Comparison of the Effects of Short Interventions on Enhancement of Physical Activity and Symptoms of Depression and Anxiety

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Foreword and Acknowledgements

This research is a project for a thesis in M.Sc. in clinical psychology. Preparation, literature review, research schedule and application for permission from the National Bioethics Committee in Iceland was made in spring semester 2015. The following autumn the procedure in the study was constructed and data collection began in October 2015 and continued through April 2016. During the spring semester of 2016 the data was analysed and a manuscript of an article for publication was made.

The aim of the study was to investigate effects of a short exercise program on symptoms of depression and anxiety. Physical activity has shown to be effective in reducing such symptoms and is therefore being considered as a potential treatment, either as monotherapy, alongside other treatments or at least efficient to ease mood for short periods of time. Studies show that treatment in the form of physical activity can be as effective as pharmacological and psychological treatments. It appears as regular aerobic and anaerobic exercising of at least moderate intensity on a regular basis are most efficient in reducing symptoms of depression and anxiety. The positive effects can be seen from short interventions as well as from one bout of exercising. Another aim of the study was to evaluate whether different types of recommendations about physical activity and additional support from professionals would enhance physical activity and positively affect mood. Verbal recommendations can have the effect of enhancing physical activity and by adding written recommendations the effects are even greater. By adding supervision to the physical activity has also been effective in enhancing physical activity and affecting symptoms of depression and anxiety. Participants were recruited at Landspítali-The National University Hospital of Iceland and were randomized into three groups: A) getting verbal recommendations about physical activity, B) getting verbal and written recommendations as well as an exercise program, C) getting verbal and written recommendations and assistance from a sport scientist while exercising. The setup of the research was A-B-A single subject reversal design. At the beginning of each phase and after the second baseline information about mental health was gathered by self-reports of depression (PHQ-9), anxiety (GAD-7), and quality of life (QOLS). Participants assessed their mood in general each day and information about physical activity was logged on a specially made record sheet. Participants wore pedometers and logged their step count each day.

The results indicate that physical activity of individuals with depression and anxiety can be enhanced with the support of a professional. Verbal and written recommendations

don't seem to enhance physical activity. Exercising for as little as 5 days can have a positive effect on mood.

Abstract

Background: Physical activity has been shown to reduce symptoms of depression and anxiety. The aim of this research was to investigate effects of a short exercise program on symptoms of depression and anxiety. It was assessed whether different types of recommendations about physical activity and support from professional would enhance physical activity and improve mood. *Method:* Participants (N=19) were recruited at Landspitali-The National University Hospital of Iceland. Participants were randomized into three groups: A) verbal recommendations about physical activity, B) verbal and written recommendations as well as an exercise program, C) verbal and written recommendations and assistance from a sport scientist while exercising according to the program. Information about mental health was gathered by self-report of depression (PHQ-9), anxiety (GAD-7), and quality of life (QOLS). Participants made general assessments of mood and physical activity was assessed by pedometers for three periods of 5 days each in a single subject A-B-A reversal experimental design. *Results:* For groups A and B intervention did not result in a higher step count. Step count increased during intervention phase of exercising with assistance from a sport scientist. General assessment of mood and symptoms of depression and anxiety decreased independent of experimental groups, however with some indication of physical activity having positive effect on mood. *Conclusions:* Physical activity of patients with depression and anxiety can be enhanced with support from a professional, verbal and written recommendations don't seem to enhance physical activity. Exercising for as little as five days may positively affect mood.

Keywords: Physical activty; Intervention; Depression; Anxiety; Mood

Comparison of the effects of short interventions on enhancement of physical activity and symptoms of depression and anxiety

Depression and anxiety disorders are, among the most common mental illnesses, with a lifetime prevalence of about 30% for anxiety disorders and 17% for major depressive disorder (Kessler et al., 2005). Only a small part of people suffering from these disorders get adequate treatment (Wang et al., 2007). Cognitive behavioural therapy (CBT) has been shown to be effective for treating depression and anxiety and is empirically supported (LeMoult, Castonguay, Joormann, & McAleavey, 2013; Newman, Crist-Cristop, & Szkodny, 2013). Physical activity has also been considered a potential treatment for depression and anxiety as it has shown to effectively reduce symptoms and is an accessible self-help strategy (Martinsen, 2008; Stathopoulou, Powers, Berry, Smits, & Otto, 2006). Studies have shown that physical activity can be as effective as in reducing symptoms of depression and anxiety as pharmacological and psychological treatments (Blumenthal et al., 2007; Broocks et al., 1998; Stanton & Reaburn, 2014; Wegner et al., 2014). Results of a randomized controlled trial by Blumenthal and associates (2007) indicated that aerobic exercising was as effective as medication in reducing symptoms of depression. Two recent meta-analyses indicated that effects of psychotherapy and physical activity on symptoms of depression are equal (Stanton & Reaburn, 2014; Wegner et al., 2014). As treatment for patients diagnosed with panic disorders exercising was an effective treatment, however cognitive behavioural therapy was more effective in that comparison (Hovland et al., 2013).

Both aerobic and anaerobic exercises account for the diminishing of depression and anxiety symptoms (Dunn, Trivedi, & O'Neal, 2001; Stathopoulou et al., 2006; Wegner, 2014). The relationship between frequency of physical activity and symptoms of depression and anxiety has been studied and seems to be curvilinear. Studies have shown that people who exercise 2 - 5 times per week have fewer symptoms than people who either exercise

more than five times per week or a maximum of once per week (Hassmén, Koivula, & Uutela, 2000; Wipfli et al., 2008). Contrary to these findings Dunn, Trivedi, Kampert, Clark, & Chambliss, (2005) concluded that the frequency of exercises had no difference in effects on depressive symptoms of participants but rather the energy expenditure of the exercises. Exercises of energy expenditure of 17/kcal/kg/week, which is consistent with public health recommendations, reduced depression symptoms more than exercise of intensity of energy expenditure 7/kcal/kg/week and also in comparison to stretching flexibility exercises. High intensity exercising has also been shown to be effective. Singh et al. (2005) found that high intensity resistance training (80%, of the one repetition maximum weight) reduced symptoms significantly more than low intensity training (20%, the one repetition maximum weight) and the control group where the participants only got their usual care from a general practitioner. Chu, Buckworth, Kirby and Emery (2009) on the other hand found no difference between the effects of high and low intensity exercises. In conclusion regular aerobic and anaerobic exercising of at least moderate intensity can reduce symptoms of depression and anxiety and are a part of public health recommendations about ideal physical activity (WHO, 2016).

Even though most studies of the effectiveness of physical activity for treating depression and anxiety are carried out over a course of several weeks or months the effects of exercise on mental health can be measured for shorter interventions and acute effects on mood can even be measured from a single bout of exercise (Bartholomew, Morrison, & Ciccolo, 2005; Sibold & Berg, 2010). Dimeo, Bauer, Varahram, Proest and Halter (2001) tested the effects of short exercise intervention of 10 days. The intervention was 30 minutes of interval walking on a treadmill and had the effect of reduce symptoms of depressed patients. The acute effects of single aerobic exercise sessions were demonstrated by Bartholomew et al. (2005). Individuals diagnosed with major depressive disorders all experienced improved mood after either 30 minutes of brisk walking on a treadmill or resting

in a quiet environment. Participants who walked on the treadmill experienced more well-being and vigour 5, 30 and 60 minutes after exercising. Some studies suggest the acute effects of exercising can last for three to four hours up to 24 hours after each session of physical activity (Yeung, 1996). Sibold and Berg (2010) conducted a randomized control study and concluded that single bout of moderate aerobic exercise improved mood immediately after, 4, 8 and 12 hours post exercise. Not all research supports this claim. Some even suggest that exercising increases state anxiety, depressive mood and fatigue (Bilbeau et al., 2010; Weinstein, Deuster, Francis, Beadling, & Kop, 2010).

It can be challenging to get people to follow recommendations about physical activity and types of support can produce different enhancements. The nature of the support can affect the effort people put into the physical activity. The results of Swinburn, Walter, Arroll, Tilyard and Russel (1998) showed an increase in physical activity when people received written recommendations in addition to verbal ones compared to people who only received verbal recommendations where the increase was not as great.

Supervision of exercising is a common factor in research designed to assessing the effects of physical activity for reducing symptoms of depression and anxiety and has shown to be an significant contributing factor (Perraton, Kumar, & Machotka, 2010; Stanton & Reaburn, 2014). Reduction of symptoms of depression could be seen from supervised exercising in a study by Blumenthal et al. (2007). Home-based and unsupervised exercising was as effective in reducing symptoms but, supervised group exercising resulted in a higher step count. Another example is a study by Craft, Freund, Culpepper, and Perna (2007), were significantly more steps were seen in partly supervised interventions in comparison to only unsupervised home-based exercise. Both interventions had equal significant effects of reducing symptoms in depressed women. These summarized results seem to indicate that

additions to verbal recommendations, be it written recommendations or supervision, seem to have a greater effect on the effort people put into physical activities.

The aim of this research was to investigate the effects of a short exercise program. It was hypothesised that the exercise program would enhance physical activity, improve mood and reduce symptoms of depression and anxiety. Another aim of the study was to evaluate whether different types of recommendations about physical activity and additional support from professionals would enhance physical activity and improve mood. It was therefore also hypothesised that different types of recommendations would not enhance physical activity equally.

Method

Participants

Nineteen participants (12 women, 7 men, Mage= 35,4 years, range: 21-51 years) were recruited at Landspitali-The National University Hospital of Iceland, where they participated in a cognitive behavioural therapy group or dialectical behavior therapy (DBT). Inclusion criteria for the study was: 1) to meet ICD-10 criteria for depression and/or anxiety evaluated by mental health professional 2) be an outpatient at the psychiatric ward. Exclusion criteria for participation was: 1) mental health professionals had detected a current psychotic condition in individual, 2) current self-reported substance abuse 3) obvious signs of dementia or other generalized cognitive impairment and 4) being younger than 18 years of age.

The participants were randomized into three groups. Participant assigned to group A got verbal recommendations about exercising, similar to advice given by a psychologist to their clients. Participants assigned to group B had the same recommendations as members of group A in addition to a five day exercise program to execute (see procedure). The exercise program also included a written version of the verbal recommendations. In addition to having

an exercise program and recommendations members of group C were each assigned a sport

scientist who supervised and guided them while they exercised.

Twelve participants (63%) dropped out so data from the seven participants (5 women,

2 men, Mage= 41.3 years, age range: 31-51 years) who completed the experiment was

analysed (see figure 1).

Figure 1. Participant flow from randomization to analysis.
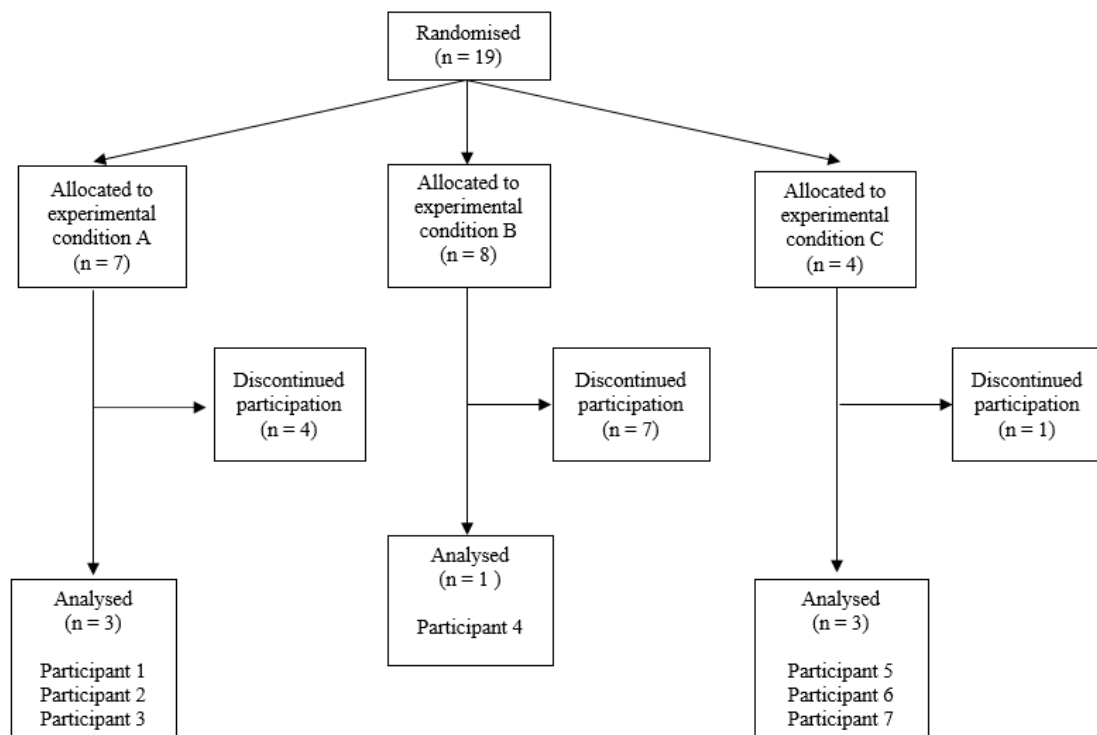
Measures

Patient Health Questionnaire - 9 (PHQ-9; Kroenke, Spitzer, & Williams, 2001). The

PHQ-9 is a 9 item self-administered instrument which scores each of the 9 DSM-IV criteria

for depression and assess severity of depression during the two weeks prior to admission.

Each item is scored on 4 point scale. The total score ranges from 0-27 and a higher score

represents more severe depression. Just as the original version the Icelandic one is reliable and valid (Kroenke, Spitzer & Williams, 2001; Pálsdóttir, 2007).

Generalized Anxiety Disorder - 7 (GAD-7; Spitzer, Kroenke & Williams, 2006). The instrument assesses generalized anxiety disorder and has been used to assess other types of anxiety disorders. GAD-7 is a 7 item self-administered that assesses severity of anxiety during the two weeks prior to admission. Scoring ranges from 0-21 and a higher score represent more severe symptoms of anxiety. Psychometric properties of the original and Icelandic version are good (Ingólfsdóttir, 2014; Kroenke, Spitzer, Williams, Monahan & Löwe, 2007).

Quality of Life Scale (QOLS; Burckhardt & Anderson, 2003). The QOLS is a 16-item instrument that measures five conceptual domains of quality of life: material and physical well-being, relationships with other people, social-, community- and civic activities, personal development/fulfilment and recreation. Each item is scored on 7-point scale, score ranges from 16-112 with higher score representing better quality of life. Psychometric properties of QOLS and the Icelandic version are good (Burckhardt, Anderson, Archenholtz & Hägg, 2003; Hrafnsson & Guðmundsson, 2007).

Questionnaire about demographic parameters. The questionnaire has questions about demographic parameters such as age, sex, education, marital status and occupation. The questionnaire also contains questions about mental health and treatment, physical activity and attitude toward it. The questionnaire was compiled by the researcher.

Daily recordings about mental state and exercise. Sheets for daily recording were provided to all participant. They assess depression, anxiety, stress on a scale of 0-10, zero represencting no symptoms and 10 represencting severe symptoms. General assessment of mood was assessed on a scale of 0-10, zero represencting very bad and 10 represencting very good. Participants recorded type and length of their exercises and if it was typical for the

participant or not. Each day the participants logged their number of steps according to the pedometers. Participants were asked to log how much time passed from the end of the exercise until the assessment. The daily recording sheet was compiled by the researcher.

Yamax electronic pedometer. Physical activity was assessed by Yamax electronic pedometer (Digi-walker SW-200). The devise counts steps and was worn by participants during the day and reset by the participants before going to sleep.

Procedure

While at the hospital outpatients in cognitive behavioural therapy or dialectical behavior therapy (DBT) groups were offered to participate in the study. The patients who agreed to participate met the researcher at the hospital. They were randomly deviden into the three groups. All participants got introduction letters and provided written informed consent before participating. They also filled out GAD-7, PHQ-9, QOLS and a questionnaire that measures demographic information. Pedometers and daily recording sheets were given to the participants. They were asked to start the assessment the following morning and do so for 5 consecutive days. They were instructed to keep the pedometer in a front pocket or on their waistband during the whole day and to remove and reset it before going to bed. After a baseline assessment participants met with the researcher again and got instructions according to the group they were assigned to.

In the beginning of the intervention phase all participants filled out the questionnaires for the second time and were given the following recommendations: *"Exercise is good for physical and mental health. By exercising you can have a positive impact on how you feel. It is recommended that adults engage in moderate physical exercise at least 30 minutes per day. It is possible to divide 30 minutes into shorter intervals for example to exercise for 15 minutes twice a day or 10 minutes three times a day. It´s easy to make physical activity a part*

of everyday activity for example: walk instead of traveling in a vehicle or take the stairs instead of the elevator. Some physical activity is better than none. "

Participants assigned to group A only received these verbal recommendations for intervention. Participants assigned to group B got these recommendations verbally and in a written form in the exercise program which was made by sport scientists and included a mix of strength and aerobic training. The strength training consisted of exercises that utilized bodyweight and free weights. Recommendations for weights were calculated using a percentage of the participant's bodyweight. Each exercise on the program had demonstrational pictures that showed how to perform them. The intensity of the aerobic training was 50–80% of maximum heart rate. Exercising according to the program was estimated to take one hour. Participants were offered to use the gymnasium facility at the hospital or access to a fitness centre.

Like members of group B participants assigned to group C got written and verbal recommendations and an exercise program. In addition to that they were introduced to a sport scientist and together they decided on when to meet for the exercises during the 5 day intervention phase. During the exercises the sport scientists supervised and guided the participants of group C. They were instructed to use the built-in heart rate sensor on the treadmills/stationary bikes to monitor the intensity of their exercise. During the 5 day intervention phase participants were asked to wear the pedometer and keep on logging every day. After that period participants met with the researcher again and filled in the psychological questionnaires for the third time and started the final 5 day phase which was a second baseline. Participants were asked to log their steps each day as they did during the first phase. After the second baseline participants answered the questions for the last time.

All appointments of either the researcher and participants or sport scientist were carried out at Landspitali.

Permission for the study was obtained from the National Bioethics Committee in

Iceland (VSNb2015050058/03.01).

Data analysis

A single-case experimental A-B-A reversal design was used for visual inspection.

Results

Drop-out in the study was total 63% and is presented for different groups and time of

drop-out in table 1.

Table 1

Drop-out Rate for All Intervention Groups and Time of Drop-out

	Participated	Finished experiment	Drop-out rate %	Time of drop-out
Total	19	7	63%	-
Group A	7	3	57%	1,1,1,0
Group B	8	1	87%	1,2,1,2,1,1,2
Group C	4	3	25%	1

Note. Time of drop-out; 0 = before first assessment, 1 = after baseline assessment, 2 = after introduction of intervention, 3 = after completing intervention, 4 = not attending final assessment.

Four of the seven participants in group A dropped out, three of them after baseline

assessment and one without attending the first assessment. For group B, seven of eight

participant dropped out, either after baseline assessment or after receiving recommendations.

For group C, one of four participants dropped out after baseline assessment.

Participant 1

Participant 1 is a 36 year old female who was assigned to group A. She got verbal

recommendations at intervention and started her participation in her first week of group CBT.

In figure 1 a daily assessment of mood in general and step count during different phases is displayed.
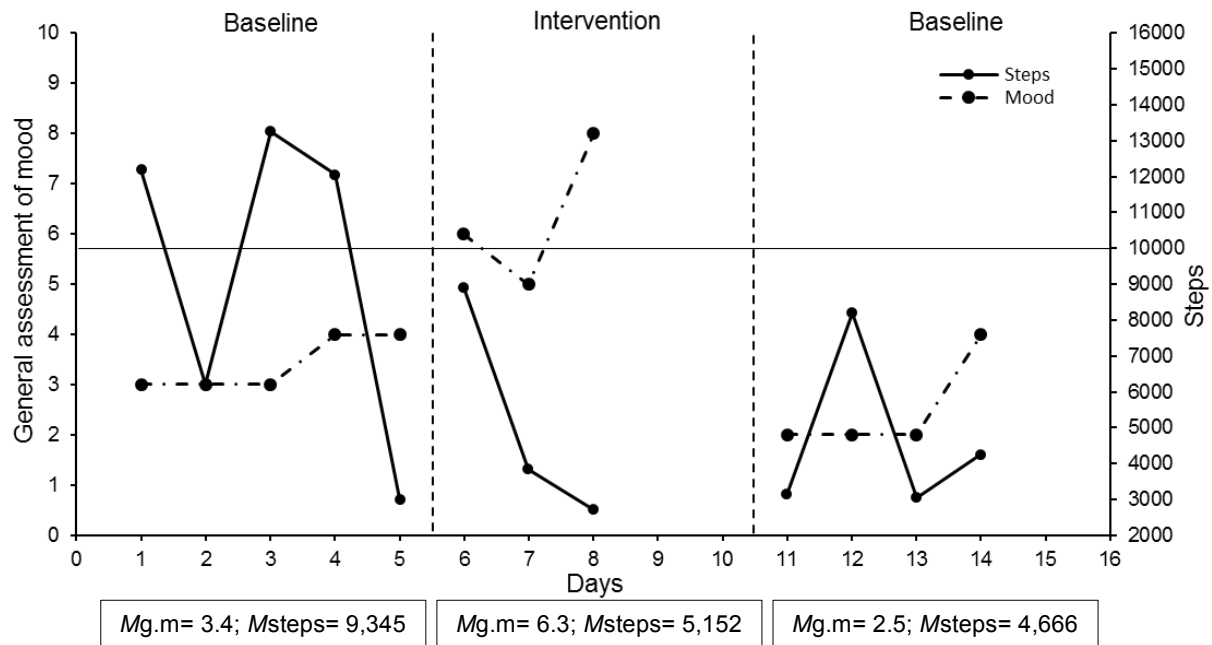
Note. Horizontal line represents recommended daily step count.
*M*g.m = mean of general assessment of mood, *M*steps = mean of steps.

Figure 2. Daily evaluation of mood on a scale of 0-10, 10 = very good, and step count during baseline, intervention and second baseline.

Mean number of steps during baseline is 9,345 and general assessment of mood is on average 3.4 during baseline. During baseline the participant had special circumstances causing her to walk more than usual. Step count is low at the end of baseline and increased the first day of intervention, then dropping again to a similar level. Mean of general mood increased to 6.3 and average steps decreased to 5,152 during the intervention. During second baseline mean of mood in general dropped to 2.5 and mean of steps decreased to 4,666. Trends in lines of mood and steps are not parallel.

In table 2 the scores of self-assessment of depression, anxiety and quality of life is reported.

Table 2

*Scores of PHQ-9, GAD-7 and QOLS at Beginning of Each 5 Day Phase and Post Second Baseline*

Measures	Baseline	Pre intervention	Post intervention	Post second baseline
PHQ-9	14	12	8	11
GAD-7	16	12	9	7
QOLS	48	63	63	56

Note. PHQ–9 = Patient health questionnaire 9 item; GAD-7 = Generalized anxiety disorder 7 item; QOLS = Quality of life scale.

Scores of PHQ-9 dropped from baseline through post intervention measurements going from moderate to mild depression. Post second baseline scores increased again to moderate depression. Scores of GAD-7 dropped from baseline measures through post second baseline measures, from severe anxiety to moderate anxiety. QOLS increased from baseline assessment to pre-intervention by 15 points, with no changes over intervention, and decreased to score 56 post second baseline.

Participant 2

Participant 2 is 48 year old female who was assigned to group A. She got verbal recommendations at intervention and started participation after a few weeks of DAM. In figure 2, daily general assessment of mood and step count during different phases is presented.
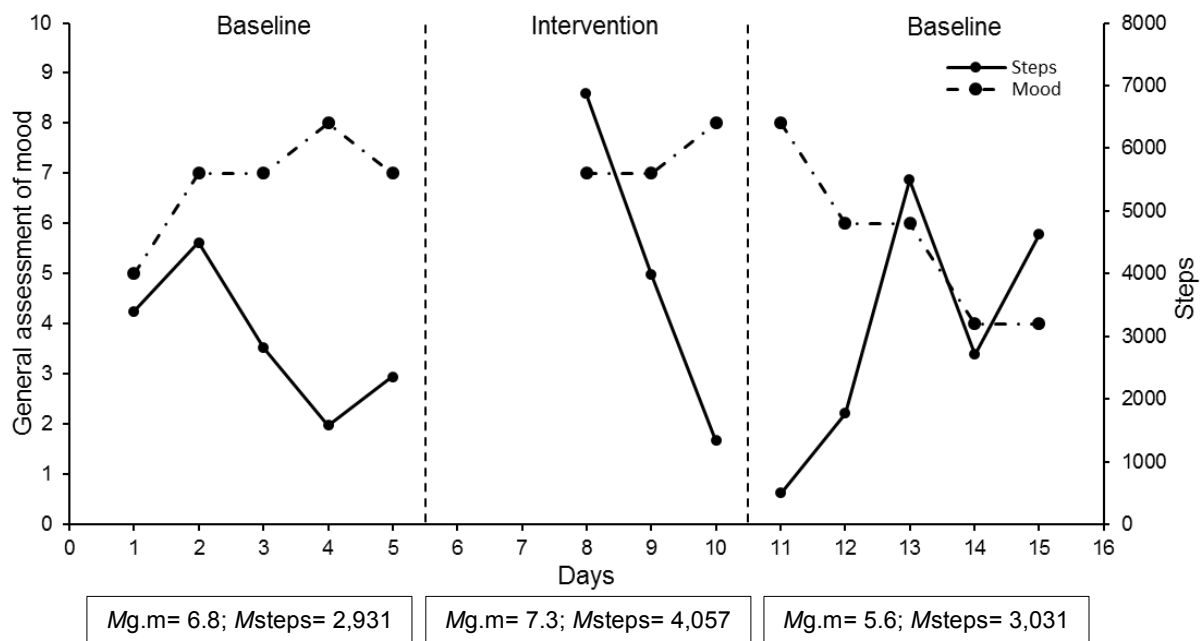
Note. Horizontal line represents recommended daily step count.
Mg.m = mean of general assessment of mood, Msteps = mean of steps

Figure 3. Daily evaluation of mood on a scale of 0-10, 10 = very good, and step count during baseline, intervention and second baseline

During baseline mean number of steps is 2,931 and mean of general assessment of mood is 6.8. The assessment of mood stays nearly the same in intervention, mean 7.3. Maximum number of steps, about 7,000, can been seen in the third day of intervention where the mean number of steps is 4,057. During second baseline mood has a downward trend with mean of 5. 6 steps in that phase vary from below 1,000 steps to almost 6,000, with mean number of 3,031 steps. Trends of lines of mood and steps are not parallel. Step count never reached 10,000.

In table 3 the scores of self-assessment of depression, anxiety and quality of life is displayed.

Table 3

*Scores of PHQ-9, GAD-7 and QOLS at Beginning of Each 5 Day Phase and Post Second Baseline*

Measures	Baseline	Pre intervention	Post intervention	Post second baseline
PHQ-9	14	8	3	7
GAD-7	6	5	5	7
QOLS	65	51	67	68

Note. PHQ–9 = Patient health questionnaire 9 item; GAD-7 = Generalized anxiety disorder 7 item; QOLS = Quality of life scale.

Scores of PHQ-9 decreased from baseline through post intervention measurements going from moderate to minimum depression and then increased to score of mild post second baseline. Scores of GAD-7 drop by one score from baseline to post intervention measure, from moderate to mild. In the post second baseline measures, scores increased again and depression is moderate again. QOLS scores dropped from 65 to 51 between baseline and pre intervention. Between pre and post intervention quality of life improved and scores go up 16 scores. Difference to second baseline is 1 score.

Participant 3

Participant 3 is a 45 year old male who was assigned to group A. He got verbal recommendations and started participation in first week of treatment in a group CBT. In figure 3 daily assessment of mood in general and step count in different phases is presented.
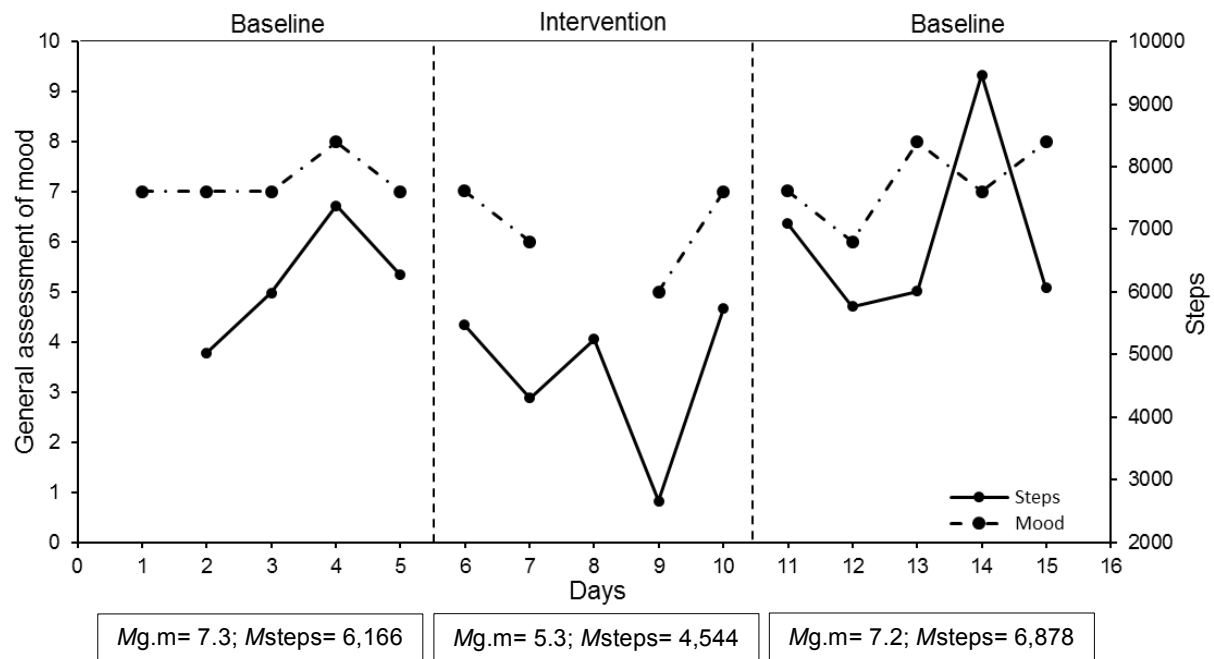
Note. Horizontal line represents recommended daily step count.
*M*g.m = mean of general assessment of mood, *M*steps = mean of steps

Figure 4. Daily evaluation of mood on a scale of 0-10, 10 = very good, and step count during baseline, intervention and second baseline.

During baseline general assessment of mood is on average 7.3 and mean number of steps is 6,166. Steps trend downward in intervention, mean step count dropped to 4,544. Mood decreased as well to a mean of 5.3 during intervention. Both means increased again in second baseline, mood to 7.2 and number of steps to 6,878. On days 1-4, 6-8, 10 and 13-15 the participant attended CrossFit. Trends in lines of general mood and steps have some parallel profile. Step count never reached 10,000 steps.

In table 4 the scores of self-assessment of depression, anxiety and quality of life is reported.

Table 4

*Scores of PHQ-9, GAD-7 and QOLS at Beginning of Each 5 Day Phase and Post Second Baseline*

Measures	Baseline	Pre intervention	Post intervention	Post second baseline
PHQ-9	17	11	4	7
GAD-7	12	10	6	4
QOLS	67	61	65	70

Note. PHQ–9 = Patient health questionnaire 9 item; GAD-7 = Generalized anxiety disorder 7 item; QOLS = Quality of life scale.

Scores of PHQ-9 dropped from baseline through post intervention measurements going from moderately severe to minimal depression and then increased to score of mild in post second baseline measurement. Scores of GAD-7 dropped from baseline measures through post second baseline measures from 12 to 4 scores, from moderately severe to mild anxiety. QOLS scores dropped from 67 to 61 between baseline and pre intervention. Dropping 4 scores between pre and post intervention and adding 5 scores again at post second baseline.

Participant 4

Participant 4 is a 38 year old female who was assigned to group B, got verbal and written recommendations and an exercise program and started participation in her second week of treatment in a group CBT. In figure 4 daily assessment of mood in general and step count in different phases is presented.
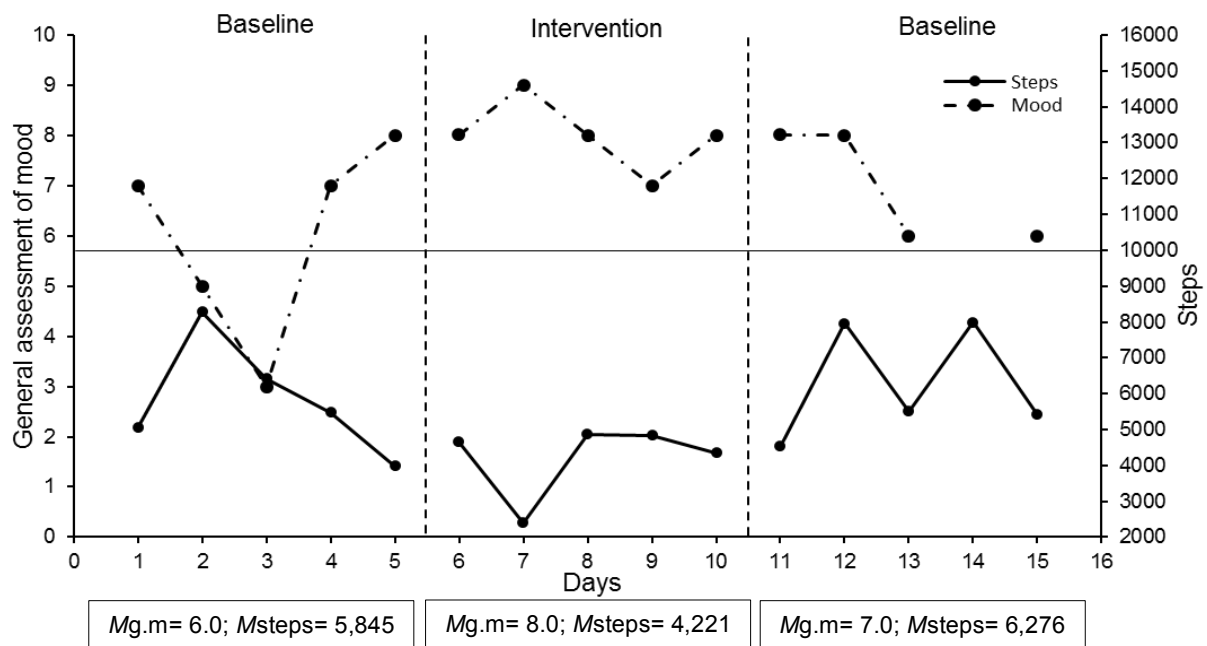
Note. Horizontal line represents recommended daily step count.
*M*g.m = mean of general assessment of mood, *M*steps = mean of steps.

Figure 5. Daily evaluation of mood on a scale of 0-10, 10 = very good, and step count during baseline, intervention and second baseline.

During baseline mean number of steps is 5,845 and has a downward trend to intervention, mean of general assessment of mood is 6. At intervention number of steps decreased to 4,221 but general assessment of mood improved with mean of 8. Participant reported never exercising according to the program given at intervention. During second baseline moods dropped again to a mean of 7 and mean number of steps increased to 6,276. Parallel pattern of lines of mood and steps is not seen. Participant never exceeded 10,000 steps.

Table 5

*Scores of PHQ-9, GAD-7 and QOLS at Beginning of Each 5 Day Phase and Post Second Baseline*

Measures	Baseline	Pre intervention	Post intervention	Post second baseline
PHQ-9	7	7	4	7
GAD-7	8	7	5	7
QOLS	74	77	-	73

Note. PHQ-9 = Patient health questionnaire 9 item; GAD-7 = Generalized anxiety disorder 7 item; QOLS = Quality of life scale.

Scores of PHQ-9 was the same through all measures but decreased at post intervention from mild to minimal depression. GAD-7 scores dropped from baseline to post intervention and then increased again after second baseline, being mild post intervention and otherwise moderate anxiety. QOLS scores increased between baseline and pre intervention measures. Data is missing for post intervention. The lowest score for QOLS was post second baseline.

Participant 5

Participant 5 is a 40 year old woman who was assigned to group C. She got verbal and written recommendations and executed an exercise program with the assistance of a sport scientist. She started participation in first week of group CBT. In figure 5 daily general assessment of mood and step count during different phases is presented.
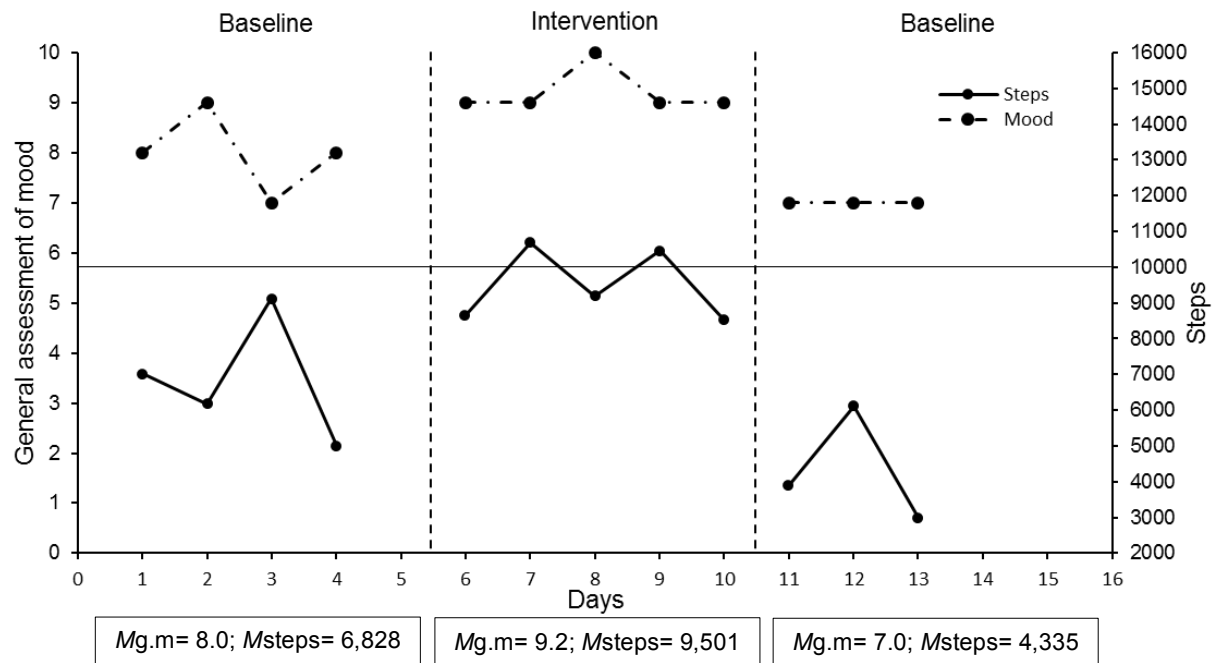
Note. Horizontal line represents recommended daily step count.
*M*g.m = mean of general assessment of mood, *M*steps = mean of steps.

Figure 6. Daily evaluation of mood on a scale of 0-10, 10 = very good, and step count during baseline, intervention and second baseline.

During baseline mean number of steps is 6,828 and mean of general assessment of mood is 8. In intervention mean of steps increased to 9,501. Step count was over 10,000 two days of the intervention phase. General assessment of mood is higher in intervention, with one day of assessment where mood was 10 out of 10 and mean of 9.2. Mood and steps decreased during second baseline with mean number of steps being 4,335 and mean general assessment of mood 7. Lines of mood and steps are trending in similar pattern. At intervention phase the highest number of steps is taken and mood assessed higher than in baselines.

In table 6 the scores of self-assessment of depression, anxiety and quality of life is reported.

Table 6

*Scores of PHQ-9, GAD-7 and QOLS at Beginning of Each 5 Day Phase and Post Second Baseline*

Measures	Baseline	Pre intervention	Post intervention	Post second baseline
PHQ-9	17	14	9	10
GAD-7	18	14	10	9
QOLS	55	75	84	79

Note. PHQ–9 = Patient health questionnaire 9 item; GAD-7 = Generalized anxiety disorder 7 item; QOLS = Quality of life scale.

PHQ-9 scores decreased between measures from baseline to post intervention with the most difference at pre- and post-intervention. Scores ranged from moderately severe to mild depression and to moderate depression at post second baseline measures. GAD-7 scores decreased between all times of measures, from severe to moderate anxiety. QOLS scores rose during all phases except at second baseline measure with decline from post intervention.

Participant 6

Participant 6 is 51 year old male. He started participation in first week of group CBT and was assigned to group C, getting verbal and written recommendations and exercised according to program with the assistance of sport scientist. In figure 6 daily assessment of mood in general and step count in different phases is presented.
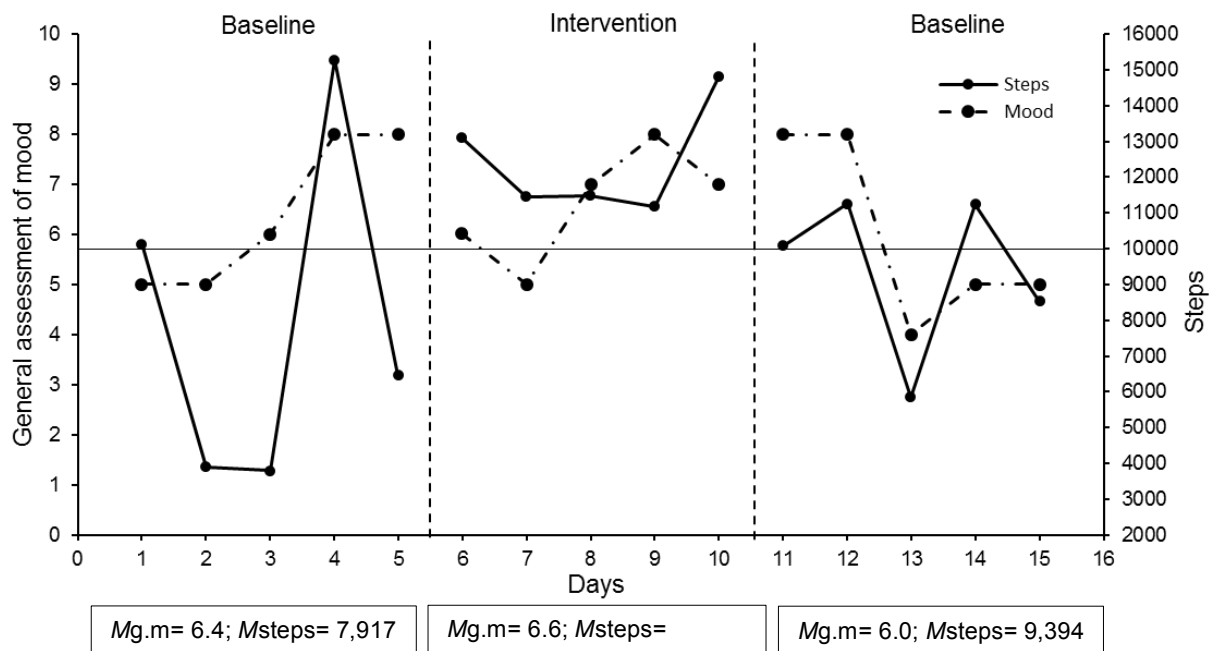
*M*g.m= 6.4; *M*steps= 7,917	*M*g.m= 6.6; *M*steps=	*M*g.m= 6.0; *M*steps= 9,394

Note. Horizontal line represents recommended daily step count.
*M*g.m= mean of general assessment of mood, *M*steps= mean of steps.

Figure 7. Daily evaluation of mood on a scale of 0-10, 10 = very good, and step count during baseline, intervention and second baseline.

During baseline the lowest and highest number of steps for participant can be seen, ranging from about 4,000 to 16,000 steps. Mean number of steps in baseline is 7,917 and general assessment of mood is 6.4. In day four and five in baseline, mood was assessed unusually high due to some pleasant incidents. At intervention phase mean number of steps increased to 12,409 and is never below 10,000 steps. Mean of general assessment of mood is similar 6.6 but with an upward trend. At second baseline mean steps dropped to 9,394, where the step count is above 10.000 steps for 3 days. Mean of general assessment of mood is 6 with possible carry-over effects from intervention phase. Parallel trends of lines of mood and steps is most clear in second baseline and showing in other phases.

In table 7 the scores of self-assessment of depression, anxiety and quality of life is reported.

Table 7

*Scores of PHQ-9, GAD-7 and QOLS at Beginning of Each 5 Day Phase and Post Second Baseline*

Measures	Baseline	Pre intervention	Post intervention	Post second baseline
PHQ-9	5	3	1	0
GAD-7	4	2	1	1
QOLS	77	82	87	92

Note. PHQ-9 = Patient health questionnaire 9 item; GAD-7 = Generalized anxiety disorder 7 item; QOLS = Quality of life scale.

Scores of PHQ-9 dropped through all measures from mild depression at baseline to none at post second baseline. GAD-7 scores dropped from baseline to post intervention being sorted as mild during the whole research time. QOLS score increased between baseline and post second baseline total of 15 scores.

Participant 7

Participant 7 is 31 year old female who was assigned to group C and started participation in her third week of CBT. She got verbal and written recommendations and exercised according to program with assistance of a sport scientist. In figure 7 daily assessment of mood in general and step count in different phases is presented.
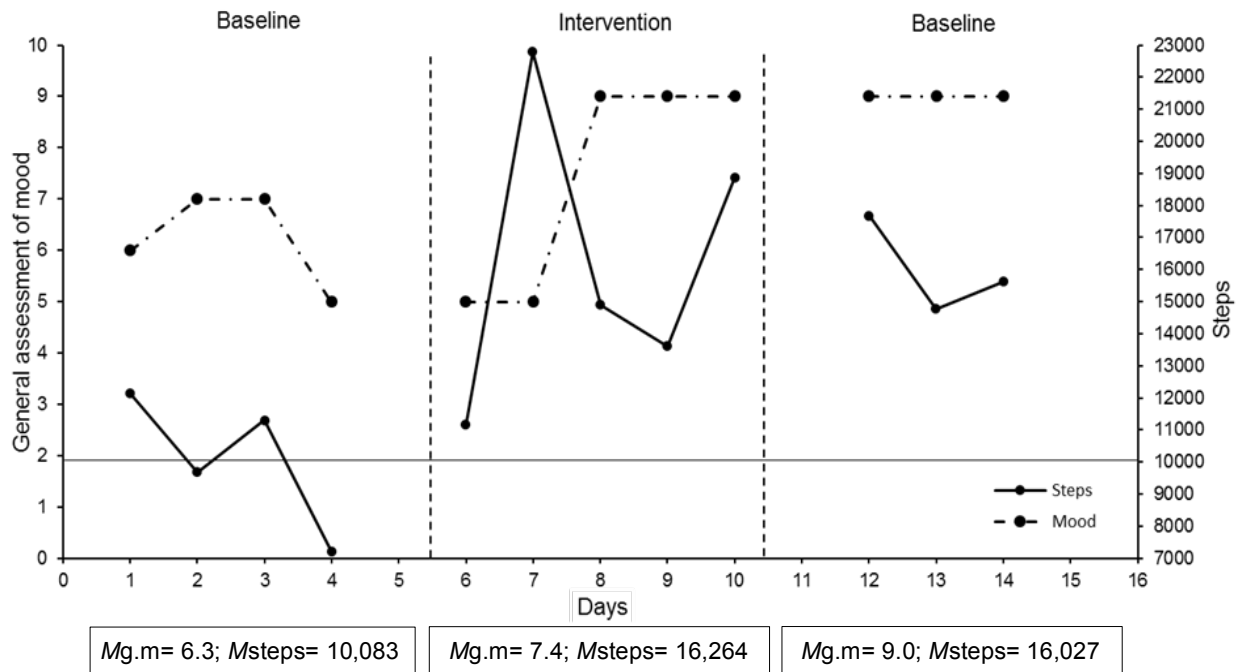
Note. Horizontal line represents recommended daily step count.
*M*g.m = mean of general assessment of mood, *M*steps = mean of steps

Figure 8. Daily evaluation of mood and step count during baseline, intervention and second baseline.

During baseline mean number of steps were lowest of all phases 10,083. Mean of general assessment of mood is 6.3 and a downward trend is seen at the end of phase and remaining for the first two days of intervention. At day three in intervention mood is assessed 9 out of 10 and remains throughout measurement days. Mean of assessment of general mood is 7.4 in intervention and 9 in second baseline, possible a carry-over effect. Peak of about 23,000 steps is seen the second day of intervention and mean number of steps is 16, 264. Step count decreases in second baseline, where the lowest number of steps is in line with highest number of steps in baseline. Mean of number of step is 16,027 and possible carry-over effects from enhanced step count in intervention.

Table 8

Scores of PHQ-9, GAD-7 and QOLS at Beginning of Each 5 Day Phase and Post Second Baseline

Measures	Baseline	Pre intervention	Post intervention	Post second baseline
PHQ-9	10	12	2	2
GAD-7	12	10	4	3
QOLS	73	75	78	80

Note. PHQ-9 = Patient health questionnaire 9 item; GAD-7 = Generalized anxiety disorder 7 item; QOLS = Quality of life scale.

PHQ-9 scores dropped between measures from baseline to post second baseline, from moderate to minimal depression. Most difference in scores is pre and post intervention, 10 scores. GAD-7 scores decreased from baseline throughout post second baseline, from moderate severe to mild anxiety, with highest decreased pre and post intervention of 6 scores. QOLS scores increased over assessment points of total 7 scores.

Discussion

The main aim of this study was to examine whether different types of recommendations about physical activity and additional support from professionals would enhance physical activity. Effects of a short exercise program for improving mental health was assessed.

Verbal and written recommendations did not enhance physical activity of participants. The fact that there was no increase in physical activity after receiving verbal recommendations is contrary to the results of Swinburn et al. (1998) which showed verbal advice alone had the effect of enhancing physical activity. It must be taken into consideration that the study was conducted over a longer period of time and participants were sedentary people in primary care and the same may not apply to outpatients with mental illnesses. The participants in the study who only got verbal recommendations were in general more active

during baseline and their physical activity did not increase after receiving the

recommendations. The known motivational effect of carrying pedometers could possibly

explain this pattern (Kang, Marshall, Barreira, & Lee, 2009). The motivational effect could

have peaked for the first days of participation with physical activity of participants later

dropping to normal levels during intervention phase. A similar pattern can be seen in the

results of the only participant in group B but the high rate of drop-out in this group is

noteworthy. That participant received verbal and written recommendations and an exercise

program. After getting the recommendations the participant took fewer steps and did not

follow the exercise program. During a meeting with the researcher the participant said the

reason for this was lack of time. These results are contrary to assumptions about written

recommendations in addition to verbal ones being more likely enhance physical activity

(Swinburn et al., 1998).

The participants getting verbal and written recommendations about physical activity

and instructions from a sport scientist while exercising according to the program enhanced

their physical activity during the days they exercised. These results are similar to earlier

researches which indicates that additional support in the form of supervision has a greater

effect on enhancing physical activity than being unsupervised (Blumenthal et al., 2007; Craft

et al., 2007). For participants in group C mood was rated better during the intervention phase.

Parallel trends in lines of assessment of mood and steps suggest a possible connection

between mood and the amount of physical activity. These results indicate that a short exercise

program can effect physical activity and mood during interventions as seen in studies where

the effects have lasted from a few minutes up to 12 hours (Bartholomew et al., 2005; Sibold

& Berg, 2010; Yeung, 1996). These results contrast earlier results from Bibeau et al. (2010)

and Weinstein et al. (2010) which indicated physical activity has acute negative effect on

mood. These findings are similar to earlier studies where interventions of a few days showed to be effective in reducing symptoms of depression (Dimeo et al., 2001).

During the course of the experiment, anxiety, depression and quality of life improved for participants in all groups. This could be due to the participants being in psychological treatments alongside their participation. Normal fluctuations of mood might be a contributing factor to the difference in general mood of the participants for all phases of the study.

As mentioned before the high rate of drop-out for participants assigned to have a verbal and written recommendations (group B) and those who only got verbal recommendations (group A) is notable. Time of drop-out was most often after baseline assessment for those in group A. For members of group B the time of drop-out was either after first assessment or after the second appointment where they got the instructions and exercise program. Only one of the participants that dropped out of the research notified the researcher about it. The reason for it in her case was not enough time for exercises and the debilitating effects she claimed her symptoms had. This could be the case for other participants that dropped out of the research. Other possible reason for this high drop-out is there might have been something unappealing about the exercise program unbeknownst to the researcher, but might serve as an important note for further studies.

There are some limitations to the study. The number of participants and limited amount of data for each of them affects comparisons and generalizability of the results. For practical reasons the second intervention phase was not conducted but it would have made a stronger arguments for the relationship or lack thereof. Psychological treatment was an uncontrollable external factor that could hypothetically affect the results.

For participants in group C, it might be, as speculated by Blumenthal er al. (2007), that decrease in symptoms and mood changes over the days of intervention is influenced by having the full attention, motivation and positive attitude from the sport scientists. Meeting

the expectations of the supervisor might have been a constituting factor in increasing the physical activity.

For further studies of this nature a bigger and more convergent sample would be ideal e.g. members of the same cognitive behavioural therapy group. Another interesting approach would be to conduct an experiment where CBT is provided as part of the research and physical activity is included in the therapy.

Results of this study indicate that the effort patients with depression and anxiety put into physical activity can be increased with the support of a professional. Exercising for as little as 5 days can have a positive effect on mood.

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