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Joy of living through exercise - a qualitative study of clinically referred adolescents’ experiences of moderate to vigorous exercise as treatment for depression

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ABSTRACT

Aim: Depression is common and rising in adolescents. Recent meta-analyses indicate a moderate effect of exercise on depression symptoms. Clinically referred adolescents and their experiences of an exercise intervention have rarely been studied. The aim of this study was to describe clinically referred adolescents’ experience of moderate to vigorous exercise as a treatment for depression.

Methods: A total of 16 clinically referred adolescents with persistent major depression, who had taken part in a 14-week aerobic exercise intervention of moderate to vigorous intensity, were interviewed. Data was analysed by latent qualitative content analysis.

Results: After taking part in the exercise intervention the adolescents expressed enhanced participation in daily life and joy of living by demonstrating commitment and a sense of empowerment. The categories contained both improved vitality and structure of everyday life as well as improved self-esteem and self-control. Participation in the exercise intervention changed their self-image, relationships, school performance, and family life. The adolescents highlighted that exercising in a group was beneficial, giving security and structure.

Conclusions: Adolescents with persistent depression experienced several beneficial aspects of participating in an aerobic group exercise of moderate to vigorous intensity.

Introduction

Depression is common and rising in adolescents \cite{1,2}. Depression causes suffering, increases the risk of substance abuse, suicidality, as well as psychiatric and somatic illness later in life \cite{3,4}. Adolescent depression affects school performance and is associated with increased work impairment in adulthood, poorer perceived general health, and increased risk of cardiovascular disease \cite{3,5,6}.

Treatment guidelines for depression in adolescence include psychosocial interventions such as cognitive behavioural therapy (CBT), interpersonal psychotherapy (IPT), and medication with SSRI. CBT and IPT seem to be effective in mild depression and have a decreasing efficacy with increasing severity of depression \cite{4}. Qualitative studies show that adolescents who experienced a good clinical outcome with CBT, valued a therapeutic relationship with a supportive and kind ‘expert’. Expert advice and tools to support behavioural change together with being involved in shared decision making were highly valued \cite{7}. Adolescents’ experiences of antidepressive medication vary, but there might be a fear of dependency and a wish to manage the depression on their own \cite{8}. Medication has been shown to be moderately effective for adolescents with depression \cite{9}. The medication was seen as necessary when the depression was severe and medication then became an indication of severity. Many saw medication as additional help in recovery, rather than a solution on its own \cite{8}.

Meta-analyses have shown that physical exercise is an effective intervention for clinically diagnosed adult patients with depression \cite{10,11}. The effect sizes have been large also in subsets with low risk of bias trials only \cite{11}. However, exercise as a treatment for depression in adolescence has shown a moderate effect in reducing depressive symptoms. Methodological quality of studies was low and effects might have been overestimated \cite{12–14}. An RCT with an intervention program for adolescents with depression of 12 exercise sessions with preferred intensity aerobic exercise, twice...
weekly for six weeks showed significantly improved depression and a trend-level favorable comparison to the control group (treatment as usual) upon the completion of this short-term intervention. Moreover, the intervention group of preferred intensity exercise showed a significantly larger depression improvement in comparison to the control group of treatment as usual at 6-month follow-up [15]. In a qualitative study following the RCT [12], the adolescents preferred to control the exercise intensity, resulting in the exercise being perceived as easy [16]. Also, providing a routine and exercising in a group was highly valued, and the adolescents reported a sense of achievement, increased motivation in important areas of life, improved mood, heightened energy, and enjoyment were highlighted as positive [16]. Adolescents have been shown to associate exercise with health benefits, feelings of competence, and attractiveness. Staying physically active was facilitated by experiencing social support, while a decline in the exercise was associated with poor social support and barriers related to access [17]. General guidelines endorsed by the World Health Organization recommend at least one hour of exercise of moderate to vigorous intensity per day for physical and mental health in adolescents, whereof vigorous-intensity aerobic activities and activities to strengthen muscle and bone should be performed at least three days a week. Adolescents should also limit the amount of sedentary and recreational screen time [18].

To sum up, exercise seems to be effective for adolescents with depressive symptoms. Preferred and easy exercises in group format showed a broad range of positive experiences. However, qualitative studies of moderate to vigorous exercise in clinically referred adolescents or adolescents with persistent depression are scarce. For that reason, additional qualitative research is needed to provide a deeper understanding of adolescents’ experiences of exercise as a treatment for depression. Therefore, the aim of this study was to describe clinically referred adolescents’ experience of moderate to vigorous exercise as a treatment for depression.

**Methods**

**Design**

The present study had an explorative design, based on qualitative content analysis, with an inductive approach to provide knowledge and understanding of adolescents’ experience of exercise as a treatment for depression. The purpose of inductive qualitative content analysis is to explore the subjectively experienced world, systematically analyse individuals’ experiences and reveal the meaning of the experiences using various varieties of interpretations [19,20].

**Setting and intervention**

This study was a part of an intervention study aimed to test the feasibility of aerobic exercise of moderate to vigorous intensity to treat depression in clinically referred adolescents [21]. The adolescents in the test group exercised with a personal trainer three times a week for 14 weeks. The exercise took place in a gym and lasted 60 min per session. The adolescents had pulse monitoring equipment during all sessions. Aerobic level \( n = 19 \) with at least 70% of maximum heart rate (HR max) was 31.6 (range 17.6 – 39.7) min and at least 80% of HR max in 17.0 (range 6.5 – 26.9) min indicating a moderate to vigorous intensity.

**Participants**

Inclusion criteria were outpatients 12–17 years old, major depressive disorder according to DSM-5 and scored above 6 on the clinician rated Quick Inventory of Depressive Symptomatology- Adolescent Version, QIDS-A17 recruited from an adolescent psychiatry clinic with a clinical diagnosis of depression (ICD F32-F34) during 2016 and at least three previous visits to ensure that some basic interventions had been performed. The QIDS-A17 consists of 17 items that corresponds to each of the 9 DSM-5 depression criteria scored 0-3 (mild 6–10, moderate 11–15, severe 16–20 or very severe depression ≥21). It has performed well both as clinician and patient report and most so in the intermediate symptom range [22]. Twenty-one (62%) of 32 eligible clinically referred adolescents with depression consented to the exercise intervention and to be interviewed. Two participants dropped out before the intervention began. Nineteen started the exercise intervention but three did not show up for the interview of which one dropped out at the beginning of the intervention and the other two had a low participation rate. The median participation rate \( n = 19 \) was 67% of exercise sessions. Five (26%) participants participated in \( 7 – 12 \) (19 – 33%) of sessions mostly just during the early phase. Fourteen patients (74%) attended a median of 29 (81%), range 20 – 35 sessions with a stable participation throughout the program. There was no control group. Exclusion criteria were eating disorder, intellectual disability, exercise above 150 min/week of moderate intensity or 75 min/week of vigorous intensity, need of interpreter, high risk of suicide, chaotic social circumstances interfering with a regular exercise schedule, medication adjustment within the past four weeks and chronic somatic illness precluding exercise. Sixteen adolescents were interviewed within a week after the intervention (four boys and twelve girls). The participants were median 15.5 (range 12.8 – 17.5) years old and had been suffering from depression median 2.6 (range 1.1 – 5.3) years. The clinician Quick Inventory of Depressive Symptomatology for Adolescents (QIDS- A17 –C) at baseline was 14 (range 6–18) indicating that most patients suffered from a moderate depressive episode at baseline. There was significant comorbidity including Attention Deficit Hyperactive Disorder (ADHD, \( n = 12 \), 75%), and anxiety disorders \( n = 11 \), 68%). The functional level was mostly moderately impaired with the Children’s Global Assessment Scale (CGAS 50, range 39 – 62). Four participants had a history of self-harm but no participants had recently injured themselves. The high rate of comorbidities and the long duration of depression are most likely due to a selection towards treatment resistance as the participants had been in treatment but were still depressed. After the 14-
week intervention and at the time of the interviews, three of the participants were in the normal range (remitted) according to the QIDS- A17, five had responded (50% reduction in QIDS- A17, and eight were still in depression but all but one with less symptoms when interviewed. Although the terms “remitted”, or “responded” are used for the corresponding individual variability of discharge depressive severity of the participants, it should be mentioned that this a rule of a simplified approach employed in the current study in the absence of a control group. A more robust evaluation of individual variability for depressive severity within the context of an exercise randomized controlled trial for depressed adults can be found in Morres, Hinton-Bayre, Motakis, Carter & Callaghan (2019) [23].

**Data collection**

Data was collected using individual interviews with the adolescents after they had completed the 14-week exercise intervention. We used a semi-structured interview guide [24]. The questions were ‘Can you describe how you have experienced the exercise intervention?’, ‘Can you describe how the exercise intervention influenced your well-being?’ The focus was both on physical and mental effects, ‘Can you describe what motivates you to exercise?’ ‘How do you feel about exercising individually versus in a group?’ and ‘What do you think about exercise as a treatment?’ In order to encourage the adolescents to think more profoundly about the questions and to obtain in-depth data, follow-up questions such as ‘Can you tell me more about …?’, or ‘How do you mean?’ were asked. The interviews were conducted by the authors; MS, IL, and AB, none of which had a treatment connection with the adolescents, nor were they involved in the exercise intervention. The interviews lasted between 15 and 60 min (mean 25 min), were sound-recorded, and transcribed verbatim, including pauses and laughter. The interviews were performed between March 2018 and June 2018. One interview was conducted by telephone.

**Data analysis**

A qualitative content analysis was used, and both the manifest and latent content were analysed [19,25]. The interviews were read several times in order to gain a sense of the overall data. The analysed research questions were; How do clinically referred adolescents experience moderate to vigorous exercise as a treatment for depression? How do clinically referred adolescents describe the effects of the exercise intervention? A total of 686 meaning units related to the aim of the study were identified. The meaning units were condensed to shorten the text while maintaining the content. The condensed meaning units were abstracted and labelled with codes that briefly described the content. The codes were compared, based on similarities and differences, after which they were grouped at a manifest level into four subcategories and two categories (Table 1). The first 64 meaning units were coded and analysed by the authors: MS, IL, and AB. The remaining 622 meanings units were first analysed by the author MS and then discussed among the authors: IL and AB until consensus was reached. The underlying meaning of the categories was interpreted into an overall theme, expressing the latent meaning of the content. We have reported findings in accordance with the consolidated criteria for reporting qualitative studies checklist (Table S1).

**Results**

The adolescents experienced an enhanced participation in daily life and joy of living through commitment and empowerment after taking part in the exercise intervention (Table 2).

**Experiencing commitment through exercise**

The experience of the intervention varied among the adolescents. Taking part in the exercise intervention boosted the adolescents’ vitality, both physically and mentally, and together with experiencing structure in everyday life, this lead to increased commitment and a feeling of joy in life.

**Vitality**

An increased physical and mental vitality was experienced, for example, relief from chronic pain, with subsequently improved mood. Exercise could be seen as a cure but without side-effects, and it was more appealing than conventional therapies. The adolescents who had remitted from depression experienced mental vitality along with improved mood contributing to joy of living. The exercise was experienced as a distraction from negative and suicidal thoughts. However, there were also adolescents not experiencing any change in mood.

Becoming stronger and more comfortable in one’s own skin contributed to vitality. Tasks and activities were found easier to engage in and carry out, due to increased strength and endurance. Finding exercise enjoyable was motivating.

You have the energy to walk, I mean without being exhausted. For example, in school to get to a classroom, what is it, you have to climb 4–5 flights of stairs. It killed me in the beginning, but now it’s like: It’s OK, it’s cool; I can do it. (Adolescent no. 3)

Mental vitality was also experienced as increased focus, thinking clearly and faster, and the ability to persevere in mentally challenging tasks. Vitality also contributed to increased commitment in school for adolescents who previously had low participation in school activities. The increased ability to focus was mentioned by most of the adolescents, regardless of improvement or not of depressive symptoms.

I read like detective stories and crime, that kind of books. But it’s not as hard to keep track of names and stuff like that, than it used to be. I’m more present. And when watching a movie and stuff like that, I get what’s happening, which I didn’t a while ago. (Adolescent no. 5)

Being more active led to an amelioration of relationships and a commitment to family and friends. Improved vitality enabled adolescents to help out more and be present and active in conversations and activities. Greater joy in activities...
increased commitment to hobbies. A few adolescents experienced only short-term effects, lasting a few hours up to a day after a work-out session. Feeling tired from the exercise was also an initial effect, that for a few lasted all through the intervention.

**Structure of everyday life**

The intervention facilitated commitment to new habits and structures, respectively return to old habits for those who had previously been physically active. Participation in the exercise sessions gave structure to daily life, commitment and joy to adolescents not going to school or having other daily activities. The exercise was described as time-consuming, which was perceived as positive by those who mainly stayed at home and negative for those who went to school and were active with friends.

> It took a lot of time. Sometimes you just sit at home and do nothing. Then you can exercise instead... After the work out you feel that you’ve done something and then you feel great. That’s how I’ve felt. (Adolescent no. 6)

Support from others, family, friends, health professionals, and coaches were important for adherence and commitment to the exercise program. Parents had an important part in persuading the adolescents to go to the training when they were not up to it; they drove them and insisted that they complete what they had undertaken, some even with limitations on computer games if they failed to go. These demands were spoken of in positive terms by the adolescents; they saw the need for the support and its positive consequence, although it was not appreciated at the time.

> Those days, when I didn’t want to go, my parents drove me, even if I really didn’t want to. (Adolescent no. 12)

Support from fellow group members was a facilitator and made it easier to commit to the exercise regime. Exercising in a group was usually experienced easier and more enjoyable compared to working out individually in a gym. But not everyone enjoyed group training and a few adolescents expressed that it would have been easier to work out individually with a coach. At the beginning of the intervention, it was common among adolescents to express hesitation towards participating in a group. With time they came to appreciate the companionship in the group, both having fun together and being there with the same purpose. Most of the adolescents challenged and encouraged each other while others stated difficulties in balancing one’s competitive instinct; not comparing too much within the group. Having a coach and organized training sessions were appreciated and generally adolescents with depression felt safer and less exposed by working out in a group compared to individually. Continuous support by the coach was expressed as important for adhering to the exercise and for being able to commit to an exercise regime after the intervention. The adolescents preferred having exercise as a standard treatment for depression.

> Sometimes I kind of wanted to work out more, because I enjoyed being in the group. (Adolescent no. 11)

**Experiencing empowerment through exercise**

Taking part in the exercise intervention refuelled self-esteem and improved self-control with increased independence and empowerment as a positive consequence. Feeling empowered by the exercise intervention was an important building block for finding joy in living.

**Self-esteem**

Regained self-esteem was experienced both by improved physical ability and by improved mood. Self-esteem was experienced as confidence in regard to their future and reassurance in one’s own capability. The intervention was experienced as empowering through achieving improvement from exercise and gaining self-esteem in the process.

> I haven’t had as bad thoughts and I’ve had a better view of myself, stuff like that. Like my self-esteem has gotten better. (Adolescent no. 14)
Losing weight was as important in regaining self-esteem. Being more fit was experienced to increase attractiveness and adolescents with neither weight loss nor being more fit expressed disappointment in not becoming thin.

I’ve felt a bit better than I did before. That’s the good thing. But you still get too high hopes when you work out. To become thin and stuff like that. (Adolescent no. 8)

Most of the adolescents expressed a lack of self-esteem at the beginning of the intervention. Overcoming the resistance in regard to exercise was experienced as empowering; how they had participated, committed, and sustained throughout the intervention, gaining control of their exercise.

I used to think a lot, but I don’t any more. I just do and then I’ll see how it works out. I’m thinking that it will be alright. (Adolescent no. 5)

Improved self-esteem from looking at themselves and their surroundings in a brighter light was empowering. This resulted in being more open-minded, both towards engaging in new activities in the future and towards new possible treatments. The effect of the exercise had met some adolescents’ expectations, while others were disappointed and planned for other treatments.

**Self-control**

Self-control was described as emotional control and self-regulation leading to empowerment. Emotional control was experienced as being more safe, decreased anxiety, and less need for control, contributing to a feeling of empowerment and joy in life. Being more spontaneous and safe to participate in activities without knowing exactly what was going to happen led to a sense of self-control and empowerment. Taking part in an exercise intervention decreased stress and anger among adolescents with depression. Most of the adolescents, including those who were still depressed, reported peace of mind by clearing their thoughts with exercise.

I’ve started liking that it aches in my arms from working out. Like, when you work out, you think of a different pain, the pain in your arms instead of the pain in your head. You think of other stuff. (Adolescent no. 12)

Improved sleep in terms of falling asleep easier and sleeping uninterrupted was reported. Self-control included independence in being able to sleep on one’s own, instead of with parents.

Before when I was supposed to go to bed, I was often worried in the evening and then I wanted to watch TV when going to sleep, to keep me from thinking. But now I don’t like having the TV on. I want it dark and quiet. Then it takes like 5 min for me to fall asleep. And I sleep on my own now. Before, I used to sleep with my parents, because I didn’t feel safe to be on my own. So that’s changed as well. (Adolescent no. 5)

Being better equipped to handle difficulties and feeling reassured in knowing what to do if one became depressed again was emphasized by the adolescents who remitted from depression and interpreted as empowering. Improving activity and energy levels increased self-regulation and facilitated lifestyle change. Some adolescents had tried to improve their lifestyle before the intervention, only to give up shortly afterward, since they had exaggerated their efforts in the beginning and tried to change all habits at the same time. Instead, starting with a low-key exercise at the beginning of the intervention enabled participation. Those who remitted from depression expressed confidence in using the same approach; namely exercise and reasonable expectations also in other activities and endeavours, such as returning to school.

When I didn’t work out and just stayed at home, I got like a lot of ideas, because I had energy somewhere within, that I didn’t use, and then I went all in for something a couple of days and then I crashed. But now I’m more stable because with the exercise I can channel my energy. (Adolescent no. 5)

**Discussion**

After taking part in the exercise intervention, the adolescents expressed enhanced participation in daily life and joy of living by demonstrating commitment and declaring feelings of empowerment. The aim was to study the effect of exercise on persistent depression and the adolescents expressed changes in life ranging from none to life-changing, varying with the degree of improvement in depressive symptoms. Exercise introduced joy in life by improving physical and mental symptoms and supporting changes in everyday life. The importance of our results is supported by a qualitative study aiming at understanding anhedonia, where depressed adolescents describe a loss of joy, struggling with motivation and active engagement, and losing a sense of connection and belonging [26]. The adolescents in our study describe the exercise intervention as alleviating these core aspects of depression.

The experiences of commitment, through vitality, described are in line with previous findings by Carter et al. where they found that the adolescents gained increased energy and improved mood along with commitment, expressed as ‘motivation in being sociable, engaging in education and making positive changes’ [16]. The enjoyment of exercise was often, but not always, related to an improvement in mood and other symptoms of depression. Some adolescents described the exercise as enjoyable and rewarding, without having had any change in mood. Several also noted, some with pride, that they did not mind the intensity of the exercise, although it was moderate to vigorous maybe because hyperactivity was a component of our sample given that 75% of the participants had ADHD. Finding the exercise enjoyable has been found to be a main motive to exercise [27,28].

The structure of everyday life, in terms of having an activity to do on a regular basis, was described as beneficial, which supports earlier findings [16,29]. The regular activation in the exercise intervention might be seen as behavioural activation, a cornerstone in CBT for depression [30]. Similarly, the exercise provided activity, achievement, and purpose, leading to commitment. The adolescents in both our and Carter’s study [16] also proposed that the experience of consistency could be applicable to other activities and hence
improve everyday life further. This experience of the intervention is interpreted to be due to taking part in a group activity, rather than exercise specifically. The adolescents’ own commitment to stay physically active varied, regardless of whether they had experienced a positive effect on mood symptoms or not. Some of the adolescents, who had improved during the intervention and promoted the idea of having exercise as a treatment for depression, still failed to go to the exercise sessions if their parents did not insist and help with transport. Support from parents was also described as important for enrolling in the study in the first place. Others had the maturity and independence to manage the training on their own. This illustrates one of the difficulties in exercise interventions for adolescents; some will require a lot of support from parents or other adults just to enrol and even more so to adhere to the plan throughout the intervention. This kind of family support might not always be present, particularly not for those who have had a persistent depression where social support might have been insufficient or parents have become exhausted by giving extensive support for a long time. The need for social support to maintain exercise has been described for adults with bipolar disease and depressive symptoms [31] and healthy adolescents, where the support was given by family and friends [17].

The experiences within empowerment, self-esteem, and self-control, are in line with previous studies [16,29] including improved sleep and using exercise as a distraction from negative thoughts. Improvement in regard to anxiety and being able to discontinue sleep medication was also described for adolescents [16]. In our results losing weight and becoming thin was emphasized as motivating and important. Some described how they felt better and more confident since they felt their body had changed. Possibly this enhanced the effect of the exercise and helped to improve the adolescents’ view of themselves. This is in line with previous findings among adolescents and young women where attractiveness and weight control were a motivator to stay physically active [17,27].

Self-control through regulating one’s energy and activity was distinctly described in our study, but not in previous studies [16,29]. Possibly this could be a change that occurs over time and be due to the duration of the exercise intervention. It might also reflect the burden of disease and comorbidity among our participants, where all had persistent depression and the majority had comorbid ADHD or anxiety disorders. For future studies and treatment, the question of adherence is crucial. In our study, the fixed exercise program was highlighted as efficient and helpful for adherence by providing structure and a sense of security in knowing what to do. The adolescents also expressed gaining competence and daring to make greater efforts due to the encouragement and guidance provided by the coach and Child and Adolescent Mental Health Services (CAMHS). Notably, the majority of the adolescents adhered to the exercise intervention although the aerobic intensity was moderate to vigorous, showing that with appropriate support and structure adherence can be maintained even in a physically demanding intervention [21]. In Carter’s study with preferred intensity exercise, the adolescents stressed the importance of choosing their exercise intensity and activities themselves [16], which resulted in exercise at a low aerobic intensity. However, in our study, we conclude that with support from a competent coach and CAMHS, the more intense level did not become an obstacle. In both studies, the adolescents gained a more positive attitude towards exercise over time.

For adherence, it is a challenge both to motivate the adolescents to come in the beginning and to help them persevere for the duration. Some expressed that doing the exercise in a group was daunting at first, but perceived it as positive over time. Creating an ambiance in the group where one feels safe and comfortable was reported as a valued aspect. It is possible that adolescents with persistent depression require coaching and support from CAMHS for a longer period of time to stay physically active.

Limitations

Since a text can be interpreted in many ways, our findings represent one possible interpretation of adolescents’ experience. In qualitative studies, trustworthiness should be based on four criteria: credibility, dependability, confirmability, and transferability [25]. Credibility was enhanced by the large number of meaning units described by the participants. All content that emerged was considered relevant and important. Credibility was strengthened by the co-author’s familiarity with the methodology and that all categories were discussed, compared, and revised until the final classification was established. In order to achieve dependability, all interviews began with the same opening question, and the participants were encouraged to talk openly. Follow-up questions were posed to avoid misunderstanding. The interviews were conducted by the authors; AB, IL, and MS. Having multiple interviewers can be considered a weakness since the way the interviews were conducted might vary. In order to increase dependability, an interview guide was used and all data were discussed and revised by all three assessors. Confirmability was strengthened by repeated reading, identification of, and reflection on the content. The participants’ experiences were described in as much detail as possible and quotations illuminate the content. A limitation could be the duration of the interviews, where 15–60 min might have been too short. However, the interview texts were rich in content and contained a great variety of statements. A limitation in transferability might be that all data was collected in the same clinic and from two exercise groups and that 75% of the participants also had ADHD. However, we recruited almost half of all eligible clinical patients from a defined catchment area strengthening a variation among the adolescents. The differences in age and maturity might impact the results in giving a broader range of experiences. Given this variation, our results can be transferred within the patient group of adolescents with persistent depression. Further, the experience of participating in a group exercise can be affected by the group leaders and other local circumstances.
Conclusions
Clinically referred adolescents with persistent depression experienced joy of living due to commitment and empowerment having participated in aerobic exercise intervention of moderate to vigorous intensity. The moderate to vigorous intensity neither seemed to impede participation nor was experienced negatively maybe because three-quarters of the participants had ADHD. Exercising in a group added values such as community, structure of everyday life, and consistency. Mood symptoms were ameliorated including experiencing vitality, self-esteem, and self-control. Social support was essential for adherence. The adolescents in the study advocated the idea of having exercise as a standard treatment for depression.

Integrity of research and reporting
The Ethical Review Board at Lund University, Sweden, approved the study, nr 2017/98. The study conforms to the principles outlined in the Declaration of Helsinki [32]. The adolescents and their guardians were informed about the study in their treatment contact at the Child and Adolescents Psychiatry Clinic. Those who were interested in participating received written and verbal information from the study coordinator about the study and the voluntary nature, confidentiality, and possibility to withdraw at any time. They also had a meeting with the personal trainer who described the framework of the exercise. The adolescents, and guardians if the adolescent was under 16 years of age, then gave their informed consent.

Disclosure statement
No potential conflict of interest was reported by the author(s).

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