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**Exercise and Mental Health: An Exercise and Sports
Science Australia Commissioned Review**

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ABSTRACT

Morgan AJ, Parker AG, Alvarez-Jimenez M, Jorm AF. Exercise and Mental Health: An Exercise and Sports Science Australia Commissioned Review. **JEP**online 2013;16(4):64-73. Mental disorders are common, and they are a significant contributor to disability in the community. There is growing interest in the effectiveness of exercise interventions for improving mental and physical health in individuals with mental disorders. This paper reviews the evidence for the benefits of exercise for mental health problems and provides some practical recommendations for patients and clinical exercise professionals. Exercise appears most effective for depressive disorders and may also improve mental well-being and physical health in individuals with serious mental disorders. There is limited research on the optimal type and dose of exercise suitable for individuals with mental disorders. It is recommended that exercise dose should meet minimum public health guidelines for maintaining health. Higher doses may have stronger effects on mental health, but may be more difficult to implement in practice. Exercise programs should be adapted to accommodate individual circumstances and preferences and to minimize barriers to exercise medicine.

Key Words: Mental Disorders, Depressive Disorder, Schizophrenia, Anxiety Disorders

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1. INTRODUCTION

Mental health lies on a continuum from having no symptoms and being fully functioning to having a severe mental disorder. Mental disorders are not categorically distinct, but rather label the part of the continuum where symptoms are longer lasting and cause disability. They are characterized by problems in thinking, emotional state, and behavior. Mental disorders are common in Australia. Recent studies show that the 12-month prevalence in adults was 14.4% for anxiety disorders, 6.2% for affective disorders (such as depression) and 5.1% for substance use disorders (37). In addition, the 12-month treated prevalence rate of psychotic disorders such as schizophrenia is 0.45% (26).

The population impact of mental disorders is principally on disability rather than on mortality. In Australia, mental disorders are the third largest source of disease burden after cancers and cardiovascular diseases, but the largest source of disability burden (4). This disability burden arises in part because mental disorders often begin early in life and have a relapsing course. For anxiety and affective disorders, the major treatment options are psychological therapy and antidepressant medication, with the latter being appropriate for more severe cases (9). For psychotic disorders, antipsychotic medication is a key component of treatment, but needs to be accompanied by psychosocial intervention and practical support (33). The present review looks at the evidence for exercise as a treatment option, in particular for depression, anxiety, and psychotic disorders.

There is a strong relationship between physical activity and mental health. Cross-sectional studies show that regular physical activity is associated with better mental health and emotional well-being (11) and lower rates of mental disorders (12). Longitudinal studies also show an association between physical activity and reduced risk of developing a mental disorder (41). For example, a population-based study of 7076 Dutch adults found that engaging in physical exercise reduced the risk of developing a mood or anxiety disorder over the 3-yr follow-up period, even when controlling for sociodemographic characteristics and physical illnesses (41).

However, the relationship between physical activity and mental health is likely to be complex and bidirectional. Physical inactivity may be the cause and/or the consequence of poor mental health, and there may be common factors (such as overlapping genetic vulnerabilities) that predict both (6). Consistent with the relationship between physical activity and mental health is that individuals with a mental disorder are at higher risk of chronic physical conditions such as heart disease, diabetes, arthritis, and asthma (40,45).

2. ROLE OF EXERCISE IN TREATMENT

Exercise has been investigated for its potential to improve mental health outcomes in a variety of mental disorders, but there is a paucity of high-quality research. Apart perhaps from depression, exercise is not considered an established treatment for mental disorders, and it is typically evaluated as an adjunctive treatment to pharmacotherapy or psychological therapy. Nevertheless, the Royal Australian and New Zealand College of Psychiatrists recommends that exercise may complement other treatments and be used as a stress management strategy to improve recovery, help prevent recurrences, to manage the side effects of some medications, and to improve lifestyle practices and overall health (42,43).

Most research to date has been conducted on the benefits of exercise as a treatment for depression. Several recent meta-analyses of randomized controlled trials indicate that compared to controls, exercise has a moderate (21,24) to large (24,31) effect size for individuals with a depressive disorder. The benefits from exercise may not be long-lasting however, as research suggests no difference at follow-up between exercise and control groups (21), or a reduced effect size compared to effects at the end of the exercise intervention (24). Participants in these studies typically have mild to moderate depression rather than severe depression. Exercise is also mildly effective at improving depressive symptoms in individuals with a chronic physical illness (e.g., cardiovascular disease and chronic pain) (18).

Though exercise has been evaluated in over 25 randomized controlled trials, there are few well-conducted studies on which to make conclusions about how effective it is and how to optimize its effectiveness for depression. Despite these concerns, it does appear reasonable to recommend exercise as a treatment for depression. Indeed, the National Institute for Health and Clinical Excellence in the United Kingdom recommends that a structured group program of exercise should be considered as a first step in the treatment and management of people with persistent 'sub-threshold' depressive symptoms or mild to moderate depression (27). Exercise is also highly rated by people who have experienced depression (29).

Exercise is also moderately effective for anxiety, though most studies have evaluated its effect on anxiety symptoms in non-clinical populations (47). One RCT showed that exercise may be helpful for panic disorder. It found that 10 wks of aerobic exercise was more effective than a placebo pill but less effective than medication (5). However, a more recent study failed to show a benefit for exercise when completed as an adjunct to medication (46). Although panic symptoms improved in the group undergoing exercise training, exercise was no more beneficial than a relaxation training control.

Research in adults with schizophrenia shows that exercise programs can improve certain kinds of mental health symptoms (e.g., blunted emotions, loss of drive, and thinking difficulties), but are less effective for other symptoms (e.g., delusions and hallucinations) (13). Exercise programs may also improve other psychological outcomes, such as social competence, self-esteem, and well-being (19). Exercise is also important in improving the physical health of individuals with serious mental disorders (e.g., schizophrenia), as these individuals die 16 to 20 yrs earlier than the general population, with this differential mortality gap growing in recent decades (34). Two-thirds of these premature deaths are related to physical health risk factors resulting from poor access to medical care, poor diet, little exercise, and medication-induced weight gain (34). Indeed, up to 86% of patients treated with antipsychotic medication experience significant gain in weight (2).

Likewise, metabolic syndrome, a combination of medical disorders associated with an increased risk for developing cardiovascular disease, diabetes, and early death occurs in approximately 40% of

patients receiving antipsychotic treatment (23). As a result, the prevalence of type 2 diabetes mellitus among people with schizophrenia more than doubles that of the general population (16). Given the benefits of exercise on weight control, preventing the onset of type 2 diabetes mellitus, and improving glycemic control in those with pre-diabetes (20), there is a growing interest in the interventions focused on increasing physical activity as an adjunctive therapy for this population (8,13). Most studies have evaluated structured, supervised exercise interventions lasting between 4 and 16 wks that includes predominantly aerobic exercise (i.e., walking, cycling, and swimming) (8,13). These studies indicate that exercise therapy is well received, and is associated with improved physical health (3,8,13).

3. EXERCISE PRESCRIPTION – BOUNDARIES OF EVIDENCE

There is a lack of rigorous research on which to guide decisions about optimal exercise parameters (e.g., dose, type of exercise) for individuals with mental disorders. Meta-analyses of exercise interventions for mental health have examined this issue by evaluating which factors explain heterogeneity in effect sizes from different studies (e.g., 17,18,21,24,31,47). But these analyses can be limited by the small number of studies to compare and the variety of confounding parameters and study characteristics. Another strategy is to compare different kinds of exercise and doses head-to-head within a clinical trial (7,22,36,44). A third approach has been to summarize the most common parameters in exercise interventions shown to be helpful in clinical trials (30).

For treating depression and anxiety, most studies have evaluated aerobic exercise rather than resistance or mixed exercise interventions. One meta-analysis (24) suggested that aerobic exercise may be less effective than resistance or mixed exercise, but effect size confidence intervals overlapped, and other meta-analyses have not shown a moderating effect from type of exercise (21,31,47). Only a handful of studies have directly compared the effectiveness of aerobic and resistance exercise for mental disorders. These studies have indicated no difference in effectiveness for depression (39). The effect of exercise supervision is also unclear (24), though the majority of studies have involved some degree of supervision (30) and it may be helpful to improve adherence. There are too few studies to determine whether individual- or group-based exercise is better (24). Both have been shown to be effective (30), but for individuals with serious mental disorders, encouraging other people to be involved in the physical activity will lead to a higher chance of success (1).

Duration of the exercise intervention may have an effect on mental health outcomes. One meta-analysis of exercise to treat depression showed that interventions lasting 10 wks or longer had weaker effects than durations less than 10 wks (21). However, the reverse was found in a different meta-analysis of exercise for clinical depression with interventions lasting 10 to 16 wks more effective than shorter durations (31). It is possible that other study characteristics may be responsible for these discrepant findings. Studies of exercise for anxiety symptoms suggest that durations up to 12 wks are more effective than longer interventions (17). Most studies have evaluated exercise interventions over a period of at least 8 wks (30).

Exercise dose may vary in the frequency of exercise sessions per week, the session length, and exercise intensity. Unfortunately, only a few studies have adequately reported data on exercise intensity (24,31), so it is difficult to draw conclusions on the optimal intensity and dose of exercise for mental health benefits. For individuals with serious mental disorders, current guidelines on physical activity and exercise (30 min of daily moderate physical activity) appear to be feasible (13). Of studies that have shown exercise to be helpful for depression, the most common parameters were sessions

lasting at least 30-min at an intensity of 60-80% of maximum heart rate three times a week (30). For depressive symptoms in chronic illness patients, exercise interventions that met American public health guidelines for moderate or vigorous physical activity were more effective than those that did not (18).

Where meta-analyses have examined the effect of exercise dose, no linear relationship was found for clinical depression (31), but for anxiety symptoms there was a trend for a non-linear relationship, with exercise most effective when the dose approached $12.5 \text{ kcal}\cdot\text{kg}^{-1}\cdot\text{wk}^{-1}$, and then becoming less effective with higher doses. However, studies that have directly compared different doses of exercise suggest that higher doses may be more effective (7,22,36,44). For example, a higher dose of aerobic exercise ($17.5 \text{ kcal}\cdot\text{kg}^{-1}\cdot\text{wk}^{-1}$) achieved across either 3 or 5 weekly sessions was more effective for depression than a lower dose ($7.0 \text{ kcal}\cdot\text{kg}^{-1}\cdot\text{wk}^{-1}$), which was no more effective than a flexibility-exercise placebo (7). Another study found that although a higher dose of exercise ($16 \text{ kcal}\cdot\text{kg}^{-1}\cdot\text{wk}^{-1}$) led to overall similar depression remission rates as a lower dose ($4 \text{ kcal}\cdot\text{kg}^{-1}\cdot\text{wk}^{-1}$), there were significant moderating effects of gender and family history of depression (44). Remission rates were significantly higher for men in the higher dose group than the lower dose (85.4% vs. 0.1%). For women, the higher dose was more effective in women without a history of depression (39.0% vs. 5.6%), but the lower dose was more effective for women with a history of depression (43.7% vs. 15.5%). Of note is that adherence rates were significantly lower in the higher-dose group, and it is important to consider that although higher doses may be more effective for mental health, they may be less likely to achieve in practice.

4. EXERCISE PRESCRIPTION – RECOMMENDATIONS

Based on the limited scientific evidence reviewed above, minimum recommendations for mental health benefits are that individuals should exercise for at least 30 min, 3 times·wk⁻¹ at a moderate-to-vigorous intensity for a period of at least 8 wks. Larger doses (e.g., longer or more frequent sessions) may be more effective if this is feasible. This dose is similar to the minimum public health recommendations to promote and maintain health (15). The type of exercise (e.g., aerobic exercise or resistance exercise) or whether the exercise is carried out in a group or individually may be less important than tailoring the exercise to the person's preferences. Particularly for individuals with serious mental disorders, it may be necessary to slowly build up to this amount of exercise, taking into account current activity level, and focus on increasing daily physical activity rather than 'exercise' per se (1).

5. SPECIAL CONSIDERATIONS

Although individuals with mental disorders often face substantial illness-related barriers to physical activity that others do not face, the barriers are not dissimilar to the barriers to engaging in and adhering to psychological therapy or medication. The key features of common disorders such as depression and anxiety often include a tendency to passivity/withdrawal and avoidance, and those with more serious mental disorders such as schizophrenia may at times have little insight into their illness and have low motivation. Exercise interventions may be incorporated as part of the treatment for depression and anxiety disorder, whereas for disorders such as schizophrenia, the focus may be on increasing physical activity in order to provide structure and stability to assist day-to-day functioning. Professionals need to stay mindful of the barriers faced by depressed or anxious individuals, namely the potential to minimize success and the tendency to avoid and/or adapt exercise programs to suit the individual. Some examples are encouraging a depressed person who is

having difficulty sleeping to exercise later in the day; initially avoiding group activities for someone with social phobia; and building from small blocks of activity to develop a sense of achievement.

Knowledge of any concomitant psychological or pharmacological treatments may impact on the development of an individual physical activity plan, such as integrating physical activity into the behavioral components of psychological treatment (48) or working effectively with the duration of action or side effects of medications for mental health (28). In developing an individual physical activity plan, it is important to start where the individual feels comfortable, but build towards meeting public health exercise recommendations (48). It is important to discuss that lower doses may not be as effective in decreasing the symptoms of depression versus higher doses of physical activity (7). Given the increased likelihood of comorbid mental health and physical health problems, clients may find it motivating to acknowledge the efficiencies in treatment that exercise offers (38).

Where possible, encourage the individual to take advantage of nonspecific effects such as social supports and establishing routines. Both increase the likelihood that changes in physical activity will be maintained beyond the intervention period (48). This is important since adherence to exercise programs can drop dramatically within six months (39) and mental disorders tend to recur. Working through the costs and benefits associated with engaging in physical activity and addressing barriers and resistance, as well as building problem solving skills, may encourage perseverance with a new exercise routine (35). The physical activity plan should be tailored to the individual's preferences and circumstances. The plan should also consider the individual's current level of physical activity, what activities they would like to do, what they used to enjoy, the costs and benefits for each activity, the potential barriers, and the resources needed (49). These steps will help create a realistic and achievable plan for engaging in physical activity. Regular review of progress is essential and should explore the immediate benefits of exercise. These benefits can be identified by using recording sheets to monitor the relationship between how an individual feels and their activity levels, before, during, and after exercising (10).

6. CONTRAINDICATIONS TO EXERCISE

Exercise is generally a safe physical intervention. The contraindications are not specific to people with mental disorders (32). They include cardiovascular disease or acute infectious diseases (25). However, it is noteworthy to remember that individuals with serious mental disorders are often at a greater risk of cardiovascular disease and/or poor balance (14).

7. SUMMARY

There is a strong relationship between physical activity and mental health. Exercise may help improve symptoms of mental disorders such as depression and anxiety, and improve functioning and physical health in individuals with psychotic disorders. There is limited research on which to guide exercise prescriptions, but both aerobic and resistance exercise may be effective, as well as programs that consist of 3 sessions·wk⁻¹ of at least 30 min moderate-to-vigorous intensity exercise for a minimum of 8 wks. Higher doses may be more effective, but may have lower adherence, particularly given the additional barriers to exercise that individuals with mental disorders may face. Exercise programs should be adapted to accommodate circumstances and preferences and to minimize barriers to exercise. As mental disorders increase the risk of chronic physical conditions, and tend to recur across the lifespan, exercise can be useful for both mental and physical health, and may maintain well-being and prevent recurrences of poor mental health.

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