Original Research Article

Association of Physical Fitness with Depression in Women with Fibromyalgia

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Abstract

Objective. The aim of this study was to examine the association between physical fitness and depressive symptoms in women with fibromyalgia (FM). We also assessed whether different fitness components present independent relationships with depressive symptoms.

Design. Cross-sectional study.

Setting. University facilities and FM associations.

Subjects. Four hundred and forty-four patients with FM according to the 1990 American College of Rheumatology criteria.

Methods. Depressive symptoms were assessed using the Beck Depression Inventory (BDI-II). Physical fitness (aerobic fitness, muscle strength, flexibility, and motor agility) was assessed using the standardized Senior Fitness Test battery and the handgrip strength test. A standardized composite score for fitness was computed and divided into quintiles.

Results. Overall, the fitness tests presented inverse associations with the total BDI-II score ($P < 0.05$). The patients in the highest fitness quintile had 8.4% lower depressive symptoms than the patients in the lowest fitness quintile ($P = 0.014$). The odds of severe symptoms of depression were between 3.7% and 16.9% lower for each performance unit in the back-scratch, handgrip, arm-curl, and eight-feet up-and-go tests. When all the fitness tests were...
simultaneously considered, the back-scratch test was the only one independently associated with the total BDI-II score ($P = 0.001; R^2 = 0.023$).

Conclusions. Although higher physical fitness was generally associated with lower symptoms of depression in women with FM, the observed associations were somewhat weak and inconsistent, differing from those previously observed in healthy adults. Further research to determine the clinical relevance of the association between physical fitness and depression in FM is warranted.

Key Words: Chronic Pain; Depression; Physical Function; Exercise; Quality of Life; Pain Management

Introduction

The etiology of fibromyalgia (FM) is not fully understood, yet it is considered a disorder of the sensory and modulatory mechanisms of pain processing [1] with concomitant symptoms and comorbidities such as altered sleep patterns, fatigue, cognitive difficulties, and depression [2]. The prevalence of depression among FM patients ranges from 28.6% to 70% across studies [3,4]. FM patients incur large extra health care costs in many countries [5–7], and comorbid depression in this population is related to higher pain intensity, fatigue, overall FM severity [8,9] and self-reported affective distress [10], as well as to poorer sleep quality and health-related quality of life [11,12].

The high prevalence and negative outcomes related to depressive symptomatology in patients with FM make it essential to find strategies to improve depressive symptoms in this population. As a non-pharmacological approach, exercise is becoming increasingly popular for enhancing physical fitness [13] and improving symptoms of depression [14–16] and quality of life [17,18] in FM patients. Physical fitness is a multicomponent, modifiable factor that represents a powerful marker of health in FM [8,9,19,20] and is closely related to the development of depressive symptoms in the general population [21]. Therefore, low fitness levels could be related to high levels of depressive symptoms in women with FM. However, a comprehensive characterization of the relationship between fitness and depression in FM is lacking in the literature.

The Beck Depression Inventory second edition (BDI-II) [22] is a widely used self-reported questionnaire for assessing depressive symptomatology in chronic pain patients. However, measuring depression in patients with chronic pain is controversial [23]. Self-reported questionnaires (such as the BDI-II) comprise somatic items that are related to depression but also inherently linked to chronic pain (e.g., fatigue, energy, sleep). Harris et al. provided a three-subscale structure of the BDI-II (negative attitude, performance difficulty, and somatic elements) in women with chronic pain [24].

The main purpose of this study was to assess the association between physical fitness and depressive symptoms in women with FM. We also examined whether different fitness components present an independent relationship with depressive symptoms. On the basis of previous research in the general population [21], we hypothesized that higher physical fitness levels (especially aerobic fitness) would be associated with lower levels of depressive symptoms in women with FM.

Methods

Participants

The sampling procedure to recruit a representative sample of women with FM from the Andalusia region (southern Spain) has been described elsewhere [2]. Briefly, a total of 616 women with FM (aged between 30 and 65 years) from the eight provinces of Andalusia were recruited for this cross-sectional study (through local FM associations, as well as via email, telephone, or local newspaper advertisements) and gave written informed consent to participate. Inclusion criteria comprised a diagnosis of FM by a rheumatologist. In addition, to avoid bias in the diagnosis by different rheumatologists in the eight provinces of Andalusia, the patients were evaluated according to the 1990 American College of Rheumatology (ACR) criteria for FM and had to meet these criteria to be included in the study [25]. Exclusion criteria included acute or terminal illness and severe cognitive impairment (Mini Mental State Examination [MMSE] < 10) [26]. The study protocol was reviewed and approved by the Ethics Committee of the Hospital Virgen de las Nieves in Granada (Spain).

Procedures

The same group of trained researchers carried out the evaluation process on two non-consecutive days (e.g., Monday and Wednesday) either at the university or at facilities from associations of FM patients. The assessments were performed in either morning or afternoon sessions. On day 1, the diagnosis of FM was confirmed [25], the BDI-II and a complete self-reported socio-demographic questionnaire were completed, and anthropometric measurements were taken. Participants were then given the revised Fibromyalgia Impact Questionnaire (FIQR) and the Pittsburgh Sleep Quality Index (PSQI) (together with other questionnaires not used in this study) to fill in at home and bring on the next assessment day. On day 2, the research team verified that the questionnaires were properly and completely filled in. Thereafter, the physical fitness assessment was undertaken.

Assessment of Depressive Symptoms

The BDI-II [22] is a 21-item self-report measure designed to assess depressive symptomatology. Participants rated each depressive symptom (0 [not present] to 3 [severe]) in terms of how they had been
feeling during the past 2 weeks, including the date of questionnaire completion. The BDI-II provides a single overall score (0–63) that can be used alone or in combination with the three subscales developed by Harris et al. [24] to assess depressive symptoms in chronic pain patients. A BDI-II ≥ 29 units is considered to designate severe depressive symptoms [22].

Assessment of Physical Fitness

Physical fitness was assessed with the Senior Fitness Test battery [27] and handgrip dynamometry. This battery of tests has been validated for assessing physical fitness in healthy older adults [27] and has been consistently used in FM patients [8,20,28–30] since these patients have shown fitness levels similar to those of healthy adults 20–30 years older. In addition, these tests have shown to be feasible and reliable in women with FM [31]. The tests were performed in the same order as described below.

The chair sit-and-reach test [32] was administered as a measure of lower-body flexibility. Starting from a sitting position with one leg extended, participants slowly bent forward, sliding the hands along the extended leg in an attempt to touch (or pass) the toes. The distance (in centimeters) short of reaching the toe (negative score) or reaching beyond it (positive score) was recorded. The test was performed twice for each leg, and the average of the best value from each leg was used.

The back-scratch test measured upper-body flexibility [27]. The distance between (or overlap of) the middle fingers behind the back was recorded twice for each arm, and the best scores from the right and left arms were averaged.

Handgrip strength was completed with a TKK 5101 Grip-D digital dynamometer (Takey, Tokyo, Japan) as described elsewhere [33]. Participants performed the test twice (alternatively with both hands), with a 1-minute rest between trials. The best scores from both hands were averaged.

The 30-second chair-stand test [27] measured lower-body muscle strength as a function of the number of times an individual is able to rise, starting from a seated position, to a full stand within 30 seconds with back straight and feet flat on the floor, without pushing off with the arms.

The arm-curl test [27] was used as a measure of upper-body muscle strength. This test measures the number of times a hand weight of 2.3 kg can be curled through a full range of motion within 30 seconds. The average number of repetitions from both arms was recorded.

The eight-feet up-and-go test [27] was used as a measure of motor agility (which relates to the ability to rapidly change the position of the entire body in space with speed and accuracy) [34]. This test consists in standing up from a chair, walking 8 feet (2.44 m) to and around a cone, and returning to the chair in the shortest period of time (therefore requiring movement speed, balance, and motor coordination). The better (lower) time from two trials was used.

The 6-minute walk test [35] was used as an estimate of aerobic fitness. It measures the distance (in meters) that a participant is able to walk along a 45.7 m rectangular course within 6 minutes. This test has shown moderate validity and reliability as an estimate of aerobic fitness in women with FM [35].

Anthropometric Characteristics and Body Composition

A portable eight-polar tactile-electrode bioimpedance device (InBody R20, Biospace, Seoul, Korea) was used to measure weight (kg) and total body fat (%). The validity of this instrument has been reported elsewhere [36]. Height (cm) was measured with a Seca 22 stadiometer (seca GmbH, Hamburg, Germany), and body mass index (BMI) was calculated [weight (kg)/height (m²)].

Drugs Consumption

The consumption of weak and strong analgesics, as well as antidepressants and anticonvulsants, was registered as binary variables (yes/no).

Pain Intensity

The pain subscale from the FIQR (numerical rating scale, 0–10) [37] was used as a measure of clinical pain intensity in the context of the prior week.

Sleep Quality

The total score of the Spanish version [38] of the PSQI [39] was used as a measure of sleep quality in the present study (0–21, where higher scores represent worse sleep quality).

Statistical Analysis

To provide a comprehensive description of the BDI-II scores, a one-way analysis of variance (ANOVA) compared the average score of the items comprising the three BDI-II subscales. The association of physical fitness with the BDI-II total score and the three BDI-II subscales was analyzed with linear regression. The BDI-II total score and the three subscales were entered as dependent variables in separate models, and each fitness component as an independent variable. Two consecutive models were built to account for potential confounding. Model 1 was adjusted for age, BMI, educational level, marital status, and time since diagnosis. Model 2 was additionally adjusted for pain intensity, sleep quality, and drug consumption (analgesics, antidepressants, and anticonvulsants), which are closely related to depressive symptoms.
To further characterize the aforementioned relationship, binary logistic regression (adjusted for potential confounders; model 2) was used to examine the odds ratio (OR) for severe depression (versus no severe depression) as a function of the different components of physical fitness in separate models. Furthermore, a composite fitness score (henceforth the global fitness profile) was calculated as the average of the standardized scores \((\text{value}_i - \text{mean})/\text{standard deviation} \) from the seven fitness tests (weighted for the number of tests assessing the same fitness component). The standardized score from the eight-feet up-and-go test was multiplied by \(-1\) since a higher time represents poorer performance. The global fitness profile was divided into age-specific quintiles (where quintile 1 [Q1] represents the group with the lowest fitness level). One way analysis of covariance (ANCOVA) with Bonferroni’s correction for multiple comparisons was used to assess the differences in the BDI-II total score (dependent variable) across the global fitness profile quintiles (independent variable). The aforementioned confounders (model 2) were included as covariates. The difference in the BDI-II total score between participants in the lowest (Q1) and highest (Q5) fitness quintiles was used to assess the potential clinical relevance of physical fitness in relation to depressive symptoms in women with FM.

We also aimed to assess whether the different fitness components were independently associated with depressive symptoms (e.g., when all fitness tests are simultaneously accounted for). We used a forward stepwise regression method with the BDI-II total score as a dependent variable. The seven fitness tests were included in the model together with age, BMI, educational status, marital status, pain intensity, drug consumption, and sleep quality with a forward stepwise procedure. This procedure introduced the variables step by step into the model (if \(P < 0.05\)) according to the strength of the association with the outcome. The model will be reassessed with the addition of every new variable and variables will be left out of the model if \(P > 0.10\).

The statistical analysis was performed with Stata v.13.1 (StataCorp LP, College Station, Texas, USA). Statistical significance was accepted at \(P < 0.05\).

### Results

One hundred and twenty-nine participants did not meet the 1990 ACR criteria and one had severe cognitive impairment. Of these, 18 women (3.7% of the sample) did not attend the second evaluation day. Some women did not perform some fitness tests owing to physical injury (<2.5%) or did not complete some of the questionnaires (<2.5%). Only participants with complete data on all the study variables were included in the analyses (N = 444). The descriptive characteristics of the study participants are presented in Table 1. The description of the BDI-II items across the three BDI-II subscales is presented in Table 2. There were statistically significant differences in the average score across the three BDI-II subscales (\(P < 0.001\)), with the somatic elements subscale presenting the highest score.

The association of physical fitness with depressive symptoms is displayed in Table 3. Initial analyses (model 1) revealed a statistically significant inverse association of all fitness tests with the total BDI-II and subscale scores (all, \(P < 0.001\)). Adjusting for pain, drug consumption, and sleep quality (model 2) reduced the magnitude of the coefficients (all > 10%). However, all the fitness tests presented a statistically significant inverse association with the total BDI-II score (all, \(P < 0.05\)), with the exception of the chair-sit-and-reach test (\(P = 0.059\)). Upper-body flexibility was associated with the total \(\beta = -0.148\); \(P = 0.001\) and subscale scores of the BDI-II (except the somatic elements subscale \(P = 0.055\)), but lower-body flexibility was not related to either of the outcomes (all, \(P > 0.05\)). Upper- and lower-body muscle strength was associated with the total

### Table 1: Descriptive characteristics of study participants (N = 444)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age, years</strong></td>
<td>52.0</td>
<td>8.0</td>
</tr>
<tr>
<td><strong>BMI, kg/m²</strong></td>
<td>28.6</td>
<td>5.4</td>
</tr>
<tr>
<td><strong>BDI-II total score, 0–63</strong></td>
<td>26.3</td>
<td>11.6</td>
</tr>
<tr>
<td><strong>Chair sit-and-reach, cm</strong></td>
<td>-11.1</td>
<td>11.8</td>
</tr>
<tr>
<td><strong>Back-scratch, cm</strong></td>
<td>-13.9</td>
<td>12.2</td>
</tr>
<tr>
<td><strong>Handgrip strength, kg</strong></td>
<td>19.3</td>
<td>6.3</td>
</tr>
<tr>
<td><strong>Chair-stand, reps.</strong></td>
<td>10.5</td>
<td>3.2</td>
</tr>
<tr>
<td><strong>Arm-curl, reps.</strong></td>
<td>14.4</td>
<td>4.9</td>
</tr>
<tr>
<td><strong>8-feet up-and-go, s</strong></td>
<td>6.8</td>
<td>1.7</td>
</tr>
<tr>
<td><strong>6-minute walk, m</strong></td>
<td>488.5</td>
<td>76.9</td>
</tr>
<tr>
<td><strong>Pain intensity (NRS; FIQR), 0–10</strong></td>
<td>7.5</td>
<td>1.8</td>
</tr>
<tr>
<td><strong>Sleep quality (PSQI total score), 0–21</strong></td>
<td>12.7</td>
<td>3.8</td>
</tr>
</tbody>
</table>

BMI = body mass index; BDI-II = Beck Depression Inventory second edition; NRS = numerical rating scale; FIQR = revised Fibromyalgia Impact Questionnaire; PSQI = Pittsburgh Sleep Quality Index; SD = standard deviation.
BDI-II score, although there were inconsistencies across the different subscales. Motor agility was consistently associated with the total (β = 0.148; P = 0.001) and subscale scores of the BDI-II (all, P < 0.01). The distance walked in 6 minutes was associated with the total BDI-II score (β = 0.095; P = 0.041), but not with the three individual subscales (all, P > 0.05).

Table 4 presents the adjusted OR for severe depressive symptoms (versus no depressive symptoms) as a function of the different physical fitness tests. The odds of severe symptoms of depression was 3.7% (95% CI: 5.7% to 1.7%; P < 0.001) lower for each additional centimeter of performance in the back-scratch test; 4.8% (95% CI: 8.2% to 1.2%; P = 0.010) lower for each additional kilogram in the handgrip test; 5.3% (95% CI: 0.6% to 9.8%; P = 0.027) lower for each additional repetition on the arm-curl test; and 16.9% (95% CI: 2.7% to 33.1%; P = 0.018) higher for each additional second (worse performance) on the eight-feet up-and-go test.

Discussion

This is the first study assessing the relationship between field-based fitness tests and depressive symptoms in women with FM. Our results indicate that higher physical fitness is generally associated with less severe symptoms of depression. However, analyses on the different BDI-II subscales revealed that these associations were not completely consistent. The group of patients with the highest global fitness profile had 8.4% less severe depressive symptoms than the group with the lowest fitness. Upper-body flexibility (as measured with

<table>
<thead>
<tr>
<th>BDI-II Subscales</th>
<th>Mean</th>
<th>SD</th>
<th>Mean subscale score</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative attitude [0–30]a</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sadness</td>
<td>0.99</td>
<td>0.81</td>
<td>0.98a,b</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Pessimism</td>
<td>1.27</td>
<td>0.98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Past failure</td>
<td>0.90</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guilty feelings</td>
<td>0.88</td>
<td>0.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Punishment feelings</td>
<td>0.59</td>
<td>1.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-dislike</td>
<td>1.12</td>
<td>1.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-criticalness</td>
<td>1.09</td>
<td>0.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suicidal thoughts</td>
<td>0.46</td>
<td>0.64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crying</td>
<td>1.35</td>
<td>1.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worthlessness</td>
<td>1.17</td>
<td>0.97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance difficulty [0–18]b</td>
<td></td>
<td></td>
<td>1.30b,c</td>
<td></td>
</tr>
<tr>
<td>Loss of pleasure</td>
<td>1.28</td>
<td>0.82</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agitation</td>
<td>1.18</td>
<td>0.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of interest</td>
<td>1.19</td>
<td>0.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indecisiveness</td>
<td>1.46</td>
<td>0.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irritability</td>
<td>1.18</td>
<td>0.88</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concentration difficulty</td>
<td>1.55</td>
<td>0.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Somatic symptoms [0–15]c</td>
<td></td>
<td></td>
<td>1.72a,c</td>
<td></td>
</tr>
<tr>
<td>Loss of energy</td>
<td>1.83</td>
<td>0.72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changes in sleep</td>
<td>1.72</td>
<td>0.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changes in appetite</td>
<td>1.19</td>
<td>0.98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tiredness or fatigue</td>
<td>2.05</td>
<td>0.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of interest in sex</td>
<td>1.80</td>
<td>1.03</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD = standard deviation.
P values correspond to one-way analysis of variance (ANOVA) comparing the average BDI-II subscale scores. Common superscripts indicate significant differences (P < 0.05) between subscales with the same letter.

The physical fitness variables that were independently associated with the total BDI-II score are displayed in Table 5. Among all the fitness tests included in the stepwise procedure, only upper-body flexibility (as measured with the back-scratch test) was independently associated with depressive symptoms. Flexibility entered the model at the third position, after sleep quality (R² = 0.186) and antidepressants (R² = 0.064), explaining an additional 2.3% of the BDI-II variance. Age, pain, anticonvulsant consumption, and time since diagnosis were included thereafter and explained between 0.9% and 1.3% of additional variance.
the back-scratch test) was the only fitness component independently associated with depressive symptoms, although the explained variability was relatively low.

Most of the current literature on the relationship between physical fitness and depression focuses on either aerobic fitness or muscle strength [21,40]. Gerber et al. [41] reported that moderate or high cardiorespiratory fitness had protective effects against depressive symptoms in health care workers. A large epidemiological study in previously healthy women [21] revealed that women with moderate and high aerobic fitness (maximal metabolic equivalents, METs) had between 46% and 54% lower odds of incident depression, respectively, than those with low aerobic fitness. By contrast, we observed only a borderline significant association between the 6-minute walk distance and the total BDI-II score, and this association was inconsistent across BDI-II subscales. Furthermore, aerobic fitness was not associated with the odds of severe depressive symptoms. These controversial results might be partially explained by the fact that the 6-minute walk test is only a moderately valid and reliable estimate of aerobic fitness in FM [35], and further research using objective measures of aerobic fitness (e.g., maximal aerobic fitness) is needed to better understand the relationship between physical fitness and depression.
Oxygen uptake ($\text{VO}_{2\text{max}}$) is warranted to determine the consistency of these results. Previous studies observed improvements in depressive symptoms following exercise-based intervention programs, although Valim et al. revealed that the improvements observed in aerobic fitness were not related to improvements in depression [15]. Therefore, it could be speculated that exercise might have beneficial effects on depressive symptoms (e.g., through an increase of endorphins) without the need for enhancing aerobic capacity [15].

Summary evidence suggests that strength training reduces the level of depression in healthy adults [42] and in patients with FM [14,43]. Sener et al. [44] observed that handgrip strength modestly correlated ($p = -0.26$ to $-0.23$) with depressive symptoms (BDI total score) in women with FM, although confounding might have played a role in this relationship. Our results support a modest association between muscle strength (especially upper body) and depressive symptoms since the odds of severe depressive symptoms were 4.8% and 5.3% lower for each additional unit in the handgrip and arm-curl tests, respectively. However, it is unknown whether these represent clinically meaningful effects, and further research is needed.

To our knowledge, this is the first study reporting on the relationship between motor agility and depressive symptoms in women with FM. Motor agility was associated with both the total BDI-II score and the three subscales representing different aspects of depression (negative attitude, performance difficulty, and somatic elements). The odds of severe depressive symptoms was 16.9% higher for each additional second (worse performance) in the eight-feet up-and-go test. Although future longitudinal studies are needed, it could be speculated that low levels of motor agility (which relates to the ability to rapidly change the position of the entire body in space [34], requiring movement speed, balance, and motor coordination) could negatively impact self-perceived ability to undertake challenging tasks [45] and have a deleterious influence on self-esteem and signs of depression.

A different pattern was observed in the association between lower- and upper-body flexibility with depressive symptoms in this population, which is difficult to explain. Although lower-body flexibility showed no association with depressive symptoms, upper-body flexibility was the fitness component that presented the strongest association and the only one independently related to the total BDI-II score when all fitness tests were considered simultaneously. Although the direction of causality cannot be determined, it could be speculated that higher upper-body flexibility could enhance self-perceived ability to perform activities of daily living, improving psychosocial factors such as self-esteem [46] and social interaction [47], which are related to mental health and mood. However, it must be underlined that the contribution of flexibility, as well as of other important variables like age, pain intensity, anticonvulsant consumption, or time since diagnosis, as an explanation of the total BDI-II variability was relatively low.

Overall, the present findings point out that the relationship between fitness and depressive symptoms in women with FM is rather weak and contrast with

### Table 4

Odds ratio (OR) for severe depressive symptoms (versus no severe symptoms) as a function of different components of physical fitness in women with fibromyalgia

<table>
<thead>
<tr>
<th>Severe depressive symptoms</th>
<th>BDI-II ≥ 29</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR 95% CI</td>
<td>P</td>
</tr>
<tr>
<td>Chair-sit-reach, cm</td>
<td>0.990</td>
</tr>
<tr>
<td>Back-scratch, cm</td>
<td>0.963</td>
</tr>
<tr>
<td>Handgrip strength, kg</td>
<td>0.952</td>
</tr>
<tr>
<td>Chair-stand, rep</td>
<td>0.942</td>
</tr>
<tr>
<td>Arm-curl, rep</td>
<td>0.947</td>
</tr>
<tr>
<td>8-feet up-and-go, s</td>
<td>1.169</td>
</tr>
<tr>
<td>6-minute walk, m</td>
<td>0.997</td>
</tr>
</tbody>
</table>

CI = confidence interval.

Model was adjusted for age, body mass index, educational level, marital status and time since diagnosis, pain intensity and drugs (analgesics, antidepressants and anticonvulsants) consumption and sleep quality.

### Figure 1

Graphic representation of association between physical fitness (global fitness profile) and depressive symptoms in women with fibromyalgia. BDI-II = Beck depression inventory second edition. Analysis of covariance with Bonferroni’s correction for multiple comparisons was applied. Common superscripts indicate significant differences ($P < 0.05$) between the groups with the same letter.
previous findings in healthy adults [21]. Several potential explanations might justify our results. First, it is possible that the true relationship between fitness and depression in FM patients is rather weak or clinically irrelevant, and a high statistical power as a result of our relatively large sample size could have yielded non-important but statistically significant associations. Second, although the Senior Fitness Test battery and handgrip dynamometry are feasible, reliable, and very commonly used measures of physical fitness in FM patients [27,29,31,48], objective measures using the gold standards (e.g., VO2max for aerobic fitness, isokinetic dynamometry for muscle strength, goniometer-based measures for range of motion) might have provided more precise estimates of the relationship under study. Third, measures of activity and participation, rather than measures at the body level [49], could provide wider insights of important factors associated with depressive symptoms in FM patients. In addition, it is worth noting the potentially important role that measurement error of depressive symptoms in patients with chronic pain might have had in our results [50]. Following Pincus et al. [50], the clinical concept of depression comprises somatic symptoms, but these are not dominant among patients clinically diagnosed with major depression [51], and their usefulness in the assessment of depression in chronic pain patients might be confounded by criterion contamination [50]. Chronic pain patients may obtain a clinically significant score on most depression measures by endorsing items concerning changes in sleep, fatigue, or reduced activity, for example. In fact, these three items were the ones with the highest scores in this study. Although a factor structure of the BDI-II in FM patients is currently lacking in the literature, applying the one developed by Harris et al. [24] in patients with chronic pain to our sample revealed that women with FM scored higher on the somatic elements subscale than on any other subscale. Therefore, a lack of criterion validity on the measure of depressive symptoms (BDI-II) in the present study might have influenced the results.

Limitations

This study has limitations. The cross-sectional design precludes establishing causal relationships. We do not know whether the observed results in women apply to men, and future studies should analyze the association between physical fitness and depressive symptoms in men with FM. Finally, the Senior Fitness Test was validated for assessing fitness in healthy older adults [27] and not specifically in women with FM, which might have partially influenced the results. However, this battery has shown to be feasible and reliable in women with FM [31]. In addition, since FM patients have fitness levels similar to those of healthy older adults [30,52], it is very likely that this battery of tests is appropriate for assessing physical fitness in this population. At the same time, the relatively large sample size and our efforts to recruit a representative sample of women with FM from southern Spain [2] are strengths of the study.

Conclusion

The results of the present study indicate that higher physical fitness is generally associated with lower levels of depressive symptoms in women with FM. Upper-body flexibility (as measured using the back-scratch test) was the only fitness component independently associated with depressive symptoms. The observed associations were not completely consistent and differed from those previously observed in healthy adults. It is therefore plausible that exercise programs of low to moderate intensity are effective at improving depressive symptoms in this population without the need for enhancing physical fitness.

References


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