



## Sticking with it? Factors associated with exercise adherence in people with mild to moderate depression

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### ARTICLE INFO

#### Keywords:

Depression  
Exercise  
Randomized controlled trial  
Patient adherence

### ABSTRACT

**Background:** Exercise is an effective treatment for depression but non-adherence is common. The aim of this study was to determine the level of adherence to an exercise intervention, specifically factors associated with adherence in a depressed population.

**Methods:** This study reports the secondary analysis from a randomized controlled trial. The 310 participants were aged 18–67 years and affected by mild to moderate depression i.e. scoring  $\geq 10$  on the Patient Health Questionnaire-9 (PHQ-9). Adherence to an exercise intervention (light, moderate, vigorous, performed three times a week for 12 weeks) was measured using pulse watches or self-reports (78.4% vs. 21.6%). Factors associated with adherence were explored using negative binomial regression models.

**Results:** Adherers ( $\geq 12$  sessions, 32.7%) exercised on average 22.9 (SD = 7.4) times, while sub-adherers (1–11 sessions, 26.9%) attended on average 4.7 (SD = 3.1) sessions. Around 40% of participants were non-adherers (0 sessions). Tobacco use and hazardous alcohol use were associated with a lower adherence while flexibility at work was associated with higher adherence.

**Conclusion:** Tobacco use, hazardous alcohol use and flexibility at work can influence adherence to an exercise program among depressed people and should be considered when applying exercise interventions.

### 1. Introduction

Depression is an increasing public health problem and one of the leading causes of disease burden globally (Ferrari et al., 2013). The most common treatments are antidepressants and psychotherapy (Rimer et al., 2012). Both options have disadvantages; psychotherapy can be expensive and antidepressants can have unwanted side effects (Josefsson, Lindwall, & Archer, 2013). Exercise has been proposed as an alternative or complementary treatment for depression and has the added benefit of having a positive effect on somatic health (DeBoer, Powers, Utschig, Otto, & Smits, 2012). This is especially important as depression is associated with a higher risk of the metabolic syndrome, type 2 diabetes, cardiovascular disease and the associated mortality (Correll et al., 2017; Vancampfort et al., 2015a, 2016). According to recent Cochrane reviews, exercise has a small to moderate effect on depression compared with no treatment or control condition and equivalent effects to usual care (Cooney et al., 2013; Rimer et al., 2012). However, a recent review suggested that the effect of exercise on depression is even larger (Schuch et al., 2016).

In Sweden and other Western countries, exercise prescription is increasingly common for somatic problems including musculoskeletal issues, diabetes, high blood pressure, overweight and obesity (Leijon, Bendtsen, Nilsen, Ekberg, & Stahle, 2008). Prescribing exercise for mental health problems has not been as popular (Leijon et al., 2008), even though it is recommended by public health agencies (Professional associations, 2010). The strength of prescribing exercise, as opposed to general recommendations to the public, can be attributed to several factors. Firstly, it can be attributed to the physician's written prescription in comparison to a verbal recommendation, secondly to the patient-centered approach and thirdly to the follow-up during and after the treatment (Bull & Jamrozik, 1998; Harland et al., 1999). Non-adherence to depression treatment regimens is common (DiMatteo, Lepper, & Croghan, 2000) and associated with worse patient outcomes and a greater likelihood of relapse (Wing, Phelan, & Tate, 2002). Adherence to exercise interventions is also suboptimal in depressed patients (Oeland, Laessoe, Olesen, & Munk-Jorgensen, 2010). Thus, it is important to identify factors associated with poor adherence so that effective exercise interventions can be developed based on individual patient characteristics.

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However, adherence to exercise interventions for depression has not been sufficiently studied and existing studies have usually used self-reported adherence, which tends to overestimate actual adherence (Sallis & Saelens, 2000). A review on the predictors for exercise participation in the general population showed that being male, younger age, higher education level and having social support from family and friends increased exercise participation (Troost, Owen, Bauman, Sallis, & Brown, 2002). On the other hand, the review found that being overweight or obese, lack of time and having barriers to exercise was associated with lower exercise participation while the evidence on alcohol, tobacco, and psychological health was not conclusive.

Exercise intensity is one important factor, which may conceivably influence adherence. Intervention studies in non-depressed people have found that high-intensity exercise leads to lower adherence (Pavey et al., 2011; Sexton, Maere, & Dahl, 1989). This result is not entirely unexpected as highly vigorous exercise (i.e. above the ventilatory or lactate threshold) has been associated with more negative effects relative to lighter forms of exercise (Ekkekakis, Parfitt, & Petruzzello, 2011). Moreover, patients who report positive affect in response to moderately intense exercise have a higher level of physical activity 6–12 months later (Williams et al., 2008).

Factors associated with adherence to exercise treatments for depression remain understudied. One study in depressed subjects found that those with higher levels of anxious mood had lower adherence (Herman et al., 2002), while another study found no association with anxiety but instead with higher age (Krogh, Lorentzen, Subhi, & Nordentoft, 2014). Another recent review found that higher baseline depressive symptoms negatively affected adherence, though only when restricted to studies on participants with major depressive disorder (Stubbs et al., 2016). The symptoms of depression are indeed likely to reduce adherence, as commonly reported barriers to exercise from a survey of depressed people were fatigue, lack of motivation and low mood (Busch et al., 2016).

To bridge the research gap, the aim of this study was to determine the adherence level, and which particular factors were associated with adherence to an exercise intervention among adults with mild to moderate depression. We hypothesized that being male, younger age, higher education and having social support will be associated with higher adherence as has been reported in previous studies (Krogh et al., 2014; Trost et al., 2002). We further hypothesize that overweight or obesity and exercise intensity will be associated with lower adherence (Pavey et al., 2011; Sexton et al., 1989; Trost et al., 2002). Variable associations have been found for alcohol, smoking and in psychological health (Herman et al., 2002; Krogh et al., 2014; Stubbs et al., 2016; Trost et al., 2002) and, therefore, we will attempt to elucidate the extent and direction of these associations if any. Although rarely studied formally, it is plausible that greater work flexibility might promote increased exercise participation, while low habitual physical activity, a high number of somatic disorders and high levels of pain at baseline might predict lower exercise adherence. We include these as possible explanatory factors. Use of antidepressants at baseline might reflect a more serious condition but could also have led to a decrease in symptoms and the effect on adherence could, therefore, go either way.

## 2. Methods

Data were obtained from the Regassa study, a parallel, single-blind randomized controlled trial, conducted in six Swedish counties and regions. The aim was to evaluate treatment methods for mild to moderate depression in primary health care that could be easily implemented. The original study included three treatment arms, treatment as usual (TAU), Internet-Based Cognitive Behavioural Therapy (ICBT) and exercise; this paper uses data from the exercise arm only. More information on study protocol and power calculations are available in a previously published paper (no specific power calculations were done for the current study) (Hallgren et al., 2015). The Regassa study was re-

registered at the German Clinical Trial Register (DRKS study ID: DRKS00008745).

### 2.1. Participants

Recruitment occurred between February 2011 and January 2013 through primary health care centers and advertisements. People aged 18–67 with mild to moderate depression (scoring  $\geq 10$  points at the Patient Health Questionnaire-9 (PHQ-9)) (Kroenke, Spitzer, & Williams, 2001) were invited to participate. Exclusion criteria were a primary diagnosis of alcohol or drug dependency and abuse, serious somatic disorders, or requiring specialist psychiatric treatment. Suicidal risk was screened throughout the trial.

### 2.2. Randomization

Participants were initially randomized to one of the three main groups (TAU, ICBT or exercise). The exercise group participants were then further randomized to light, moderate or vigorous exercise. The randomization was done electronically by the Karolinska Trial Alliance, which is an external organization, after the baseline interviews and questionnaires were done. A total of 310 participants were randomized to the exercise group (see Fig. 1), with a ratio of participants in each exercise intensity group of 1:1:1 (light exercise  $n = 106$ ; moderate exercise  $n = 105$ ; vigorous exercise  $n = 99$ ).

### 2.3. Exercise intervention

The intervention consisted of exercising at the assigned intensity level for approximately 60 min three times per week for 12 weeks. Pulse watches were used by the participants at each exercise session to objectively measure intensity. Participants were asked to attend certain classes that were selected by the research team before the start of the

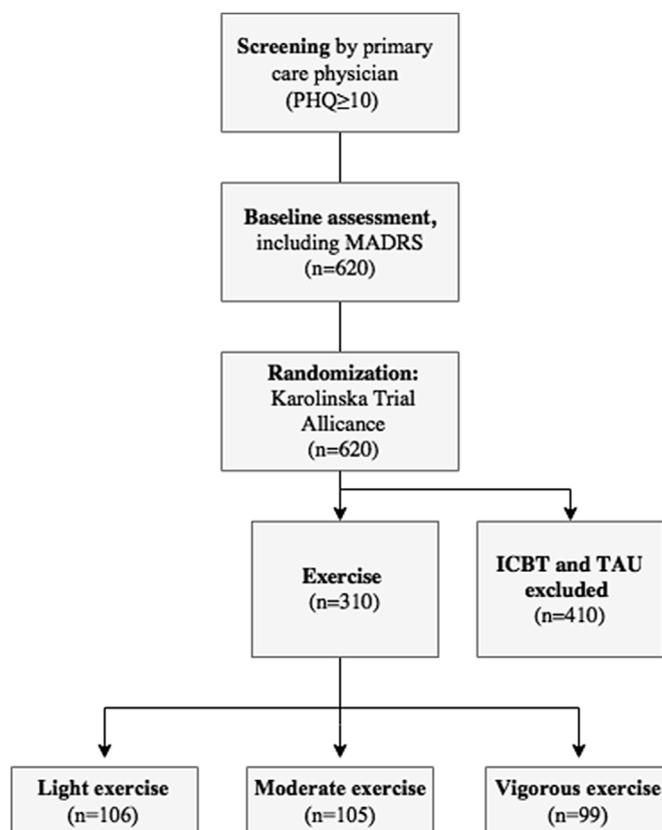


Fig. 1. Flowchart of the inclusion and randomization of the study participants.

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