Physical activity protects male patients with post-traumatic stress disorder from developing severe fibromyalgia

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Abstract

Objectives

Fibromyalgia syndrome (FMS) has been associated with various psychiatric and other, ill-defined disorders. We recently showed that fibromyalgia is more prevalent in men suffering from combat-related Post Traumatic Stress Disorder (PTSD). In this paper we analyze the relationship between engagement in physical activity, the psychometric traits of PTSD and the future development of FMS.

Methods

Fifty-five male patients, all known to have combat-related PTSD, were investigated for the presence of fibromyalgia according to the American College of Rheumatology (ACR) criteria. Each patient completed questionnaires characterizing his quality of sleep, and the Sheehan Disability Scale measuring performance in the familial, social and vocational spheres. Additionally, each of the enrollees was interviewed by an experienced psychiatrist, who then completed a Clinician Administered PTSD Scale, a Clinical Global Impression Scale, and calculated an SF-36 score. Each patient was asked whether he exercised often, occasionally or not at all. The data was analyzed by the χ^2 *test and by ANOVA.*

Results

PTSD patients who also suffered from FMS had a more severe form of disease as measured by the Clinician Administered PTSD Scale (CAPS) score, 88.2 ± 14.0 (n = 28) compared to 97.6 ± 13.2 of patients with PTSD and FMS (n = 27) ($p = 0.013$*,* $F_{(d.f\,2)}$*-6.61, ANOVA test). Interestingly, engaging in physical exercise was also associated with less severe disease. When the patients were analyzed based on their tender point count (0-5, 6-10, or > 11), the number of tender points decreased with increasing physical activity (*$p = 0.02$*,* $\chi^2_{(d.f.\text{-}4)} = 11.3$*).*

Conclusion

Physical exercise in male patients with combat-related PTSD provides protection from the future development of fibromyalgia. Furthermore, physical activity is related in this group of patients to a better perception of their quality of life.

Key words

Fibromyalgia, post-traumatic stress disorder, pain, exercise, stress.

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Introduction

The fibromyalgia syndrome (FMS) is an idiopathic chronic pain syndrome characterized by widespread non-articular musculoskeletal pain and generalized tenderness in the absence of inflammatory or structural musculoskeletal abnormalities. In addition, patients often suffer from fatigue, sleep disturbances and mood disorders.

Patients with FMS report limitations in daily activities, even including mild non-exertional physical activity. Their disability may affect almost every dimension of daily life from employment to social and familial roles (1, 2). The psychological profile of patients with FMS is heterogeneous and includes some who perceive themselves as helpless and unable to cope with their symptoms, as well as subjects who appear to manage their symptoms by adapting to their limitations. Others develop strategies that assist them to cope with their daily problems (3).

Management of FMS focuses on maximizing health, function and independence. The treatment of patients with FMS therefore includes life style modifications, pharmacotherapy, and cognitive and behavioral therapy. However, an increasing number of randomized controlled trials have established the benefits of aerobic exercise for individuals with FMS. The majority of these studies underline the favorable effects of supervised aerobic exercise performed two or three times a week and the use of various modes of aerobic physical activity (1, 3-7).

Recently we reported a high prevalence of FMS in male subjects suffering from severe post-traumatic stress disorder (PTSD) (8). In the present study we attempted to assess whether physical activity and fitness in this cohort provided protection from the subsequent development of FMS. We analyzed retrospectively whether regular physical activity over the course of many years attenuated the severity and impact of FMS.

Patients

Fifty-five male patients between the ages of 18-60, all known to meet the DSM-IV criteria for PTSD, were investigated for the presence of FMS according to the ACR criteria. Each individual had experienced, witnessed or been confronted with an event that involved actual or threatened death, serious injury, or a clear and evident threat to the physical integrity of the self or others. In all cases the traumatic event was combat-related, and took place during military action between the years 1967-1982. All of the PTSD patients were classified as non-rehabilitative by the rehabilitation department of the Ministry of Defense. These patients were recruited during their activities in a specialized daytime care center, which is conducted on an outpatient basis. Informed consent was obtained from all enrollees in accordance with the study protocol, which was approved by the ethics committee.

Scales and measures

FMS Tenderness Assessment – A tenderness assessment was performed manually in all subjects by a senior rheumatologist; a count of 18 tender points (TP) was performed by thumb palpation as specified in the ACR 1990 classification criteria. The subject was asked to say "yes" when the sensation altered from pressure to definite pain. Preliminary measurement of control sites was obtained in order to familiarize the subject with the process, and discourage anticipated or exaggerated responses. Patients were not informed as to which sites were tender or control points. In order to further simplify the statistical analysis we aggregated the sum of sensitive TP as follows: 0–5 TP = borderline, 6–10 = mild sensitivity, and 11–18 = sensitive. Patients were considered to have FMS if they fulfilled the ACR criteria for FMS, *e.g.*, widespread musculoskeletal pain with excess tenderness in at least 11 of 18 pre-defined tender points.

Sheehan Disability Scale – A disability assessment that measures subjective disability as related to familial, social and vocational aspects of life was completed by each of the enrollees. The questionnaire is scored on a VAS global self-assessment scale (9, 10).

Medical Outcome Survey Short Form (SF-36) quality of life assessment – A validated Hebrew language version of the SF-36 scale was used to measure the quality of life. The SF-36 contains eight subscales: physical functioning (PF), social functioning (SF), and role limitations attributable to physical and emotional problems, mental health, vitality, bodily pain, and general health. Each scale is scored on a VAS scale (0 to 100), with a high score indicating better health and less body pain (5).

Clinician Administered PTSD Scale (CAPS) – The CAPS is a structured interview instrument designed to assess the severity of PTSD according to the DSM-IV criteria. It measures symptom frequency and intensity by constructing a continuous score which reflects the severity of PTSD. A senior psychiatrist completed a CAPS questionnaire following an interview with each PTSD patient (11).

Clinical Global Impression Scale (CGI) – The CGI is a semi-quantitative scale that measures the severity of psychiatric illness as perceived by an experienced psychiatrist on a continuous scale from 1 to 7. A high numeric rating reflects a greater degree of severity in 6 symptoms. A senior psychiatrist completed a CGI evaluation for each PTSD patient (4).

Physical activity assessment – Each patient was asked about his physical activity habits, and responded to the question whether he exercised often, occasionally or not at all.

Statistical analysis

Data analysis was two-fold, based on group comparisons and correlations. Differences between groups for the continuous variables were calculated using one-way analysis of variance (ANOVA) with group as an independent variable. For the categorical variables, group comparisons were calculated using the chi-square test for goodness of fit.

Table I. Prevalence of medical disorders types of drug therapy among patients with post-traumatic stress disorder.

Concomitant medical disorders	PTSD patients (%) (n = 55)	Type of medical therapy	PTSD patients (%) (n = 55)
Hypertension	11 (20%)	Anti-depressants	37 (67%)
Diabetes	11 (20%)	Anxiolytics	32 (58%)
Ischemic heart disease	6 (11%)	Anti-psychotics	12 (24%)
Previous wounds (multiple trauma)	5 (10%)	Anti-hypertensive agents	11 (20%)
Cerebrovascular accident	5 (10%)	Oral hypoglycemics	6 (11%)
Hyperlipidemia	4 (7%)g	Aspirin	6 (11%)
Hypothyroidism	1 (2%)	Insulin	3 (5%)
Peripheral vascular diseases	1 (2%)	Statins	2 (4%)
Alcoholism	1 (2%)	Anti-convulsants	2 (4%)
		Anticoagulants	2 (4%)
		l-thyroxine	2 (4%)

Table II. Comparison of variables in the PTSD patients, when divided into three groups based on the extent of their physical activity. Results are expressed as means and standard deviations.

Variable	Degree of engagement in physical activity				
	Regular basis	Infrequent	None at all	$F_{(d.f\ 2)}$	Significance
Age (years)	48.9 ± 7.2	55.2 ± 4.9	50.2 ± 6.8	0.9	$p = 0.75$
Sheehan – vocational scale	9.6 ± 0.8	9.8 ± 0.5	10 ± 0	3.8	$p = 0.03$
Sheehan – social scale	7.7 ± 1.5	8.5 ± 1.3	8.2 ± 2	0.4	$p = 0.70$
Sheehan – familial scale	7.2 ± 2.1	5.8 ± 2.6	7.4 ± 2.5	0.7	$p = 0.46$
Tender point count	4.6 ± 5.6	8.2 ± 5.1	9.8 ± 4.8	4.0	$p < 0.03$
CGI	5.4 ± 0.5	5.8 ± 0.5	5.8 ± 0.7	1.4	$p = 0.26$
CAPS	90 ± 10	84.2 ± 10.4	92.5 ± 15.4	0.7	$p = 0.52$
Total SF-36	46.2 ± 15.3	26.2 ± 7.6	22.8 ± 10.7	13.0	$p < 0.0001$
Physical function	76.2 ± 24.7	48.7 ± 25.6	45.9 ± 27.6	4.0	$p < 0.03$
Physical role limitation	46.8 ± 36.4	12.5 ± 25	7.1 ± 15.0	10.6	$p < 0.001$
Body pain	50.1 ± 22.4	32.0 ± 21.6	22.3 ± 18.7	6.3	$p < 0.01$
General health	50.8 ± 18.6	27.5 ± 14.4	26.4 ± 14.9	7.5	$p < 0.002$
Total physical function	52.2 ± 15.2	29.7 ± 8.9	24.1 ± 12.1	15.7	$p < 0.0001$
Vitality	38.1 ± 18.3	30.0 ± 12.4	19.8 ± 18.8	3.3	$p < 0.05$
Social functioning	45.5 ± 30.5	31.2 ± 12.5	20.7 ± 19.4	4.2	$p < 0.03$
Emotional role limitation	20.8 ± 30.7	0 ± 0	13.1 ± 26.2	0.9	$p = 0.43$
Mental health	42.0 ± 12.8	27.0 ± 12.8	25.9 ± 19.7	2.5	$p = 0.10$
Total mental function	39.4 ± 13.5	23.0 ± 6.5	21.2 ± 12.1	7.1	$p = 0.002$

Results

The average age of the PTSD patients was 49.7 ± 7.5 years (mean ± standard deviation). As expected, we found high rates of usage of anti-depressants, anxiolytics and anti-psychotics (Table I). In addition, high rates of hypertension, diabetes and ischemic heart disease were observed. Only 5% of the population had actually suffered physical injury during the combat events that led to the development of PTSD.

When the patients were asked about the regularity of their physical activity, 10 replied that they perform physical activity on a regular basis, 4 stated that they did so infrequently, and 31 patients acknowledged that they engaged in no physical activity at all. Ten PTSD patients did not answer this question.

The degree of physical exercise was not related to the age of the patients. The severity of PTSD was similar among all the patients regardless of whether they were physically active or not; no significant changes were observed between the CAPS and the CGI scores of the PTSD patients between the different groups (Table II). Similar rates of anti-psychotic and non-psychiatric medications were recorded for the various PTSD groups; interestingly, a trend towards lower rates of anti-depressant and sedative usage was noted in the physically active PTSD subgroups.

Also of note, the tender point count of the PTSD patients decreased [when subdivided by group based on the number of tender points (0–5, 6–10, or >11)] with increasing physical activity ($p = 0.02$, $\chi 2_{(d.f.-4)} = 11.3$) (Table III).

Analysis of the PTSD patients based on their degree of physical fitness revealed significantly better scores for vocational performance according to the Sheehan scale (physically active 9.6, partially active 9.75, non-active10, $p < 0.05$, $F_{(d.f\,2)}$ -3.8, ANOVA), although all scores reflected a high degree of disability.

The SF-36 scores for quality of life were clearly more discriminative, demonstrating scores that correlated with the degree of physical activity (physically active – 46.2, partially active – 26.25, not active – 22.75, $p < 0.0001$, $F_{(d.f\,2)}$ -13). The major impact that physical activity had on the SF-36 was also reflected in some specific components such as physical function, physical role limitation, body pain, general health, vitality and social function (Table III).

Table III. Distribution of the patients based on their tender point count (TP) and level of physical activity.

	0-5 TP	6-10 TP	11-18 TP
Physically active	7	0	3
Partially active	2	0	2
Not active	6	10	

Discussion

FMS is frequently encountered among individuals who have been exposed to extreme life events, such as sexual, physical or psychological abuse or other traumatic and sometimes life-threatening situations. However, studies have thus far failed to identify which individuals are vulnerable and susceptible to develop future FMS. Recently we investigated the characteristics of FMS in a group of male patients with long-existing PTSD (who had never attended rheumatology clinics) and observed that 49% of these patients had concomitant FMS that met the ACR classification criteria (8).

There is no optimal therapy for FMS and its management is often a frustrating and difficult process for patients and physicians alike. Several studies have shown that continuous aerobic exercise performed at an adequate level of intensity can improve function and well-being (2, 3, 8). However, experience has repeatedly shown that a multi-disciplinary approach based on life style modifications that include physical exercise, pharmacotherapy, and cognitive and behavioral therapy along with patient education is the most rewarding approach. Few clinical trials have combined medications with non-pharmacological measures (12, 13). Goldenberg *et al.* (14) reviewed all available and clinically proven treatments for FMS, and concluded that optimal FMS management requires a combination of pharmacological and non-medicinal therapies.

Several studies have focused on the effect that exercise has when used as the sole therapeutic modality for FMS, estimating the impact of the type of exercise (aerobic, non-aerobic), its intensity, and its duration on the disease response. Mannerkorpi (3, 11) reviewed the various exercise methods that have been used in the treatment of FMS, and concluded that low intensity aerobic exercise undertaken at least twice a week offered the most benefits. High intensity programs and non-aerobics have their own benefits, but do not effectively improve the entire spectrum of FMS symptoms that patients experience.

The chronic nature of the disease has a major impact on daily social, familial and vocational activities. Consequently, it is of great importance not only to discover effective interventions but also to try and prevent FMS from occurring, particularly in susceptible subjects.

The results of our study suggest that regular physical activity conducted over many years can prevent the emergence of FMS among patients with sustained PTSD. We observed that patients who engaged in regular physical exercise had lower TP counts even though the severity of their disease was similar to that of their counterparts who did not exercise. In addition, exercising patients reported a higher quality of life as measured by the SF-36 score. We elected to use the SF-36 questionnaire since it has been shown to reliably evaluate not only quality of life, but also the severity of functional impairment in patients with FMS (15).

One limitation of this study is that, due to its retrospective design, the clarity of the cause-effect relationship between the severity of FMS symptoms and the level of physical exercise as reported by the patients may have been blurred. Nevertheless, it should be underscored that PTSD was the primary health problem of the study group. The severity of this disorder as measured by the CAPS and CGI scores did not differ between the exercise and non-exercise subgroups. Moreover, prior to the study these patients had never sought treatment for generalized pain at any pain or rheumatology clinic. In view of these facts, it may be concluded that exercise on a regular basis could protect PTSD patients from developing FMS.

Exercise has many protective health benefits; it not only reduces cardiovascular disease but also affects cognitive functions. Several studies have shown that physical activity delays cognitive decline in the elderly; in a prospective study, regular exercise reduced the incidence of Alzheimer's disease in a series of subjects aged 65 years and older (16, 17). Different biological mechanisms are assumed to tie exercise to the mitigation of stress. Aerobic training leads to increased basal levels of norepinephrine in the locus coeruleus and frontal cortex and to the downregulation of cortical ß-adrenoreceptors (18, 19). Higher concentrations of the protective cellular stress protein, heat shock protein 72, in the brain have been recorded following continuous exposure to submaximal exercise (19, 20). Finally, it is well established that physical activity increases plasma concentrations of beta-endorphins, which mediate analgesic effects; however, studies have not thus far demonstrated low beta-endorphin levels in patients with fibromyalgia (21, 22).

Although FMS and PTSD share many features, studies assessing the impact of physical activity on the progression and severity of PTSD are scarce. One recent paper showed significant reductions in PTSD, anxiety, and depression following a 12-session aerobic exercise program, and this improvement was maintained during a consecutive one-month follow-up (23). Clearly it is premature to draw any definitive conclusions regarding the effectiveness of exercise on the chronic features of PTSD, but additional studies are warranted to elucidate these ties.

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