitive behavior therapy and two studies found that it was at least comparable with sertraline (Zoloft)” (Saeed, Antonacci and Botch 981). Supervised and unsupervised exercise, including Qigong has produced marked clinical positive effects.

However, this particular trial did not find evidence that Qigong was an effective treatment, as the results faded within a month of completion (Saeed, Antonacci, and Botch 982). The 11-19 year old group did not show statistically significant positive effects.

Yoga has similar effects on depression as Qigong and aerobic exercise, though it has many shapes and forms. Both Cramer, et al. and Woodyard point out the various styles and practices of yoga. There are four basic principles behind all practices, similar to Qigong. First, the human body is a holistic entity comprised of inseparable parts. One aspect cannot be separated from another. The health or illness of one affects the other. Second, every human being is unique. There is no ‘correct’, ‘one size fits all’ model that works for everyone. Third, empowerment and advocacy are key. The client, individual, or student must be a part of the learning process by being an active participant on their journey towards harmony, balance or, scientifically, ‘homeostasis’. Finally, the state of an individual’s mind is crucial towards healing or living a healthy life. The power of a positive mind helps in the healing process, just as a negative outlook would prolong or hinder the clinical recovery (Woodyard 1).

Research recognizes that meditation-based yoga is effective for treating depression (Cramer et al. 2-14, Woodyard 3). Movement-based yoga has an even greater effect when compared to control groups and relaxation, yet only moderate differences when compared to aerobic exercise (Cramer et al. 11). Yoga has also been evaluated for its positive effects on improving sleep, emotional regulation, addiction treatment, overall quality of life as well as anxiety, pain and stress reduction (Woodyard 1-3). Cramer et al.’s meta-analysis reinforces Woodyard’s research concerning anxiety (1).

Both studies correlate the efficacy of yoga's therapeutic effects on depression and wellbeing to yoga's meditative techniques and mindful rhythmic breathing postures. The practice of yoga is similar to that of other exercise techniques. The main goal and function is to restore the body and maintain an equilibrium or homeostasis within the individual's experience (Cramer et al. 2, Woodyard 1). Cramer et al. pointed to evidence from imaging studies which suggests yoga increases endogenous dopamine in the ventral striatum and brings balance back to gamma-aminobutyric acid, serotonin and noradrenaline levels (2). Stress reduction and the relaxation response in the parasympathetic nervous system were correlated to reduction in cortisol and monoamine oxidase, an enzyme that breaks down neurotransmitters (Woodyard 2).

Woodyard points to the number of individuals seeking alternative treatments for depression because of adverse medication side effects, lack of response or simple preference (2). Depression is typically a co-occurring concern as seen from all studies referenced. The practice of yoga, whether meditative or movement based, is rooted in the philosophy of letting go what you cannot control, accepting what you are not sure you have control over, and being at ease with what comes to pass in your present and future moment experiences. In short, yoga helps people 'let go', 'go with the flow' and 'take it easy.' This is associated in three dimensions, mind (meditation), body (physical positions) and spirit/consciousness (breathing techniques or focused attention) (Cramer et al. 2, Woodyard 1). The appeal of less invasive and harmful therapies from healthy individuals to severely depressed persons has become a major topic of discussion in mortality, hence the attraction of the 'treatments' discussed.

The meta-analysis done by Cramer et al. found yoga to be useful clinically in both out and inpatient settings. More studies with low risk bias and long-term research should be done (13). Failure to include articles from mindful based stress reduction programs or mindful behavior cognitive therapy further limited the analysis. In her research, Woodyard explains that a similar focus needs to be recognized by the modern medical modality. She states:

“Yoga should be considered as a complementary therapy or alternative method for medical therapy in the treatment of stress, anxiety, depression, and other mood disorders as it has been shown to create a greater sense of well-being, increase feelings of relaxation, improve self-confidence and body image, improve efficiency, better interpersonal relationships, increase attentiveness, lower irritability and encourage an optimistic outlook on life.” (Woodyard 3)

Cramer et al.’s meta-analysis supports this summary throughout the report, though they would like to see more homogeneity in methodology and reporting. With the many yoga practices out there, they recommend forms with more meditation-based practices (14). Woodyard’s clinical recommendations suggest that slow rhythmic movements with meditation or focused attention can be more effective, especially if an individual has a health risk for strenuous activity (2). If one views the human body as a holistic entity comprised of interrelated inseparable parts where one aspect affects another; finding the right practice (depression treatment options) for the individual is what is most important. “Do what works for you” (Quintiliani) is echoed by Woodyard’s analysis.

Everyone is unique and approaches should be tailored specifically to an individual. Self-empowerment is crucial when treating any ailment, mood disorder or co-occurring issue. Every individual is on his or her own journey of growth, healing and self-discovery. The source is within, not without. The premise of holistic therapy, exercise and alternative therapies is that “pills are not skills” (to appear in Nash, *How Stories Heal: Writing Our Way to Meaning and Wholeness in the Academy*), a balance is struck between the traditional medical model. Autonomy is achieved with a greater sense of wellbeing. In addition, quality of attitude is key. A positive mind equals positive growth and healing (Woodyard 3). Keeping this in mind is the takeaway for exercise effects on depression and clinical recommendations. Though no standard for length of time and frequency was suggested, in Cramer et al.’s meta-analysis the most effective treatments were at least 20 minutes in length, three to four times a week over a period

of four to eight weeks (6-9). Research and literature consensus shows meditation for at least ten minutes a day or yoga classes of forty-five minutes in length is typical (Cramer, et al. page 6-9).

Clinical applications and recommendations include personalizing a practice, regardless of the form of exercise, and slowly increasing the frequency and duration of the routine. It is recommended through research presented in 'Happiness, Mindfulness and Health Benefit Outcomes', offered through The University of Vermont by Anthony R. Quintiliani Ph.D., LADC, this duration be increased to sixty minutes a day. A combination of practices can be utilized during this time frame. Meeting an individual where they are, both physically and mentally, is essential when beginning any treatment plan. Whether it be aerobics, running, Qigong, yoga or meditation, recording and tracking progress can be helpful and essential for continued success. Tracking can help increase plasticity around the behavior given the proper motivation and reinforces. It is also a way for individuals to see if their progress is slipping in order to gently guide themselves back on track. Mobile applications or paper can be utilized for this purpose.

In conclusion, exercise, physical movement, and mindfulness activities are safe, inexpensive lifestyle interventions that have the potential to have beneficial effects on health and well-being. In addition to physical health benefits, exercise and movement can encourage socialization, increase self-esteem and energy as well as significantly reduce symptoms of depression and other co-occurring concerns. Research shows that exercise and movement have been an effective alternative or supplementary treatment for depression (Cramer et al. 1, Woodyard 1). Many depression treatment models have begun to recognize that symptoms typically stem from biological, psychological, and social factors. These treatment 'alternatives' can help alleviate an already stressed medical model or supplement current therapies. Not only is exercise, mindfulness and movement a healthy alternative to prescription drugs, it is also cost effective, very accessible and has the ability to decrease the overall United States spending on depression and other co-occurring concerns.

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