A look into the correlation between Major Depressive Disorder (MDD) and physical activity

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Abstract

Depression is an issue that faces humanity. It carries a high suicide rate as well as a very high morbidity rate. Combating depression is a deed that is bestowed upon metal health workers. A plethora of approaches to depression exist. Many of them being pharmaceutical in nature. The authors of this paper understand that these options are not always available to everyone and, ergo, decided to conduct a review article which explores the effects of exercise on depression. This research has showed that physical activity has significant positive effects on mental health in general (namely, depression and anxiety). This effect seems rather comparable to that of SSRIs. This is of importance as it illustrates the need for the immediate implementation of physical activity in their treatment modules to combat depression in our mental health institutes.

Keywords: Neuropsychiatry, Depression, MDD, Major Depressive Disorder, Napata College, Exercise, Mental Health

Introduction:

‘Far more than any other type of illness, mental disorders are subject to negative judgements and stigmatization.’ (1)

Generally speaking, data indicates that there exists a rather significant association between the levels of physical activity and the presence of psychiatric disorders (2). As per a UK-based paper, ‘Whilst levels of activity are associated with genetic liability to psychiatric disorders to a very limited extent, the substantial differences in activity levels in those with psychiatric disorders most likely arise as a consequences of disorder-related factors’ (2). Depression affects a considerable percentage of individuals worldwide (3). If anything, this indicates an immediate need for intervention on our end. Data indicates that people with depression are less physically active than their ‘non-depressed’ counterparts (4). Not only is increased physical activity associated with overall decreased effects of depression, but it also seems to be associated with successful/improved cognitive functioning (5). The effect of physical activity seems to not be limited to the improvement of the quality of life of depressed individuals, but seems to exert a positive effect on the illness itself, this effect seems to be true for neurodegenerative illnesses as well (6–8).

Problem Statement/Justification:

With approximately 5% of adults suffering from depression worldwide, depression is a major challenge that besets the world (3). Ergo, it is of the upmost importance that we work towards bringing this to an end, or to,

at the very least work towards effectively combating this phenomenon. Furthermore, a considerable percentage (approximately 75%) of sufferers in low income countries receive no treatment (9). As per a study out of the US, 'Depression and anxiety are the most common psychiatric conditions seen in the general medical setting……. The treatments for depression and anxiety are multiple and have varying degrees of effectiveness. Physical activity has been shown to be associated with decreased symptoms of depression and anxiety. Physical activity has been consistently shown to be associated with improved physical health, life satisfaction, cognitive functioning, and psychological well-being. Conversely, physical inactivity appears to be associated with the development of psychological disorders' (10). With the etiology of depression (also referred to as Major Depressive Disorder (MDD), the terms are used interchangeably throughout the remainder of this paper) being rather unclear (11), it seems safe to assume that a combination of 'bio-psycho-social' factors exist in the making of depression
Ergo, we believe it is of the upmost importance that we illustrate treatment modalities that is of minimal cost.

History of Depression:

The following section (regarding the history of depression) will follow the same timeline illustrated by Schimelpfening in their 2020 piece for verywellmind.com (12). That being:

a) First accounts of depression
b) Ancient Greek and Roman views on the topic
c) 'The common era'
d) The enlightenment

The first accounts of depression date back to Mesopotamia (12), an area which hosted the beginnings of human civilization (modern-day middle east) and was home to a plethora of empires and cultures (13). The Babylonian cultures were of the better-known cultures to have existed in the area. The better known of them being the Neo-Babylonian Empire (14).
Despite the anachronism of the culture, they were, as reported by EHR and JVKW in their 2013 paper, 'Although the Babylonians had no understanding of brain or psychological function, they were remark- ably observant describers of many medical disorders and behaviours which we see today and for which they had their own interpretations and treatments.' (14).
Despite the relatively modern view held by the Babylonians, it is safe to summarize their beliefs as associated with the metaphysical in so far as mental health is concerned. As per Schimelpfening, 'Because of this belief [that depression is caused by demons], it was often treated with methods such as beatings, physical restraint, and starvation in an attempt to drive the demons out.' (12).
Other cultures, such as the Greek associated mental illness with the metaphysical. For example, Melancholia was associated with the Muses gods (Gods of 'poetic madness') (15). One of the best-known physicians belonging to this culture was Hippocrates, who believed that depression (termed melancholia at the time) was caused by a misbalance between certain components in the body, namely 'black bile', which he believed accumulated in the spleen and caused the illness (16).
Others, such as the Roman philosopher Cicero, believed the cause to be what we would term as 'psychological' in nature (e.g. rage, grief, fear, etc.) (12).
Moving to the common era (which is the secular equivalent of the well-known time reference 'BC') (17), we find that the beliefs regarding the origin of mental health had not vastly changed, and neither has the suggested methodology of managing them (which, if put into a modern perspective might seem rather barbaric and cruel). For example, it is believed that Celsus recommended starvation, beatings, shackling, etc. as a way of addressing mental illness (18). According to Schimelpfening ' During the Middle Ages, religion, especially Christianity, dominated European thinking on mental illness, with people again attributing it to the devil, demons, or witches. Exorcisms, drowning, and burning were popular treatments of the time. Many

people were locked up in so-called "lunatic asylums."' (12)
Moving to 1621, we find that Burton published 'Anatomy of Melancholy'. In this book, he illustrates the nature of depression and recommends diet, exercise, travel, etc. as a way to combat depression (19). The work is very well written.
Willis, in 1684, defined melancholia as 'a complicated Distemper of the Brain and Heart' (14,20).

Is physical activity a treatment for MDD?:

More or less, it is well-established that individuals suffering from depression are not as physically active counterparts; furthermore, it is also well-known that they are more deconditioned (4,21).
A systematic review and meta- analysis that took place in the US with the aim of studying the effect of non-pharmacological treatment for depression in comparison to anti-depressants concluded that in 61 RCTs. physical activity was effective in reducing the severity of depressive symptoms when compared to the control group of placebo or usual care. However, 5 RCTs concluded that there was no significant difference of physical activity compared to the usage of anti-depressants for reducing the severity of symptoms (22).
A 2-sample Mendelian randomization studied the genome wide association studies (GWAS) for physical activity and major depression disorder in UK with a number of 611,583 participants to find the Bi-directional relationship between physical activity and depression, the study found physical activity which was objectively assessed using accelerometer to be protective against depression (OR : 0.74 , P value .006) in contrast to self-reported physical activity which showed no statistically significant relationship with depression (23).
In 2011, a randomized controlled trial in 62 adults who were diagnosed as having depression and on anti-depressants was published comparing aerobic exercise or basic body awareness therapy with a control group who was only counseled about exercises. According to the study using Montgomery Asberg depression rating scale (MADRs) a mean change of -10.3 was found in the exercise group, -5.8 in the basic body awareness group and -4.6 in the counseled group. Also the study found statistically significant change in cardiovascular fitness in exercise group compared to advice group (mean change respectively: 2.4, 0.8) but there was no difference between the groups in the rate of remission or the change in global function (24).
A study was done by Salgureo el al in Spanish population with a sample of 436, found that exercise and physical activity reduce depression level in elderly (25).
Another study analyzed the correlation between muscle strength of the lower limbs and walking speed with depression concluded a negative correlation indicating that depressive symptoms in elderly have a correlation with their motor functions (26).
A follow up of 33,908 participants for 11 years showed a decrease in the risk of depression by 12% with 1 hour of regular exercise per week (26).
As per a study out of the US, 'High levels of fitness did not reduce the odds of reporting depression compared to age predicted CRF. A simple eCRF algorithm can be used to identify college student depression.' (27).
A study by Li et el found higher risk of depression by 1.1% in males, 2.1% in females with every 10 MET – min/day reduction in physical activity (28).
A study of 2724 elderly in China concluded that physical activity energy consumption of 2000k/cal per week can decrease the risk of depression (29).
A study was done by Singh in 1997 as a randomized controlled trial for 32 participants with depression, to compare the effect of resistance exercise with a control group. The study found significant reduction in depression Beck scale in the resistance exercise group compared to the control group (21.3 ± 1.8 to 9.8 ± 2.4 vs 18.4 ± 1.7 to 13.8 ± 2, $p = .002$ respectively) (30).
Aerobic physical activity was found in many researches to reduce the depressive symptoms by increasing levels of serotonin, norepinephrine, monoamine neurotransmitter and decreasing levels of cortisol (31).
A meta-analysis of 5 randomized controlled trials studied the frequency, duration and intensity of exercise in treating depression concluded that for a duration of minimum 9 weeks moderate intensity exercising 3 times

per week could be effective in reducing the depressive symptoms (32).
A study conducted by Trivedi et al studied the effect of 12 weeks walking on depression showed that high intensity walking about 16Kcal/kg per week and low intensity walking about 4 Kcal/kg per week both have significant effect on reducing the depressive symptoms ($p < .001$) (33).
In contrast a study by Chin et al for 173 elderly in care facilities studied the effect of different exercises modalities with weekly training sessions compared to a control group who only received educational program found no significant difference in improving the depression between the groups (34).
A study on female patients with depression who were allocated in two groups, one group received 9 weeks yoga program and the other received educational program found a significant reduction in depressive symptoms after a one year of regular long term yoga sessions (35).
Studies on rats suggest that aerobic exercise change the brain structure, increase the volume of vessels in hippocampal dyntate gyrus, CA1 region and increase the expression of BDNF neurons which all might contribute to alleviate the depression (36).
Courtright, on the other hand, recruited participants for a, approximately, 3 month long running and cycling program and to study the change in the hippocampal volume, the study concluded a significant decrease in Hamilton rating scale for depression with no significant change in hippocampal volume (37).
A 2011 paper clearly concluded that the effects physical activity exerts on depression are comparable to those shown by antidepressants (38).
Furthermore, it is important that we illustrate the amount of physical activity required to achieve the objective of decreasing the incidence of depressive symptoms. A very well-written Korean study that measured physical activity in metabolic equivalents (METs) per minute per week (39) reported a physical activity level of 1800-3000 METs-min/wk for males and 1200-1800 METs-min/wk for females (39) were satisfactory in combating symptoms of depression.
A 2018 study indicated that 'physical activity and exercise' may be useful in the prevention of the onset of depression in adolescents (40) and, ergo, set forth the argument that this correlation should be studied.
In 2019, authors from London compared, in no uncertain terms, the abandonment of exercise to that of any treatment to depression (41).
Evidence published in 2016 clearly indicated that physical exercise of moderate and high intensity had a positive effect on moderate depression (42)..
We believe it is justified to make the blanket claim that physical exercise is ultimately beneficial for both mental and physical health (43).
A 2016 meta-analysis that looked into non-pharmacological interventions for depression concluded the following, 'Non-pharmacological therapies of depression reduce depression symptoms and should be considered along with antidepressant therapy for the treatment of mild-to-severe depression' (22); one of the non-pharmacological interventions considered was physical activity/exercise.

Despite some raising arguments against the use of anti-depressants as treatments (many of them being weak arguments), many of whom use data like the ones exhibited in this paper (effects of physical exercise, etc.) and the existing issue of a considerable percentage of the population refusing treatment with the medications, a 2016 meta-analysis clearly concluded that exercise is a useful intervention in depression, however, it should be used in combination with pharmacotherapy (antidepressants) (44).

Specific Situations:
Data is indicative of exercise during pregnancy being beneficial to women as a combative element against depression (45).
According to a paper out of the US that looked into the effect of physical exercise on older patients suffering from depression, 'Although antidepressants may facilitate a more rapid initial therapeutic response than exercise, after 16 weeks of treatment exercise was equally effective in reducing depression among patients

with MDD' (46).

Conclusion + Recommendation(s):

In conclusion, we found a clear association between physical exercise and mental health (namely, depression). In our estimation, this should manifest itself in the immediate implementation of physical activity interventions as well as recommendations to all those who suffer from depression. In no way, shape, or form should we as professionals permit ourselves to not share this information as the intervention is both affordable and has positive effects.

List of abbreviations:

BC = Before Christ
KCAL = Kilo-calorie
Kg = Kilogram
MDD = Major Depressive Disorder
MET = Metabolic Equivalents
GWAS = Genome Wide Association Studies
RCT = Randomized Control Trial
SSRI = Selective Serotonin Reuptake Inhibitor
US = United States
WHO = World Health Organization
WK = Week

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