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RESEARCH ARTICLE

THE PREVENTIVE POWER OF PHYSICAL ACTIVITY ON DEPRESSION AND ANXIETY: A NARRATIVE REVIEW

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Abstract

Background: Effective treatments for depression and anxiety include psychology and medications. It is proposed that one of the tools of self-care is physical activity (PA), which is an adjuvant treatment that may play a crucial role in managing depression and anxiety, in addition to promoting a better quality of life (QoL).Through this narrative review, we aim to summarize the latest available evidence and guide our healthcare colleagues to help anyone suffering from depression and anxiety.

Summary: PubMed and Cochrane databases were systematically searched for relevantstudies published between January 2018 and June 2023 with no language restriction. Systematic reviews were included in the search. We performed the study selection in 3 stages: initially, we did screening by conducting an electronic search. Article titles and their abstracts were then screened. In the second screening stage, we assessed the full texts. In the last stage, we included studies that met our eligibility criteria.

Key Messages: Based on most studies examined, we could conclude that there is an apparent positive effect on depression and anxiety in all adult age groups, nevertheless, in many physical, mental, and psychological conditions.We encourage all our colleagues in preventive medicine, family medicine, and other specialties to prescribe PA as an adjuvant therapy to prevent or treat patients suffering from depression and anxiety. In addition, we recommend that public health and community medicine professionals advocate for PA and draw and implement strategies to motivate people to include PA as a lifestyle. There are still gaps in this field, and we recommend further research and trials to add more to healthcare and science.

Introduction:-

Mental disorders are clinically significant disturbances in cognition, emotional regulation, or behavior. Furthermore, there is an association with parts of functioning impairment. Different types of mental disorders exist, including

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depression, generalized anxiety disorder (GAD), social anxiety disorder, panic disorder, obsessive-compulsive disorder (OCD), post-traumatic stress disorder (PTSD), and phobias(1,2).

According to World Health Organization, in 2019, 1 in every eight people had a mental disorder; the most common are depression and anxiety. Due to the coronavirus disease 2019 (COVID-19) pandemic, the numbers significantly increased in 2020, 26% and 28% for depression and anxiety, respectively(1).

Effective treatments for depression and anxiety include psychology and medications. It is proposed that one of the tools of self-care is PA, which is an adjuvant treatment that may play a crucial role in managing depression and anxiety, in addition to promoting a better QoL(3,4).

Numerous studies have investigated the connection between PA and its impact on depression and anxiety across different age groups, health conditions, and environments. Our goal with this narrative review is to provide a concise summary of the most recent findings and assist healthcare professionals in aiding individuals experiencing depression and anxiety.

Methodology:-

PubMed and Cochrane databases were systematically searched for relevant studies published between January 2018 and June 2023 with no language restriction. Systematic reviews were included in the search. We performed the study selection in 3 stages: initially, we did screening by conducting an electronic search using the following terms: "(Exercise* OR Physical OR Activit* OR Isometric OR Aerobic OR Training* OR Sport* OR Yoga) AND (Anxiety OR Depression)". Article titles and their abstracts were then screened. In the second screening stage, we assessed the full texts. In the last stage, we included studies that met our eligibility criteria. Table 1 summarizes these studies.

Review Findings:-

Table 1:- A summary of studies.

Reference	Year	Meta analysis	Number of studies	Main relevant findings
Pearce et al.(5)	2022	Yes	15	- An inverse curvilinear association between incident depression and PA, with more significant differences in risk at lower exposure levels. - Adults meeting PA recommendations (equivalent to 2.5 h/wk of brisk walking) had a lower risk of depression than adults reporting no PA.
Cramer et al.(6)	2018	Yes	8	- Yoga might be beneficial in the short term for improving the intensity of anxiety when compared to untreated controls or active comparators. - No effects were found when only patients with DSM-diagnosed anxiety disorder were included in the analyses.
Li et al.(7)	2020	Yes	13	Mind−body exercise tai chi, health qigong, and yoga can reduce anxiety and depression in Chronic Obstructive Pulmonary Disease (COPD) patients.
Contreras-Osorio et al.(8)	2022	Yes	7	Physical exercise interventions may improve working memory behavioral measures in adults with mild-to-moderate depression compared to active and passive control conditions.
Wolfet al.(9)	2021	No	21	Performing PA during Covid-19 is associated with less depression and anxiety.
Kazeminia et al.(10)	2020	Yes	19	Sport significantly reduces anxiety in the elderly.
Recchia et al.(11)	2022	Yes	21	No significant difference between pharmacological interventions and exercise in reducing depressive symptoms in adults with non-severe depression.

McGettigan et al.(12)	2020	Yes	16	- PA interventions may not affect disease- related mental health. - PA interventions may be beneficial for aerobic fitness, health- related QoL, and cancer- related fatigue, up to six months follow- up.
Couto et al.(13)	2022	Yes	18	Exercise may be a way to reduce depression and pain and improve the QoL in adult subjects with fibromyalgia. It should be part of the treatment for this pathology.
Miller et al.(14)	2020	Yes	82	Aerobic, resistance and mind-body exercise demonstrate equivalence impact on depression symptoms in older adults aged ≥ 65 years, with comparably encouraging levels of compliance to exercise treatment.
Phadsri et al.(15)	2021	No	10	The occupation-based intervention (OBI) sports program was popular in encouraging participation and engagement with other people. Other programs were suggested for combined interventions to support life satisfaction, social participation, and QoL.
Felez-Nobrega et al.(16)	2021	No	22	Findings on the relationship between light intensity physical activity (LIPA) and mental ill health indicators were mixed across all age groups. However, there seems to be limited evidence suggesting that LIPA benefits mental ill health indicators.
Patten et al.(17)	2021	No	15	- Exercise effectively improves health-related QoL and Polycystic ovary syndrome (PCOS) symptom distress. - Exercise also shows among women with PCOS efficacy in improving depression and anxiety symptoms.
Mollarahimi Maleki et al.(18)	2020	No	23	- Community-based preventive programs for depression and anxiety in women had promising and positive results. - Cognitive behavioral therapy (CBT) and exercise were the most effortless yet most effective interventions to apply. - Computer and internet-based programs had the benefit of covering many people simultaneously. These interventions are cost-effective and feasible among Iranian women.
Ibeneme et al.(19)	2022	Yes	13	Physical exercise training could have an antidepressant-like effect inpeople living with human immune deficiency virus/acquired immune deficiency syndrome (PLWHA) but did not affect physical activity level (PAL) and social participation.
Carneiro et al.(20)	2022	No	3	- The effects of web-based exercise interventions on depression and/or anxiety symptoms are scarce, the risk of bias is high, and the quality of the cumulative results is low.
Carraça et al.(21)	2021	Yes	36	- Exercise can effectively improve QoL but not reduce depression-related outcomes. - Most psychological outcomes (i.e., body image,

				anxiety, perceived stress, life satisfaction, subjective pain, and some context-specific measures) are poorly studied, and evidence is either conflicting findings or null exercise effects to allow solid conclusions to be drawn. - Positive exercise-induced changes in exercise self-efficacy and autonomous motivation were found and, although limited, were relatively consistent.
Vollbehr et al.(22)	2018	Yes	18	- Hatha yoga does not affect anxiety disorders compared to treatment in control groups. - Psychoeducation and hatha yoga showed more reductions in depression.
Kadariya et al.(23)	2019	No	9	PA was generally found to protect against depression and improve the sleep quality of older adults from South and Southeast Asia.
Marques et al.(24)	2020	No	7	The relationship between active commuting and depression symptoms in adults and older adults is inconsistent.
Akosile et al.(25)	2023	No	19	-Antidepressant and/or psychotherapy did not significantly influence coronary artery disease (CAD) outcomes in the overall population. - No difference between antidepressant use and aerobic exercises. - Patient autonomy in treatment choice is associated with greater depression treatment satisfaction, but most studies are underpowered.
Kelley et al.(26)	2018	Yes	14	Exercise is associated with anxiety reduction among adults with selected types of arthritis and other rheumatic diseases (AORD).
Piva et al.(27)	2023	Yes	8	Among patients with post-covid-19 conditions, exercise was more effective than control interventions to reduce anxiety and depression.
Wicks et al.(28)	2022	Yes	24	PA performed outdoors in natural environments is more beneficial for psychological outcomes than in urban environments.
Bhatia et al.(29)	2022	Yes	5	No significant difference between the effects of outdoor community ambulation and comparison interventions on walking endurance and depression scores, with low to very low certainty evidence.
Gitonga et al.(30)	2022	Yes	37	The meta-analysis included only seven randomized control trials (RCTs); pooled mean estimates showed connected health interventions were moderately effective in reducing symptoms of depression (standardized mean difference (SMD): −0.226, 95% CI −0.303/−0.149) and anxiety (SMD: −0.188, 95% CI: 0.279/−0.0963) compared with usual care.
Geohagen et al.(31)	2022	Yes	29	Reactive rehabilitation for older adults may include walking programs with behavior change techniques.
Kim et al.(32)	2022	Yes	17	Serious games, including PA, had a significant impact on reducing depression in older adults.
Vancampfort et al.(33)	2020	Yes	18	- PA can effectively treat mild and moderate depression in children, adolescents, and adults, as

				well as severe depression, anxiety disorders, and psychotic disorders in adults **.** - PA can also help reduce the risk of depression and anxiety, and to a lesser extent, psychosis.
Albus et al.(34)	2019	Yes	20	Specific psychological interventions offered during Exercise-based cardiac rehabilitation (ebCR) may contribute to a reduction of depressive symptoms and cardiac morbidity.
Arsh et al.(35)	2023	Yes	17	PA can effectively reduce the severity of depressive symptoms in adults with type 2 diabetes mellitus (T2DM).
Giebel et al.(36)	2022	Yes	40	Exercise and social engagement indicated more significant reductions in depressive symptoms in treatment groups as opposed to established forms of therapies or education, for example.
Zhang Y et al.(37)	2022	Yes	10	Traditional Chinese Exercise (TCE) (Tai Chi, Qigong) may have benefits in alleviating depression, anxiety, and drug cravings in drug rehabilitees.
Zhang Q et al.(38)	2019	Yes	5	No significant improvement found meta-analysis and systematic review regarding TCE on depression parameter among older adults wih mild cognitive imparmentcompared with the control group.
Chu et al.(39)	2021	No	32	Mind-body interventions(MBI) such as music therapy, relaxation therapy, and spiritual therapy have demonstrated consistent efficacy for indications such as symptoms of anxiety, pain, and depression across multiple studies in non-chronic kidney disease (CKD) patients.

The association between PA and depression:

Due to the inverse curvilinear association between PA and depression incidence, the risk is different at lower exposure levels. Individuals who performed the recommended PA (the equivalent of performing brisk walking 2.5 h/wk.) had less chance of having depression compared to those who did not do PA. This association suggests that being physically active significantly benefits mental health, even if it is lower than the public health recommendations; thus, health professionals should encourage an increase in PA to improve mental health(5)**.**

Furthermore, people with a psychiatric disorder will benefit from PA on psychiatric symptoms and physical health; there is trans-diagnostic scientific evidence proving that. In addition to PA which also improves the quality of sleep and cardiorespiratory fitness in people with a psychiatric disorder, PA has strong evidence for its beneficial effects when incorporated with the treatment of mild and moderate depression from childhood to adults, anxiety disorders, severe depression, and psychotic disorders in adults and reductions in symptoms of ADHD in children(33).

Comparing PA with medications:

Recchiaet al. (11) conducted the first network meta-analysis to compare and assess the effectiveness of exercise, antidepressants, and combined treatments on depressive symptoms in adults with non-severe depression. Regarding those patients, the results suggest no difference between exercise and pharmacological interventions in reducing depressive symptoms. These findings go along with adopting exercise as an adjuvant or alternative in managing patients with non-severe depression. Also, results showed that all treatments had similar beneficial effects on depressive symptoms compared to the controls, but no treatment was superior to another. The acceptability assessment showed that antidepressant treatments gave fewer intervention drop-outs than exercise.

PA and individuals with chronic diseases/ conditions:

Li et al.(7) found that among COPD patients, tai chi, health qigong, and yoga can reduce anxiety and depression. With no adverse reaction, to optimize the treatment of anxiety and depression, medical professionals could combine mind-body exercise with usual medical care in those patients**.**

Adults with mild-to-moderate depression could benefit from physical exercise interventions by improving working memory behavioral measures compared to active and passive control conditions. However, due to the small number of available high-quality studies need more sound conclusions(8)**.**

Patients with non-advanced colorectal cancer apparently will not benefit from it. Theywere uncertain aboutPA interventions could improve physical function. PA interventions may not affect disease-related mental health. PA interventions (up to six months follow-up)may be beneficial for aerobic fitness, fatigue related to their condition, and health-related QoL(12).

Coutoet al. (13) conclude in their study that exercise may be a way to reduce depression and pain and improve the QoL in those subjects with fibromyalgia and should be part of the treatment for this disease condition**.**
Although there is high heterogeneity in the included studies, requiring high-quality RCTs in future studies, HIV/AIDS individuals can benefit from physical exercise training in a study that showed an antidepressant-like effect in PLWHA but did not affect PAL and social participation(19)**.**

A systematic review brought a surprising result that suggests that exercise can effectively improve QoL; unfortunately, it could not reduce depression-related outcomes. In addition, it showed that most psychological outcomes among adults with overweight or obesity (i.e., anxiety, life satisfaction, subjective pain, body image, perceived stress, and some context-specific measures) were poorly studied, and evidence either had no exercise effects to allow solid conclusions to be drawn or the findings were conflicting. Although they found limited evidence of positive exercise-induced changes in exercise self-efficacy and autonomous motivations, it was relatively consistent(21)**.**

Nineteen eligible trials were included in this systematic review. It showed that there was no difference between performing aerobic exercises and the use of antidepressants. In the overall population, psychotherapy and/ or antidepressant had no significant influence on(CAD) outcomes. There was a negligible effect on depression outcomes in CAD patients provided by psychological and pharmacological interventions(25**).**

Despite a need for further research with well-designed RCTs on this subject. It was concluded that exercise was associated with anxiety reduction among adults with selected types of AORD(26).

Across multiple studies in CKD patients, Chuet al.(39) review showed that MBI such as relaxation therapy, spiritual therapy, and music therapy had consistent efficacy on symptoms of depression, pain, and anxiety. Two studies investigated yoga therapy for CKD patients; yoga improves overall well-being through physical, mental, and spiritual practices**.**

They also found that Pilates improves the individual's physical strength and well-being through low-impact exercise combining gentle stretching and deep breathing. Although more studies were required to confirm the efficacy of this intervention, it has shown that among CKD patients, there is a promising result in improving anxiety and depressive symptoms(39)**.**

Interestingly, a study showed that among T2DM patients, PA reduced the severity of depressive symptoms; however, PA had no significant effect on improving glycemic control in adults with both conditions. Moreover, PA in high-income and low- and middle-income countries (LMICs) could be a suitable adjuvant to other methods in managing depression in T2DM(35).

Zhang Yet al.(37) found in their study that there may be benefits from performing Tai Chi and Qigong which are both traditional Chinese exercises, in alleviating symptoms of depression, anxiety, and drug cravings in drug rehabilitees **.**

The effect of several types of PA:

A study about yoga for anxiety by Cramer et al. (6)concluded that there could be a short-term improvement in the intensity of anxiety compared to those active comparators or untreated controls. However, they found no effects when only DSM-diagnosed anxiety disorder patients were included in their analyses. Furthermore, with the caution that only 3 RCTs reported safety-related data, the application of yoga was not associated with any increase in injury or anxiety symptoms**.**

Contrary to the previous study, another meta-analysis showed that hatha yoga did not affect form of mood and anxiety disorders compared to treatment as usual or active control groups. However, there is a limited ability to draw firm conclusions to support this claim due to the heterogeneity and low quality of most of the included studies. However, there is a need for more high-quality studies in this field because they found that hatha yoga had more reduction in depression compared to psychoeducation(22).

Four OBI sport and exercise programs (animal-assisted therapy (AAT), sport or exercise program(SEP), religious activity (RA), and behavioral change program and health education (BCPHE)) demonstrated visible behavioral changes in social participation and engagement with others. All of these interventions reported a decrease in depressive symptoms. Four intervention programs illustrated life satisfaction (skill-building program, SEP, peer support, and group-based activity), but only clinical psychotherapy group promoted the QoL. On these bases, AAT, SEP, and BCPHE are recommended. Integrating treatment with flexibility to cover more benefits in reducing depression, promoting social participation,and contributing to life satisfaction and QoL is recommended for other programs(15)**.**

Felez-Nobregaet al. (16)found that due to the limited evidence that suggests LIPA has benefits on mental ill health indicators, the relationship between LIPA and mental ill health indicators was mixed across different age groups. In addition, it is proven that there are benefits on several mental health indicators, and performing regular MVPA should be encouraged first. However, because MVPA is less feasible for older people or frail populations, LIPA might be a better approach to foster a physically active lifestyle in those vulnerable groups**.**

Carneiroet al. (20)could not propose any recommendations based on the high risk of bias, and the quality of the results was low. The effects of web-based exercise interventions on depression and/or anxiety symptoms were insufficient**.**

Active commuting could improve daily PA levels related to depression symptoms. Thus, it could be speculated that active commuting could be related to depression. A systematic review by Marqueset al.(24) showed an inconsistent relationship between active commuting and depression symptoms in adults and older adults. For the most part, out of seven studies, five studies showed no significant relationship between active commuting and depression symptoms. However, only two found beneficial effects of active commuting on depression symptoms.

Albuset al. (34)concluded that despite considerable uncertainty under which conditions these ebCR interventions to deploy their best effects, bearing that in mind, the results of this study showed that specific psychological interventions offered might contribute to a reduction of depressive symptoms and cardiac morbidity**.**

Contrary to the findings of Zhang Y et al. (37), a systematic review and meta-analysis did not find any significant improvement in depression parameters compared with that in the control group. They explain such insignificant findings by several factors, such as a small number of eligible trials, insufficient sample size, intervention regimens, different adopted TCE styles and the short follow-up periods for the participants(38).

Old age andPA:

Kazeminiaet al. (10)found that among the elderly age group, sports significantly reduce anxiety. Based on that, as part of the elderly care program, a regular exercise program can be introduced **.**

Pooled RCT results show that each type of exercise mode, resistance, aerobic, and mind-body, demonstrate equivalence in mitigating symptoms of depression in older adults ≥ 65 years; thus, it is encouraged to prescribe exercise to this age group presenting with depression(14).

In addition, Kadariyaet al. (23) concluded in their study that among older adults from South and Southeast Asia, PA had general protective effects against depression and improved sleep quality**.**

Regardless of the study setting, serious games had a beneficial effect on reducing depression in older adults. In addition, serious games that included PA significantly reduced depression. Besides, for more substantial evidence of the effectiveness of challenging games for depression in older adults, high-quality RCTs are necessary(32)**.**

Women's health and PA:
A study showed that exercise effectively improves PCOS symptom distress and health-related QoL. Furthermore, exercise among women with PCOS, showed some efficacy for improving symptoms of depression and anxiety. However, conclusions could not be made about the impact of exercise intervention characteristics due to the notable heterogeneity of the included studies(17).

In community-based preventive programs for depression and anxiety in Iranian women, they had encouraging and positive results. Although exercise and CBT are the most effortless, they are already the most effective interventions to be used; moreover, they are feasible and cost-effective among women. Due to the advantages of Internet-based and computer programs, they could cover many people simultaneously(18).

Outdoor PA:
Wickset al.(28) concluded in their study that compared with urban environments, performing PA outdoors in natural environments has more benefit for different psychological effects. They explain that various effect sizes may be by differing processes through which participants gain psychological benefits during PA while outdoors in nature**.**

A systematic review and meta-analysis explored the effects of PA through ambulation interventions in older adults. Unfortunately, with a low level of evidence, there was no significant difference between the effects of outdoor community ambulation compared to interventions on walking endurance and depression assessment and other outcomes that could not be pooled in the meta-analysis. Further studies are warranted to explore such associations in this field(29)**.**

Community-based PA:
Among older adults, reactive rehabilitation may include walking intervention with behavior change techniques. Future research should address the potential benefit of a walking program for proactive populations and address mobility-related anxiety as a barrier to outdoor mobility for both proactive and reactive populations(31)**.**

Depression was the most reported outcome measure; exercise and social engagement led to more significant reductions in depressive symptoms in treatment groups among older adults who are in low- and middle-income countries, compared to other forms of treatment or education, for example. Unfortunately, Giebelet al. (36)could not give a clear conclusion because the same meta-analysis approach did not assess the outcomes of the included studies**.**

The pandemic and PA:
Wolfet al. (9) found in their study that performing PA during the Covid-19 pandemic was associated with less anxiety and depression. Specific motivational and encouraging skills might be supreme to overcoming the pandemic's barriers and maintaining PA routines. Web-based technologies might be the way to increase motivation for daily PA and to maintain helpful routines**.**

The results of a study showed that in comparison to control interventions to reduce the severity of anxiety and depression, exercise had more effect; thus, it could be a valuable strategy for patients with post-Covid-19 conditions(27).

Conclusion:-

Our work tried to provide and summarize the latest available evidence regarding PA and its impact on depression and anxiety in adults. Based on most studies examined, we could conclude that there is an apparent positive effect on depression and anxiety in all adult age groups, nevertheless, in many physical, mental, and psychological conditions. Many of the included studies gave clear evidence that supports our statement, but a few still need to be determined due to difficulties after including studies in their analyses. We encourage all our colleagues in preventive

medicine, family medicine, and other specialties to prescribe PA or a suitable and feasible exercise as an adjuvant therapy to prevent or treat patients suffering from depression and anxiety. In addition, we recommend that public health and community medicine professionals advocate for PA and draw and implement strategies to motivate people to include PA as a lifestyle. There are still gaps in this field, and we recommend further research and trials to add more to healthcare and science.

Statement of Ethics
This study is exempted from ethics committee approval because it is based on reviewing previously published literature.

Conflict of Interest
All authors declare no conflicts of interest.

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Author Contributions
All authors contributed equally.

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