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Brief report

Physical fitness in depressive patients and impact of illness course and disability

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ABSTRACT

Background: There is a large and increasing body of evidence that physical exercise, such as endurance training, exerts antidepressant effects in psychiatric disorders. However, compliance rates are rather low due to reduced energy and lack of motivation. Another important reason may be low baseline fitness leading to overstrain when participating in a training program. The aim of the study was to evaluate the physical fitness of depressive patients compared to healthy controls by a standardized assessment.
Methods: 51 hospitalized depressive patients were investigated by a standardized physical fitness assessment on a bicycle ergometer including measurement of maximum workload (pmax), heart rate, lactate concentration, workload at first lactate elevation (pLT), individual anaerobic threshold (IAT) and workload at IAT (pIAT). They were compared to 51 healthy controls matched for age, sex and body mass index.
Results: p(max), p(LT) and p(IAT) were markedly reduced in depressive patients compared to healthy controls ($p<0.001$). Lactate increase was faster and steeper in depressed patients, albeit differences never reached significant levels. There was a significant negative correlation between the length of disability and poor performance parameters but no significant correlation with other illness variables.
Limitations: The study was not prospective and no study protocol was applied.
Conclusion: This study demonstrates a marked reduction of physical fitness in depressive patients which cannot be explained by differences of body mass index or age. When designing therapeutic exercise programs for depressive patients evaluation of baseline training level is recommendable because many patients might overstrain themselves because of strongly reduced baseline fitness.

1. Introduction

Physical training is an approved element within the spectrum of treatment options for psychiatric disorders. The evidence for an antidepressant effect of exercise remains controversial. On one hand there is a large body of evidence supporting antidepressant effects of exercise (Mead et al., 2009; Rethorst et al., 2009), on the other hand some authors state that because of methodological shortcomings and the lack of good quality research the effectiveness of exercise cannot be determined (Lawlor and Hopker, 2001).

Furthermore, it is not possible to conduct placebo-controlled studies, but the use of control groups with antidepressant medication, cognitive therapy or bright light therapy has been established to reduce potential placebo effects (Blumenthal et al., 2007; Klein et al., 1985; Pinchasov et al., 2000).

Interestingly, the type of exercise seems to be irrelevant for treatment outcome (Doyne et al., 1987; Martinsen et al.,

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1989). A study comparing weight training with aerobic training using relaxation training in the control group found no differences between the intervention groups, but a positive effect of weight training on work capacity (Krogh et al., 2009).

Therapeutic effects of exercise have also been shown for anxiety disorders (Meyer et al., 1998; Esquivel et al., 2008; Broocks et al., 1998), psychotic disorders (Ellis et al., 2007), obsessive compulsive disorder (Abrantes et al., 2009; Brown et al., 2007), bipolar disorder (Ng et al., 2007) and for the prevention of dementia (Valenzuela and Sachdev, 2009).

Recent research suggests an interaction between depressive disorders and obesity which further emphasizes the importance of physical training for depression (McElroy et al., 2004). Although acute depressive episodes go along with weight reduction, there seems to be a positive association between depression and obesity in the long term.

In controlled studies compliance rates tend to be about 80–90% (Blumenthal et al., 2007; Singh et al., 2005). However, in natural clinical settings compliance rates are disappointingly low with patients often complaining about not being able to integrate physical exercise into their daily routine. This could be due to reduced energy and lack of motivation, which are core symptoms of depression. Another possible explanation would be a reduced baseline physical fitness. In support of this notion, a 10-year cohort study showed a negative correlation between concurrent depression and physical activity (Harris et al., 2006). Low baseline fitness could lead to a rapid increase of lactate concentration, pulse rate and blood pressure which results in rapid exhaustion. Overstrain could therefore trigger reduced compliance in depressive patients.

The evaluation of these factors would be important to individually adjust physical training programs to the limits of depressive patients. We therefore investigated the baseline fitness of depressed inpatients. Our hypothesis was that physical fitness is significantly lower in depressive patients compared to matched controls.

2. Methods

2.1. Subjects

66 depressed patients treated as inpatients in the Department of Psychiatry and Psychotherapy at the University Hospital Freiburg were screened for the study. Exclusion criteria were significant medical disorders that would constitute a contraindication for fitness assessment, anxiety disorders and schizophrenia. Patients had to fulfill the ICD-10-criteria for depressive disorder. 51 patients, 23 females and 28 males, fit the inclusion criteria. Depressive disorder was diagnosed by experienced clinicians. The mean BDI-score was 27.9 ± 9.8. Mean age was 49 ± 11.4 years. Mean BMI was 26.5 ± 5.0 kg/m². A control group of healthy subjects was matched for age (48 ± 12.1 years), sex, BMI (25.1 ± 4.1 kg/m²) and total physical activity per week. Healthy controls were screened by experienced clinicians for mental or somatic illnesses and average physical activity. 41% of depressive patients were smokers, compared to 31% in normal controls. This difference was not significant (n.s.). 42 depressive patients were on antidepressant medication (TCA $n = 6$, SSRI $n = 10$, SNRI $n = 12$, α_2-inhibitors $n = 14$).

2.2. Physical fitness assessment

All participants performed a standardized incremental exercise test on a bicycle ergometer (Excalibur, Lode, Germany). Starting with a workload adjusted for individual capacity, the workload was increased every 3 min. After completing an exercise level blood samples were taken to measure lactate levels while blood pressure and heart rate were monitored.

Subjects were told to cycle with a steady rate of 1 Hz and to stay in the test until subjectively feeling exhausted. Maximal achieved workload was defined as p(max). Other parameters were workload at first lactate elevation (p(LT)) and workload at anaerobic threshold (p(IAT)). Each parameter was subsequently also adjusted for weight (e.g. p(max)/kg).

2.3. Lactate

Capillary blood samples were obtained from the ear lobe during rest between two exercise levels. Lactate concentrations were measured by a photometric system (Eppendorf, Hamburg, Germany). Individual anaerobic threshold was calculated via the method of Dickhuth et al. (1991).

2.4. Heart rate recording

Heart rate was recorded by a pulse monitor watch (Polar, Büttelborn, Germany).

2.5. Statistical analysis

All analysis were carried out with PRISM 4. Parameters were tested by ANOVA with a post-hoc Bonferroni correction for multiple testing. In addition to a comparison with healthy controls, the group of depressive patients was analyzed for subgroup differences. Subgroups were established for length of episode, overall length of illness, number of episodes, length of disability, smoker/non-smoker, treatment response, length of hospitalization, BMI, age and depression severity.

3. Results

3.1. Workload

p(max), p(LT), and p(IAT) were strongly and significantly reduced in depressive patients compared to healthy controls (Table 1). Depressive patients quit the assessment at lower levels than healthy controls (Fig. 1).

3.2. Heart rate

Heart rates at rest and maximal heart rates were significantly different between groups (Table 1). However, the difference in heart rate during exercise never reached significant levels.