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Multiple-Site Pain in Fibromyalgia- A Confirmatory Factor Analysis

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Abstract

Fibromyalgia is a highly heterogeneous disorder occurring as widespread pain associated with general symptoms such as fatigue, depression, anxiety, insomnia, sexual dysfunction, and gastrointestinal conditions. This cross-sectional single tertiary medical center survey study aimed to investigate how multiple pain sites contribute to the construct of general pain in fibromyalgia. Altogether 266 women with fibromyalgia aged 18 to 60 years were included in the analysis. Confirmatory factor analysis of pain severity measured by a visual analogue scale (0 to 100 points) in seven major body regions. Headache, low back pain, and neck pain explained most of the total variance in general pain perceived across seven different body regions. Substantial correlations of 0.71, 0.68, and 0.61 were found between general pain and headache, low back pain, and neck pain, respectively. Pain reported for other four regions (chest, abdomen, upper extremity, and lower extremity) demonstrated fair correlations with general pain. When experiencing multi-site pain, women with fibromyalgia perceived headache, low back pain, and neck pain being subjectively more important than pain in other sites. While pain intensity and location commonly varies in fibromyalgia patients, it is important that one is aware of most common sites to be able to recognize fibromyalgia so that it can be managed properly.

Keywords: Fibromyalgia; Depression; Sexual dysfunction; Gastrointestinal conditions

Introduction

Fibromyalgia is a highly heterogeneous disorder occurring as widespread pain associated with fatigue, depression, anxiety, insomnia, sexual disfunction, and gastrointestinal conditions among other general symptoms [1-3]. Of all fibromyalgia symptoms, multi-site pain is the most characteristic one. It has been suggested that multi-site pain differs substantially by its origin and predictors from single-site pain. It has been proposed by several previous studies that multi-site pain, as well as its impact on functioning, can be better, or even solely, described by the number of sites involved instead of specific body pain sites [4-9]. In other words, according to previous knowledge, the absolute number of pain sites might be much more important than a particular pain distribution across different body regions. Previous studies have focused on evaluating the associations of pain sites' numbers and pain distributions with different scales and factors used mostly to describe patients' sociodemographic and health-related characteristics and the level of functioning [4-9]. However, the question remains - how patients themselves perceive the importance of pain experienced in different body regions? Does pain perceived in one particular region contribute as much to overall pain as pain in another site does? The answer may be of great interest when planning a treatment or developing new scales and surveys for patients with fibromyalgia and, probably, with other non-specific widespread pain conditions. The objective of the study was to investigate how different pain sites contribute to the construct of general pain in fibromyalgia.

Methods

Setting and participants

The participants were identified through a consecutive search on a hospital electronic patient record system between May 2007 and November 2015. The inclusion criteria were female gender, 18 to 60 years of age, and diagnosis 'M79' according the International Classification of Diseases, 10th Edition. The invitation to participate was sent to 1,042 patients. Of them, 286 patients agreed to participate in the study. They received a questionnaire with a prepaid return envelope. Pain severity was assessed in seven body sites (abdomen, chest, head, low back, neck, upper extremity, lower extremity) on a visual analogue scale 0 to 100. The questionnaire included data on sociodemographic and occupational characteristics, comorbidities, medication, sleep quality, mood, alcohol and tobacco consumption, and the treatments received in the previous three months.

Statistical Analysis

Estimating the model

The estimation procedure of Confirmatory Factor Analysis (CFA) employed the maximum likelihood method considering covariances supplied as input being unbiased. For simplicity, the estimates were reported in standardized form as correlation coefficients. A correlation =<0.2 was considered poor, from 0.21 to 0.4 fair, from 0.41 to 0.6 moderate, from 0.61 to 0.8 substantial, and >0.8 was considered perfect.

Testing the goodness of model fit

In order to assess how well the model matches the observed data, the root mean square error of approximation (RMSEA) was used as a main indicator. First, the model fit was tested assuming there were no covariances between unique factors (Table 1). After that, the modification indices suggested by the software were used to add covariance between factors (double-headed arrows in Figure 1) one at a time, each time testing the RMSEA closeness to the value of =<0.05, or, at least, =<0.08- the threshold for accepting the model fit. Every insertion was considered plausible if it made logical sense and did not violate the assumption that the common and the unique factors are uncorrelated. After achieving the RMSE value of =<0.05, no further covariances were imputed and the goodness of fit was assessed using a chi-square test. As the sample was relatively small considering the requirements of CFA, in an attempt to reduce dependence on sample size, the relative (or 'normed') chi-square test was used. Relative chi-square is a chi-square estimate divided by the degrees of freedom. The chi square value =<5.0 was considered an indication of a good fit. There was no missing data in the analysis.

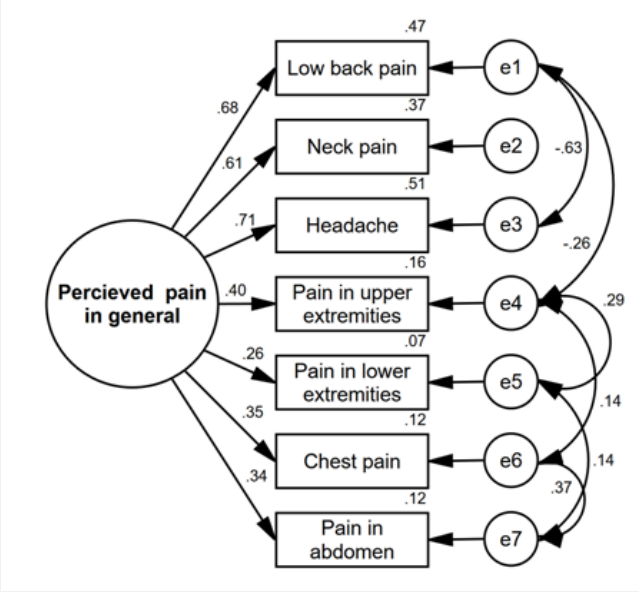

Figure 1: Confirmatory factor analysis. In the figure, circles represent unobserved and rectangles observed variables. 'e' variables represent a measurement error associated with the observed variable (variance that is not predicted by the latent factor). One-head arrows represent strength of correlation between two variables while two-head arrows strength of correlation between two covariant variables.

Table 1: Tests of the goodness of fit used.

Method	Value	90% CI		CMIN/DF
Goodness of fit index (GFI)	0.994			
Bentler-Bonett normed fit index (NFI)	0.959			
Bollen's relative fit index (RFI)	0.894			
Bollen's incremental fit index (IFI)	0.994			
Tucker-Lewis coefficient (TLI)	0.983			
Bentler's comparative fit index (CFI)	0.994			
Parsimony ratio (PRATIO)	0.381			
Parsimony adjustment to the NFI (PNFI)	0.365			
Parsimony adjustment to the CFI (PCFI)	0.379			
Akaike information criterion (AIC)	63.3			

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Browne-Cudeck criterion (BCC)	65.6			
Hoelter's 'critical N' for a significance level of .05 (HOELTER .05)	336			
Hoelter's 'critical N' for a significance level of .01 (HOELTER .01)	435			
Method	**Value**			
Noncentrality parameter (NCP)	1.341	0	12.242	
Minimum value of the discrepancy (FMIN)	0.046	0.007	0	
Root mean square error of approximation (RMSEA)	0.029	0	0.0.91	
Except for a constant scale factor (ECVI)	0.314	0.307	0.372	
Method	**Value**	**DF**	**p-value**	
Minimized value of the discrepancy function (CMIN)	9.341	8	0.314	1.168

All the analyses were conducted using IBM® SPSS® Statistics for Windows, Version 22.0, IBM Corp. Released 2013, Armonk, NY:USA IBM® Corp.; IBM® SPSS® Amos™, Version 23.0, IBM® Corp. Released 2013, PA:USA IBM® Corp.; and Stata/IC Statistical Software: Release 14. College Station (StataCorp LP, TX, USA).

Results

Of the 286 women, 266 returned the survey (response rate 93%). The participants' average age was 47.2 (SD 10.8, range 19 to 61) years. The patients were slightly overweighed with body mass index on average 29.0 (SD 6.5, range 17.8 to 60.2) kg/cm^2. They reported a mean pain severity (summarized average for all body regions) of 40.1 (SD 15.7, range 4.8 to 82.1) points on a visual analogue scale. Detailed patients' sociodemographic, occupational and clinical characteristics are described in detail in Table 2. The confirmatory factor analysis model was built based on one latent factor - perceived general pain. Using modification indices suggested by the software, covariances were imputed resulting in the RMSEA declined to 0.029 (90% CI 0.0 to 0.91) showing an acceptable fit. At this point, the relative Chi square value was 1.17 (below the cut-off point of 5.0) with 8 degrees of freedom. In other words, the model presented in Figure 1 demonstrated a good ability to describe the data observed in the study sample. Of the pain experienced in seven body areas, headache, low back pain, and neck pain explained most of the total variance within the common latent variable-general multi-site pain-demonstrating substantial correlations of 0.71, 0.68, and 0.61, respectively. Pain reported for other body regions demonstrated only fair correlations.

Table 2: Participants' sociodemographic, occupational and clinical characteristics.

Characteristic	N = 266
Patient-Reported Comorbidities, n (%)	
Musculoskeletal	132 (49.6)
Respiratory disease	75 (28.2)
Neurological	66 (24.8)
Heart or circulatory disease	62 (23.3)
Mental disease	44 (16.5)
Thyroid	44 (16.5)
Allergy or hypersensitivity	30 (11.3)
Diabetes	21 (7.9)
Cancer disease	7 (2.6)
Other	151 (56.8)
Previous Operations, N (%)	
Musculoskeletal	76 (28.6)
Gastrointestinal	66 (24.8)
Urinary tract or reproductive organs	48 (18.1)
Other	168 (63.2)
Smokers, n (%)	114 (42.9)
Cigarettes per day, mean (SD)	9.1 (5.7)
Alcohol consumption, n (%)	111 (41.7)

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Times per week, mean (SD)	1.4 (1.1)
Units of alcohol per time, mean (SD)	2.7 (1.8)
Income Source	
Working	111 (41.7)
Unemployment benefit	48 (18.0)
Pension	36 (13.5)
Sickness benefit	15 (5.6)
Student benefit	12 (4.5)
Partial pension	11 (4.1)
Maternal/parental leave	5 (6.4)
Alternation leave	2 (0.8)
Other	17 (6.4)
Treatment Visits in Previous 3 Months, Mean (SD)	
Doctor	1.2 (1.7)
Physiotherapist	1.0 (2.6)
Massage therapist	0.7 (1.8)
Naprapath	0.0 (0.4)
Osteopath	0.3 (0.3)
Chiropractor	0.3 (0.2)
Other	0.5 (2.5)
Therapies in Previous 3 Months, Mean (SD)	
Stretch	1.1 (8.2)
Electric	0.0 (0.4)
Warmth	0.3 (0.3)
Manipulations	0.1 (0.8)
Cortisone injection	0.1 (0.4)
Cold	0.7 (6.3)
Acupuncture	0.3 (1.2)
Massage	0.8 (2.0)
Depression scale (DEPS), mean (SD)	11.3 (7.0)
DEPS score>12 points, n (%)	92 (34.6)
Mood during the previous week, VAS (0-100)*	30.44 (22.5)
Sleep quality during the previous week, VAS (0-100)*	33.7 (26.1)
Pain medication, tablets during the previous week, n (%)	13.8 (15.7)

N: Number of; SD: Standard Deviation; VAS: Visual Analogue Scale 0-100, from best possible to worst imaginable.

Discussion

This survey study evaluated the importance of different pain sites in perception of general pain experienced by 266 women with fibromyalgia. The patients perceived headache, low back pain, or neck pain more important than pain in other sites when experiencing widespread multi-site pain. The weaknesses of the study are its retrospective design and relatively small (for the purpose of confirmatory factor analysis) sample. The sample was limited to women only. Taking into account the modest size of the sample, the age range was probably too broad to generalize the construct structure of general pain across all age groups. However, this was the first study focusing on differences in importance of pain feelings in different body sites when there is widespread multi-site pain. The study employed the reliable method of confirmatory factor analysis and the size of sample was proved to be large enough to achieve good model fit and statistically significant results.

In Finnish population, 14% of women are smoker [10]. In the present study, the rate of smokers was notably higher. Furthermore, in Finland, prevalence of depressive disorders

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in women is estimated at 10.0% and 4.3% of all cases are chronic [11]. In the present data 16.5% reported having a mental disorder and 34.6% of patients had a DEPS shore higher than 12 points indicating that those patients had at least 50% possibility for depression. Widespread pain risk factors have been described to be female sex, older age and at least two distressing somatic symptoms [4]. Furthermore, widespread pain can cause sickness absence more frequently than fewer pain sites [6,7]. Counting the pain sites has proposed to have value in management of fibromyalgia as it could give insight of the patients' general pain condition [4,5]. The present study suggests that not only the number of pain sites would be of importance in the management of patients with general pain but also how patients perceive pain in different body regions. There seems to be a hierarchy how different body regions contribute to general pain. Future prospects could include studies investigating the importance of pain location with risk factors, sickness absence and management of fibromyalgia.

Fibromyalgia is considered to be hereditary incurable pain syndrome. However, aerobic and therapeutic muscle strengthening and stretching exercises have shown to be effective way of reducing pain and sleep disturbance and increasing health-related quality of life [12,13]. Combining therapeutic massage with exercise seems to have an additional effect in improving pain, fatigue, sleep problems and depressive symptoms [14,15]. Drugs may be useful complement of an active rehabilitation program [16]. Also quitting smoking is an important part of treatment [17]. In conclusion, when experiencing multi-site pain, women with fibromyalgia perceived headache, low back pain, and neck pain being subjectively more important than pain in other sites. Patients often visit doctors and therapists complaining of pain only in these places. However, pain intensity and location commonly varies in fibromyalgia patients and thus it is important that doctors and therapists are aware of most common sites to be able to recognize fibromyalgia so that it can be managed properly.

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