

The Effectiveness of Aerobic Exercise With Social Interaction Versus Without Social Interaction to Reduce Symptoms of Depression

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CLINICAL SCENARIO: Approximately eight percent of Canadians will be diagnosed with Major Depressive Disorder (MDD) (Mood Disorders Society of Canada, 2009) and antidepressant medication is the most common form of treatment (Legrand & Heuze, 2007). The plethora of potential side effects associated with taking Serotonin Re-Uptake Inhibitors (Sivagnanam, 2012) highlight the need to explore alternative therapies for MDD. Many studies have concluded that aerobic exercise is as effective as antidepressant medication in reducing the symptoms of MDD (Coyle, Denault Miller, Thomas and Pham, 2008; Kruisdijk, Hendriksen, Tak, Beekman, & Hopman-Rock, 2012), but these studies predominantly examine aerobic exercise completed in a social setting. Although these findings are significant, it is important to understand the mechanisms by which exercise interventions result in a reduction of MDD symptoms because group-based interventions are not always feasible.

FOCUSED CLINICAL QUESTION:

In adults diagnosed with major depressive disorder, is aerobic exercise without social interaction as effective as aerobic exercise combined with social interaction in reducing symptoms of MDD as defined by the DSM-5?

SUMMARY of Search, 'Best' Evidence' Appraised, and Key Findings:

Many systematic reviews have been published about exercise and depression. In a review of systematic reviews, Daley (2008) concluded that both group and individual exercise are effective in reducing symptoms of depression. The most recent systematic review, completed by Stanton and Reaburn (2014) focused on analysing the exercise program variables in the randomized controlled trials (RCTs) they selected. This analysis also concluded that group and individual exercise interventions were equally effective in reducing the symptoms of MDD (Stanton, et al., 2014).

Few studies have directly compared social and independent exercise. Legrand et al., (2007) concluded higher frequency exercise predicted lower depression scores; however, the results of group-based exercise did not differ from independent exercise. These findings were echoed by Blumenthal et al.'s (2007) RCT that compared four conditions: group exercise, home-based exercise, antidepressant medication or a placebo. This study concluded that home-based exercise was as effective as group exercise or antidepressant medication in reducing symptoms of MDD (Blumenthal et al., 2007). These

results were further supported by the findings of the one-year follow up study (Hoffman, Babyak, Craighead, Sherwood, Doraiswamy, Coons, Blumenthal, 2011). In addition to supporting the initial findings, the longitudinal data provided by Hoffman et al. (2011) found that social support was associated with lower symptoms of depression.

CLINICAL BOTTOM LINE:

While more research is required, the most current research suggests that aerobic exercise completed independently, without social interaction, may be as effective as group-based aerobic exercise, with social interaction, in reducing symptoms of MDD.

Limitation of this CAT: This critically appraised topic was prepared for a graduate course assignment and has not been peer-reviewed.

SEARCH STRATEGY:

Terms used to guide Search Strategy:

- **P**atient/Client Group: Adults diagnosed with MDD
- **I**ntervention: Aerobic exercise without social interaction
- **C**omparison: Aerobic exercise combined with social interaction
- **O**utcome(s): Reduction in symptoms of MDD as defined by the DSM-5

Databases and Sites Searched	Search Terms	Limits Used
OvidSP (Medline)	Depressive Disorder, Major/ OR Depress* AND exp. Exercise/ OR exp. Sports/ OR Physical Fitness/ OR Exercise Therapy/ OR walk* OR jog* OR exercise* AND Interpersonal Relations/ OR Social Support/ OR Communication/ OR social interaction OR ((individual or group) adj3 program*)	All Adult

CINAHL (Ebscohost)	MH Depression OR depress* AND MH Therapeutic Exercise OR MH Aerobic Exercise OR MH Sports OR exercise* OR physical activ* OR walk* OR jog* AND MH Interpersonal Relations+ OR MH Communication+ OR social interaction OR ((individual OR group) n3 program*	All Adult
PsychINFO	MM Major Depression AND DE Aerobic Exercise OR exercise* OR walk* OR jog*	All Adult
EMBASE	Depression/ OR Major Depression/ OR depress* AND Aerobic Exercise/ OR Exercise/ OR walk* OR jog* OR exercise* AND Human Relation/ OR Interpersonal Communication/ OR Social Interaction/ OR ((individual or group) adj3 program)	All Adult

Legend:

/ = MeSH Heading in OvidSP

exp = Explode Feature**adj3** = proximity operator in OvidSP (term/s within () are found within 3 words of adj term)**term*** = truncation for multiple endings**MH** = MeSH Heading in CINAHL**+** = Focus feature was used for MeSH (in CINAHL)**n3** = proximity operator in CINAHL (term/s within () are found within 3 words of n term)**DE** = Descriptors (Indexed headings from PsychInfo Thesaurus)

Note: Additional studies were found through reverse engineering.

INCLUSION and EXCLUSION CRITERIA

Inclusion:

- Involved subjects with a diagnosis of MDD
- Included a reliable measurement of MDD symptoms
- Examined aerobic exercise with social interaction (or group-based exercise) and aerobic exercise without social interaction (or home-based exercise)

Exclusion:

- Subjects with other diagnoses
- Studies that did not use a reliable measurement of MDD symptoms
- Studies that only analysed exercise in one format

RESULTS OF SEARCH

5 relevant studies were located and categorised as shown in Table 1.

Table 1: Summary of Study Designs of Articles Retrieved

Study Design/ Methodology of Articles Retrieved	Level*	Number Located	Author (Year)
Systematic review of RCTs	1	1	Stanton et al. (2014)
Systematic review of systematic reviews of RCTs	1	1	Daley (2008)
Randomized Controlled Trial (RCT)	2	2	Blumenthal et al (2007)
	2		Hoffman et al (2011)
Randomized Clinical Trial	2	1	Legrand and Heuze (2007)

*Based on the OCEBM Levels of Evidence (Howick et al., 2011).

BEST EVIDENCE

The following study was identified as the 'best' evidence and selected for critical appraisal because it is an experimental study directly pertaining to this topic. Reasons for selecting this study were:

- Random assignment to experimental and control (placebo) groups
- Relatively recent and completed in America (culture comparable to Canada)
- Large sample size
- Allocation concealment
- Blinded outcome assessment using reliable measures

SUMMARY OF BEST EVIDENCE

Table 2: Description and appraisal of *Exercise and Pharmacotherapy in the Treatment of Major Depressive Disorder* by Blumenthal et al. (2007).

Objective of the Study: To compare the effects of participating in group-based exercise or individual (home-based) exercise and to determine if patients achieve reductions in symptoms of MDD comparable to antidepressant medication.

Study Design: This randomized placebo-controlled trial involved subjects with MDD and compared four conditions: group exercise, home-based exercise, antidepressant medication (Sertraline, 50 – 200 mg. daily) or a placebo. The design included “allocation concealment and blinded outcome assessment” (p. 587).

Setting: Tertiary care teaching hospital (Duke University Hospital in Durham, North Carolina)

Participants: A purposive sample of 202 adults diagnosed with MDD was recruited through newspaper, television and radio advertising. Eligible participants were diagnosed with MDD, over 40 years old, and were not currently participating in exercise or receiving psychiatric treatment. Individuals with suicidal ideation, a secondary diagnosis or those using herbal remedies with psychoactive properties were excluded. “All participants provided written informed consent” (p.588). Following an initial health screening, any subjects with health conditions that would contraindicate participation in aerobic exercise were also excluded. The participants were mostly Caucasian females and the mean age was 53. History of MDD, age, gender and ethnicity were similar between experimental groups. A table was included with reasons provided for each dropout. 3 Subjects dropped out of the home-based exercise group, 10 dropped out of the supervised exercise group, 7 dropped out of the Sertraline group and 14 dropped out of the placebo group.

Intervention Investigated: Equal proportions of subjects were randomly assigned to each condition: Supervised, group-based aerobic exercise (n=51), Home-based aerobic exercise (n=53), Sertraline (n=49) or Placebo (n=49). The supervised aerobic exercise took place 3 times each week. This intervention involved a 10-minute group-based warm up, 30 minutes of walking or running on a treadmill, followed by a 5-minute group-based cool-down. The home-based exercise group were given the same exercise prescription to complete at home. An exercise psychologist provided phone calls (at weeks 1 and 4 then biweekly until the completion of the trial) and 3 home visits: An initial visit to establish the individual exercise program and follow up visits at 1 and 2 months. Subjects who had difficulty adhering to the individual exercise program were provided with up to 2 additional visits. Exercise logs, documenting frequency and intensity, were submitted weekly. Participants in the medication condition received 50-200mg. of Sertraline daily. The dose was adjusted for each individual based on clinical response and side effects experienced. The control group received a placebo pill daily and “the treating psychiatrist was blinded to pill condition” (p. 589).

Outcome Measures: Depression was determined through a clinical interview based on the DSM-IV criteria for MDD. The primary outcome measure of symptoms of depression was the Hamilton Rating Scale for Depression (HAM-D) with a score < 8 indicating remission and a score > 12 indicating a diagnosis of depression. The Beck Depression Inventory was initially administered to establish a baseline measurement (score > 12 = major depression) then by phone, weekly for 4 weeks then bi-weekly for the remaining 12 weeks, to monitor symptoms, particularly suicidal ideation. Aerobic capacity, a secondary outcome, was measured using graded treadmill exercise testing with a metabolic cart (Sensor Medics, model 2900) measuring oxygen consumption and carbon dioxide production. Measurements were taken at baseline and again after 16 weeks of intervention. A clinical psychologist, who was blinded to treatment condition, completed the assessments.

Main Findings: Following the 16-week intervention, 41% of subjects achieved remission, as defined by HAM-D scores < 8 and no longer meeting DSM-IV criteria for MDD. Subjects receiving active treatment tended to have higher remission rates than those receiving a placebo: Group-based exercise = 45%; home-based exercise = 40%; sertraline = 47%; placebo = 31 % ($p=.057$) but the difference was not statistically significant.

Past antidepressant trials have shown a significant placebo effect, particularly within the first week of treatment (Khan, Khan, & Brown, 2002, as cited in Blumenthal et al., 2007). As predicted, seven percent of subjects in this study showed a 50% decrease in MDD symptoms after the first week of treatment. After the scores of these "early responders" were removed the BDI scores indicated that the active treatment groups had significantly higher remission rates than the Placebo ($p=.022$) and there was no significant difference between the 2 exercise groups ($p=.519$) or the medication and exercise groups ($p=.879$). "The adjusted odds ratio for remission comparing active treatment to Placebo was 2.6 (95% Confidence interval = 1.1, 5.8)" ($p.592$).

With the early responder scores removed, the remission rates still did not differ between those who exercised alone (38% remission) and those who exercised in a supervised, group setting (46% remission). Both active treatment groups had a higher rate of remission than the placebo group (26% remission).

When the researchers removed the early responders and adjusted for race, gender and prior MDD episodes, there was no difference between the HAM-D scores of the exercise groups and the Sertraline group ($p=.514$) or between the independent exercise group and the Sertraline exercise group ($p=.510$) following the 16-week intervention. The HAM-D scores for the active treatment groups were lower than the Placebo group's scores ($p=.123$), but the difference was not statistically significant.

The subjects in the exercise groups showed significantly greater increases in aerobic capacity ($p=.0001$). The supervised exercise group showed more improvements in aerobic capacity than the home-based exercise group, but this difference was not statistically significant and could have been influenced by the differing dropout rates.

Original Authors' Conclusions: Exercise and antidepressant medications are comparable treatments for MDD. There was no difference in remission rates between the home-based exercise and the group-based exercise conditions.

Critical Appraisal

Validity: Blumenthal et al.'s study used sound research methods including blinded assessment measurement, valid and reliable tools, allocation concealment, randomization and a placebo control group. The intervention was described thoroughly and co-intervention was avoided with specific selection criteria. The researchers acknowledged the ethical concerns related to using a placebo treatment and ensured the safety of subjects by closely monitoring changes in MDD symptoms. The sample size was justified but, potentially, volunteer bias could have positively influenced the treatment groups' outcomes. There is also a possibility of type II error. The effect size was small (0.20) and the study was not powered to detect extremely small changes in depressive symptoms that may exist between the two exercise conditions. Because of the small effect size, a larger sample may have helped detect small differences (DePoy & Gitlin, 2011). The authors provided thorough details of all dropouts, providing reasons for each. Because some subjects did not complete each measurement at every measurement point, intention-to-treat analysis was used. This study received a PEDro score of 8/10 and the only criteria that were not met were blinded subjects and blinded therapists (Physiotherapy Evidence Database, 2014). The subjects in the Sertraline and placebo groups were blinded, but this was not feasible for subjects in the group-based or home-based exercise groups.

Interpretation of Results: The results of this study were clinically significant, considering the high placebo response rate that commonly occurs in trials of antidepressant medication (Khan et al., 2002). The authors provided all the information necessary for a thorough analysis of their research methods and results. The large sample size and sound research methods make the findings of this study transferrable to other individuals with MDD. The authors specified that they initially intended to study the affect of social support on symptoms of depression, but felt that using group-based exercise was a more comparable condition. The findings would be more significant if *all* subjects in the home-based condition exercised independently and *all* subjects in the group-based condition displayed social interaction while exercising. The amount of social interaction that occurred during the exercise conditions was not discussed or measured.

Summary/Conclusion:

Both group-based and home-based exercise are as effective as antidepressant medication in reducing the symptoms of depression. Blumenthal et al. employed sound research methods and their conclusions are valid.

IMPLICATIONS FOR PRACTICE, EDUCATION and FUTURE RESEARCH

Although findings suggest that both independent and group-based exercise interventions are equally effective in reducing symptoms of MDD, some studies have highlighted the importance of including social support and some level of supervision in exercise interventions (Stanton et al, 2014; Uebelacker, Eaton, Weisberg, Sands, Williams, Calhoun, 2013). Group-based exercise may have additional benefits that are not captured in the studies discussed above.

Therapists and students should be aware that both group-based and individual exercise *can* be effective in reducing symptoms of MDD. In rural communities, limited transportation and community-based resources can be a barrier for participation in group-based fitness interventions. When internal or external barriers prevent participation in group-based fitness interventions, therapists can provide support and guidance for home-based exercise.

The use of exercise as an adjunct with antidepressant medication has been included as a recommended treatment in clinical practice guidelines (Ravindran, Lam, Filteau, Lespérance, Kennedy, Parikh, & Patten, 2009). Research suggests that exercise helps individuals develop self-efficacy and coping skills (Stathopoulou, Powers, Berry, Smits, & Otto, 2006). Doctors should consider prescribing independent or group-based exercise to treat MDD because, in the long term, exercise may be more effective than antidepressant medication in maintaining remission (Hoffman et al., 2011).

It is difficult to accurately measure social interaction and social support. For this reason, most research addressing the abovementioned clinical question compares group-based and home-based exercise. There are several problems with this research design. Using a home-based exercise condition does not guarantee that exercise was completed independently. Similarly, participating in group-based exercise does not guarantee social interaction. This critically appraised topic has identified a potential gap in the literature.

To address this gap, researchers could design an exercise intervention focused on stimulating social interaction while exercising. Combining speed walking with a discussion of current events is a replicable intervention that would satisfy this condition. Comparing the effects of home-based exercise (completed independently) with an exercise-discussion intervention would bring a unique perspective to the current literature.

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