Pain extent is associated with pain intensity but not with widespread pressure or thermal pain sensitivity in women with fibromyalgia syndrome

Barbero, Marco; Fernández-de-Las-Peñas, César; Palacios-Ceña, María; Cescon, Corrado; Falla, Deborah

DOI:

[10.1007/s10067-017-3557-1](https://doi.org/10.1007/s10067-017-3557-1)

Document Version

Peer reviewed version

Citation for published version (Harvard):

Barbero, M, Fernández-de-Las-Peñas, C, Palacios-Ceña, M, Cescon, C & Falla, D 2017, 'Pain extent is associated with pain intensity but not with widespread pressure or thermal pain sensitivity in women with fibromyalgia syndrome', *Clinical Rheumatology*. <https://doi.org/10.1007/s10067-017-3557-1>

[Link to publication on Research at Birmingham portal](#)

Publisher Rights Statement:

Checked for eligibility: 20/02/2017.

The final publication is available at Springer via <http://link.springer.com/article/10.1007%2Fs10067-017-3557-1>

Barbero, Marco, et al. "Pain extent is associated with pain intensity but not with widespread pressure or thermal pain sensitivity in women with fibromyalgia syndrome." *Clinical Rheumatology* (2017): 1-6.

General rights

Unless a licence is specified above, all rights (including copyright and moral rights) in this document are retained by the authors and/or the copyright holders. The express permission of the copyright holder must be obtained for any use of this material other than for purposes permitted by law.

- Users may freely distribute the URL that is used to identify this publication.
- Users may download and/or print one copy of the publication from the University of Birmingham research portal for the purpose of private study or non-commercial research.
- User may use extracts from the document in line with the concept of 'fair dealing' under the Copyright, Designs and Patents Act 1988 (?)
- Users may not further distribute the material nor use it for the purposes of commercial gain.

Where a licence is displayed above, please note the terms and conditions of the licence govern your use of this document.

When citing, please reference the published version.

Take down policy

While the University of Birmingham exercises care and attention in making items available there are rare occasions when an item has been uploaded in error or has been deemed to be commercially or otherwise sensitive.

If you believe that this is the case for this document, please contact UBIRA@lists.bham.ac.uk providing details and we will remove access to the work immediately and investigate.

Title Page

Pain Extent is Associated With Pain intensity but not With Widespread Pressure or Thermal Pain Sensitivity in Women With Fibromyalgia Syndrome

Authors

Marco Barbero¹; César Fernández-de-las-Peñas^{2,3}; María Palacios-Ceña^{2,3}; Corrado Cescon¹; Deborah Falla⁴

Affiliations

¹ Rehabilitation Research Laboratory 2rLab, Department of Business Economics, Health and Social Care, University of Applied Sciences and Arts of Southern Switzerland, Manno, Switzerland

² Department of Physical Therapy, Occupational Therapy, Physical Medicine and Rehabilitation, Universidad Rey Juan Carlos, Alcorcón, Spain.

³ Cátedra de Investigación y Docencia en Fisioterapia: Terapia Manual y Punción Seca, Universidad Rey Juan Carlos, Alcorcón, Madrid, Spain.

⁴ Centre of Precision Rehabilitation for Spinal Pain (CPR Spine), School of Sport, Exercise and Rehabilitation Sciences, College of Life and Environmental Sciences, University of Birmingham, Birmingham, United Kingdom

Corresponding / reprint requests author:

César Fernández de las Peñas

Facultad de Ciencias de la Salud

Universidad Rey Juan Carlos

Avenida de Atenas s/n

28922 Alcorcón, Madrid, SPAIN

Email: cesarfdlp@yahoo.es / cesar.fernandez@urjc.es

Category article: Brief Report

Short title: Pain extent areas in fibromyalgia syndrome

Key words: fibromyalgia, pain extent, pressure pain, sensitization

33 Abstract

34

35 **Introduction/Objective:** Widespread pain is considered a sign of central sensitization in people
36 with chronic pain. Our aim was to examine whether pain extent, assessed from the pain drawing,
37 relates to measures from quantitative sensory testing in fibromyalgia syndrome (FMS). **Methods:**
38 Thirty women with FMS and no other co-morbid conditions completed pain drawings (dorsal and
39 ventral view) and clinical and related-disability questionnaires. Pain extent and pain frequency
40 maps were obtained from the pain drawings using a novel customized software. Pressure pain
41 thresholds were assessed over the 18 tender points considered by the 1990 American College of
42 Rheumatology criteria for FMS diagnosis and over two additional standardized points. Heat and
43 cold pain thresholds were also assessed on the dorsal aspect of the neck, the dorsal aspect of the
44 wrist, and the tibialis anterior. Spearman's correlation coefficients were used to assess the
45 relationship between pain extent and quantitative sensory testing outcomes as well as clinical
46 symptoms. **Results:** Larger extent of pain was associated with a higher pain intensity (dorsal area:
47 $r_s=0.461$, $P=0.010$; total area: $r_s=0.593$, $P=0.001$), younger age (ventral area: $r_s=-0.544$, $P=0.002$;
48 total area: $r_s=-0.409$, $P=0.025$), shorter history of pain (ventral area: $r_s=-0.367$, $P=0.046$), and higher
49 cold pain thresholds over the tibialis anterior muscle ($r_s=-0.406$, $P=0.001$). No significant
50 association was observed between pain extent and the remaining outcomes. **Conclusions:** Pain
51 drawings constitute an easy and accurate approach to quantify widespread pain. Larger pain extent
52 is associated with pain intensity but not with signs of central sensitization in women with FMS.

53

54 **Key words:** fibromyalgia, pain extent, pressure pain, sensitization

55

Pain Extent is Associated With Pain intensity but not With Widespread Pressure or Thermal Pain Sensitivity in Women With Fibromyalgia Syndrome

Introduction

Fibromyalgia syndrome (FMS) is a disabling condition including widespread pain and fatigue, in addition to cognitive, physical and sleep disturbances. The mean worldwide prevalence of FMS is estimated at ~2.7% although it varies depending on the diagnostic criteria applied [1]. Although the etiology of FMS is debated, it is accepted that people with this condition exhibit hyper-excitability of the central nervous system [2].

Pain drawings are used to obtain an illustration of pain location and distribution in people with pain [3]. Several instruments are used to record the pain location and the most common method involves asking the patients to draw where they feel pain on a paper body chart [3,4]. The location of symptoms is heterogeneous in FMS since most patients report that localized pain was present before widespread pain. Some studies have shown through pain drawings that the widespread pain in FMS is formed by multiple regional painful areas and that the intensity of pain is associated with the number of painful body areas [5] and ratings of local pain [6]. Larger pain areas are thought to represent a clinical sign of central sensitization [7]. There is some evidence showing that enlarged pain areas are associated with more persistent and severe pain [8] and higher pressure sensitivity [9] in knee osteoarthritis suggesting that quantification of pain extent can assist clinicians to identify subjects with sensitization. Further, widespread pain was associated with self-perceived disability, depression and self-efficacy in chronic whiplash [10].

No previous study has investigated if larger pain extent is associated with central sensitization in FMS. Therefore, our aim was to examine whether pain extent relates to clinical variables, health status and quantitative sensory test measures in women with FMS.

81 **Methods**

82 **Participants**

83 Women diagnosed with FMS following the American College of Rheumatology (1990/2010)
84 criteria participated. Since a combination of both ACR 1990 and 2010 criteria is recommended
85 [11], patients were required to fulfill the 2010 ACR Criteria and also needed to present with 11/18
86 tender points according to the 1990 ACR Criteria [11]. They were excluded if they presented with:
87 1, co-morbid medical conditions; 2, endocrine disorders; 3, malignancy; 4, psychiatric illnesses; 5,
88 medication drug usage other than analgesics or antidepressants; 6, previous history of surgery or
89 whiplash injury. They were asked to avoid any analgesic or muscle relaxant 24 hours prior to the
90 examination. No change was made to their prophylactic drug treatment. The study was approved by
91 local Ethics Committee of Universidad Rey Juan Carlos (URJC 08-30-2014). All patients provided
92 informed written consent prior to their inclusion.

93 **Self-reported data**

94 An 11-point numerical point rating scale (NPRS; 0: no pain; 10: maximum pain) was used
95 to determine the current, the worst, and the lowest level of pain experienced the preceding week
96 [12]. The Spanish version of the Fibromyalgia Impact Questionnaire (FIQ) was used to determine
97 related-disability [13]. Higher scores of the questionnaire indicate more negative impact.

98 **Pain drawing**

99 Participants were instructed to complete a pain drawing by shading, with a pencil, the
100 perceived extent and location of their symptoms on two paper body charts (ventral and dorsal body
101 views). All paper pain drawings were scanned to digital format. The scanned images were manually
102 aligned to a standardized digital body chart and the pain drawings were copied manually by two
103 trained operators using an image analysis software (Inkscape V.0.48.5) [14]. Pain extent, reported
104 as the total number of pixels within the digital encircled pain drawings and inside the body chart,
105 was computed for each digitalized chart [15,16]. Pain extent was expressed as percentage of the

total body chart area (ventral: 21577 pixels, dorsal: 145675 pixels, total: 291978 pixels). Pain frequency maps were obtained by superimposing the pain drawings from all participants to illustrate the most frequently reported location of pain across the sample. A color grid was used to indicate the percentage of people that reported pain in a specific area.

Quantitative Sensory Testing (QST)

Pressure pain thresholds (PPT) were assessed with an electronic algometer (Somedic AB©, Farsta, Sweden). Patients were instructed to press the “stop-button” as soon as the pressure turned to pain. The mean of three trials on each point was used in the analysis. A 30sec resting period was allowed between trials. The reliability of algometry is high in patients with muscle pain [17]. PPT was measured bilaterally over the 18 tender point areas considered for FMS diagnosis and over the second metacarpal and tibialis anterior muscle in a random order.

Thermal pain thresholds over the dorsal aspect of the neck, the dorsal aspect of the wrist and the tibialis anterior muscle were tested with a Thermotest System (Somedic AB©, Farsta, Sweden). Patients were instructed to press a hand-controlled switch when the sensation change from heat/cold to heat pain/cold pain (heat or cold pain thresholds, HPT/CPT). The mean of 3 trials for each region was used for the analysis. A rest of 5 s was provided between trials.

Sample size calculation

Sample size calculation was based on detecting significant moderate correlations ($r=0.6$) between the variables with an alpha level (α) of 0.05 and a desired power (β) of 95%. This generated a sample size of at least 25 subjects.

Statistical analysis

Distribution of the data was tested with the Shapiro-Wilk test and non-normally distributed data were observed. Since no side-to-side differences in PPTs, HPTs or CPTs were found, the mean of both sides was used in the analysis. Spearman’s correlation coefficients were computed to reveal associations between pain extent with tender point count, pain intensities, related-disability, PPTs, HPTs and CPTs. Correlations were considered weak when $r<0.3$; moderate when $0.3<r<0.7$, and

133 strong when $r > 0.7$. Statistical analyses were performed using SPSS 22 (SPSS Inc, Chicago, IL,
134 USA). The significance level was set at $P < 0.05$.

135

136 **Results**

137 **Demographic and clinical data of the patients**

138 Thirty women with FMS (age: 49.5 ± 8.1 years) were included. **Table 1** summarizes all data of the
139 sample. The pain extent was $16.2\% \pm 3.4\%$, $13.3\% \pm 4.6\%$ in the ventral and $19.3\% \pm 6.5\%$ in the
140 dorsal body areas. Pain frequency maps are illustrated in **Figure 1**, whereas correlations between
141 pain extent, clinical symptoms and measures of central sensitization are reported in **Table 1**.

142 **Pain extent and clinical symptoms**

143 Significant negative correlations were observed between pain extent and age (ventral area: $r_s = -$
144 $.0544$, $P = 0.002$; total area: $r_s = -0.409$, $P = 0.025$) and pain duration (ventral area: $r_s = -0.367$, $P = 0.046$):
145 larger pain extent was associated with younger age and shorter history of symptoms. Pain extent
146 was positively correlated with the worst level of pain (dorsal area: $r_s = 0.461$, $P = 0.010$; total area:
147 $r_s = 0.593$, $P = 0.001$): the larger pain extent, the higher pain intensity. **Figure 2** illustrates the scatter
148 plots showing the association between pain extent and the worst level of pain. No other association
149 was found between pain extent and clinical features, including tender point count or disability.

150 **Pain extent and measures of central sensitization**

151 No significant associations were observed between pain extent and widespread PPT or HPT.
152 Pain extent measured from the ventral body chart showed a significant negative correlation with
153 CPT over the tibialis anterior muscle ($r_s = -0.406$, $P = 0.001$): the larger the pain extent, the lower the
154 CPT.

155

156 **Discussion**

157 Pain extent was positively associated with the worst level of pain and negatively associated
158 with age and years with pain in women with FMS: a larger distribution of pain correlated with
159 higher intensity of their worst pain, younger age, or shorter history of pain. Pain extent was not
160 associated with tender point count, pressure and thermal pain sensitivity (except CPT over the
161 tibialis anterior) in this sample of women with FMS.

162 Although it is accepted that individuals with FMS exhibit widespread pain, the evaluation
163 and the quantification of pain drawings in FMS is scarce. Pain frequency maps reported in our study
164 indicate a widespread pain pattern in our sample of women with FMS. In fact, the pain extent
165 values observed in our sample of FMS women were higher than those areas reported in woman with
166 whiplash associated disorders [10]. Further, the pain frequency maps also showed that FMS patients
167 reported pain in neck, shoulder, low back, elbow, or knee areas supporting previous assumptions
168 that the overall widespread pattern suffered by people with FMS is the sum of multiple regional
169 pain areas [5,6]. This hypothesis is supported by current ACR2010 preliminary diagnostic criteria
170 where patients are required to report painful regions rather than widespread pain [18]. Nevertheless,
171 although widespread pain is no longer required for FMS diagnosis according to the ACR2010
172 diagnostic criteria, most patients (94%) suffered from widespread pain [18]. Therefore, it seems that
173 the symptoms experienced by women with FMS are widespread, but localized in particular areas.
174 Our study is the first to reveal that pain frequency maps show an overlap between the locations of
175 the most frequent pain areas and tender point locations originally proposed and included in 1990
176 classification criteria for FMS.

177 Pain extent was associated with younger age and shorter history of pain symptoms. Patient-
178 reported improvements have been also previously correlated with younger age and shorter duration
179 of FMS symptoms at diagnosis [19]. The reduction of pain extent could reflect a natural evolution
180 of FMS where the pain is perceived more widespread during the first years and with time pain tends

181 to become more localized. This hypothesis agrees with long-term studies suggesting that a portion
182 of patients with FMS usually experience improvement in symptoms with time [20,21].

183 In our study, pain extent was positively associated with the worst pain intensity experienced
184 suggesting that clinical pain is associated with more widespread pain. These results agree with those
185 previously observed in people with knee osteoarthritis where larger pain areas were associated with
186 greater severity of pain [8,9]. The association between pain intensity and pain extent would provide
187 indirect evidence for the role of peripheral input in FMS as previously suggested [5]. Persistent and
188 long-lasting activity from peripheral nociceptive afferents can result in central sensitization that can
189 exacerbate the magnitude of the overall widespread pain [5].

190 Pain extent was not associated with pressure or thermal pain sensitivity in our sample of
191 women with FMS. We only found that more widespread pain was associated with cold hyperalgesia
192 over the tibialis anterior muscle. Cold pain sensitivity has been previously reported in FMS [22].
193 Cold hyperalgesia is considered a feature of neuropathic pain as result of peripheral nerve injury
194 and there is evidence suggesting the concept of impaired small fibre function pointing towards a
195 neuropathic nature of the pain in FMS [23]. One possible explanation for our findings may link
196 widespread pain, younger age and shorter history of pain combined with a lower neuropathic
197 involvement.

198 We explored, for the first time, the utility of the pain drawing to extract pain extent scores
199 in FMS. The software used to compute pain extent eliminates estimation errors; nevertheless, there
200 are some methodological issues that should be considered. First, we collected data from a sample of
201 30 women, which may be considered a small sample. Second, although the assessment method has
202 shown high reliability [15,16], information on the reliability of pain drawings specifically in FMS
203 are not available. Third, we collected static outcomes of sensitization. We do not know if pain
204 extent would be associated with dynamic outcomes such as wind-up, spatial/temporal summation,
205 or conditioned pain modulation. Finally, we did not investigate the presence of psychological
206 features that can be associated with higher pain extent [10] or abnormal pain drawings in

207 individuals with chronic pain [24]. Nevertheless, a recent review did not support the assumption
208 that unusual pain drawings predict the presence of a disturbed psychological state [25].

209

210 **Conclusions**

211 This study showed that an expanded distribution of pain area was correlated with greater
212 pain intensity, younger age, shorter history of symptoms and cold hyperalgesia detected over the
213 tibialis anterior muscle in women with FMS. Pain extent was not associated with tender point count,
214 pressure or heat hypersensitivity. Pain drawings may constitute an easy and accurate approach for
215 quantification of widespread pain although their ability to identify central sensitization in FMS is
216 questionable.

217

218 **Disclosures**

219 M Barbero, C Fernández-de-las-Peñas, M Palacios-Ceña, C Cescon and D Falla, authors of
220 this manuscript, have no conflict of interest to declare.

221

222

223

Legend of Figures

224 **Figure 1:** Pain frequency maps generated by superimposing the pain drawings of all women with
225 fibromyalgia syndrome (n=30). The colour bar represents the frequency of coloured areas. Dark red
226 indicates the most frequently reported area of pain

227 **Figure 2:** Scatter plots of correlations between the total (A) and dorsal (B) are of pain extent with
228 the worst pain experienced the preceding week (NPRS, 0-10) in women with fibromyalgia
229 syndrome (n=30). Note that several points are overlapping. A positive linear regression line is fitted
230 to the data.

231

232 **References**

- 233 1. Jones GT, Atzeni F, Beasley M, Flüß E, Sarzi-Puttini P, Macfarlane GJ (2015) The
234 prevalence of fibromyalgia in the general population: a comparison of the American College
235 of Rheumatology 1990, 2010 and modified 2010 classification criteria. *Arthritis Rheum* 67:
236 568-575.
- 237 2. Cagnie B, Coppieter I, Denecker S, Six J, Danneels L, Meeus M (2014) Central sensitization
238 in fiabromyalgia? A systematic review on structural and functional brain MRI. *Semin*
239 *Arthritis Rheum* 44: 68-75.
- 240 3. McBeth J, Macfarlane GJ, Benjamin S, Silman AJ (2001) Features of somatization predict
241 the onset of chronic widespread pain: results of a large population-based study. *Arthritis*
242 *Rheum* 44: 940-6.
- 243 4. Hüllemann P, Keller T, Kabelitz M, Freynhagen R, Tölle T, Baron R (2016) Pain drawings
244 improve subgrouping of low back pain patients. *Pain Pract.* doi: 10.1111/papr.12470.
- 245 5. Staud R, Price DD, Robinson ME, Vierck CJ (2004) Body pain area and pain-related
246 negative affect predict clinical pain intensity in patients with fibromyalgia. *J Pain* 5: 338-43.
- 247 6. Staud R, Vierck CJ, Robinson ME, Price DD (2006) Overall fibromyalgia pain is predicted
248 by ratings of local pain and pain related negative affect: possible role of peripheral tissues.
249 *Rheumatology* 45: 1409-15.
- 250 7. Graven-Nielsen T, Arendt-Nielsen L (2010) Assessment of mechanisms in localized and
251 widespread musculoskeletal pain. *Nat Rev Rheumatol* 6: 599-606.
- 252 8. Wood L, Peat G, Thomas E, Duncan R (2007) Knee osteoarthritis in community-dwelling
253 older adults: are there characteristic patterns of pain location? *Osteoarthritis Cartilage* 15:
254 615-23.

255

256

9. Lluch Gírbés E, Dueñas L, Barbero M, Falla D, Baert IA, Meeus M, Sánchez-Frutos J, Aguilera L, Nijs J (2016) Expanded distribution of pain as a sign of central sensitization in individuals with symptomatic knee osteoarthritis. *Phys Ther* 96: 1196-207.
10. Falla D, Peolsson A, Peterson G, Ludvigsson ML, Soldini E, Schneebeli A et al (2016) Perceived pain extent is associated with disability, depression and self-efficacy in individuals with whiplash-associated disorders. *Eur J Pain* 20: 1490-501.
11. Segura-Jiménez V, Aparicio VA, Álvarez-Gallardo IC, Soriano-Maldonado A, Estévez-López F, Delgado-Fernández M et al (2014) Validation of the modified 2010 American College of Rheumatology diagnostic criteria for fibromyalgia in a Spanish population. *Rheumatology* 53: 1803-11.
12. Jensen MP, Turbner JA, Romano JM, Fisher L (1999). Comparative reliability and validity of chronic pain intensity measures. *Pain* 83: 157-162.
13. Esteve-Vives J, Rivera-Redondo J, Salvat-Salvat I, Gracia-Blanco M, Alegre-Miguel C (2007) Propuesta de una versión de consenso del Fibromyalgia Impact Questionnaire (FIQ) para la población española. *Reumatol Clin* 3: 21-4.
14. Dos Reis FJ, de Barros E Silva V, de Lucena RN, Mendes Cardoso BA, Nogueira LC (2016) Measuring the pain area: An intra- and inter-rater reliability study using image analysis software *Pain Pract* 16: 24-30
15. Barbero M, Moresi F, Leoni D, Gatti R, Egloff M, Falla D (2015) Test-retest reliability of pain extent and pain location using a novel method for pain drawing analysis. *Eur J Pain* 19: 1129-38.
16. Leoni D, Falla D, Heitz C, Capra G, Clijsen R, Egloff M et al (2016) Test-retest reliability in reporting the pain induced by a pain provocation test: Further validation of a novel approach for pain drawing acquisition and analysis. *Pain Pract*. doi: 10.1111/papr.12429.

17. Park G, Kim CW, Park SB, Kim MJ, Jang SH (2011) Reliability and usefulness of the pressure pain threshold measurement in patients with myofascial pain. *Ann Rehabil Med* 35:412-7.
18. Wolfe F, Egloff N, Häuser W (2016) Widespread pain and low widespread pain index scores among Fibromyalgia-positive cases assessed with the 2010/2011 Fibromyalgia criteria. *J Rheumatol* 43: 1743-8
19. Kennedy M, Felson D (1996) A prospective long-term study of fibromyalgia syndrome. *Arthritis Rheum* 39: 682-685.
20. Wallit B, Fitzcharles MA, Hassett AL, Katz RS, Hauser W, Wolfe F (2011) The longitudinal outcome of fibromyalgia: a study of 1555 patients. *J Rheumatol* 38: 2238-2246.
21. Adams EH, McElroy HJ, Udall M, Masters ET, Mann RM, Schaefer CP et al (2016) Progression of fibromyalgia: results from a 2-year observational fibromyalgia and chronic pain study in the US. *J Pain Res* 9: 325-36.
22. Potvin S, Marchand S (2016) Pain facilitation and pain inhibition during conditioned pain modulation in in fibromyalgia and in healthy controls. *Pain* 157: 1704-10.
23. Üçeyler N, Zeller D, Kahn AK, Kewenig S, Kittel-Schneider S, Schmid A et al (2013) Small fibre pathology in patients with fibromyalgia syndrome. *Brain* 136: 1857-67.
24. Abbott JH, Foster M, Hamilton L, Ravenwood M, Tan N (2015) Validity of pain drawings for predicting psychological status outcome in patients with recurrent or chronic low back pain. *J Man Manip Ther* 23: 12-9.
25. Bertozzi L, Rosso A, Romeo A, Villafañe JH, Guccione AA, Pillastrini P, Vanti C (2015) The accuracy of pain drawing in identifying psychological distress in low back pain- systematic review and meta-analysis of diagnostic studies. *J Phys Ther Sci* 27: 3319-24.

Table 1: Spearman's correlation coefficients between the pain extent, computed from pain drawings and quantitative sensory testing outcomes and clinical symptoms for women with fibromyalgia syndrome (n=30).

		Median (IQR)	Correlation with Pain extent (r_s)		
			Ventral	Dorsal	Total
	Age (years)	52 (12)	-.544**	.035	-.409*
	Pain duration (years)	8 (4.5)	-.367*	.336	-.017
	FIQ (0-100)	58.3 (13.5)	.262	-.147	.060
	Tender point count (0-18)	16 (4.25)	.031	.007	.016
NPRS (0-10)	Mean pain intensity	6 (2.0)	.110	.198	.272
	Worst level of pain	9 (1.0)	.212	.461*	.593**
	Lowest level of pain	4 (1.5)	-.008	.324	.215
PPT (kPa)	Suboccipital area	192 (53.5)	.056	-.196	-.118
	Mastoid process	205 (42.5)	-.005	-.197	-.218
	Trapezius muscle	185 (39)	-.159	.103	-.019
	Levator scapulae muscle	244 (50.2)	.127	-.151	-.065
	Posterior iliac crest	280 (64.5)	-.091	-.116	-.214
	Greater trochanter	275.5 (78.5)	-.040	.009	-.098
	Sternocostoclavicular joint	181.5 (46.7)	.055	-.036	-.38
	Wrist extensor muscles	225.5 (49.7)	.217	-.066	.053
	Knee (internal part)	205.5 (22.7)	-.168	-.040	-.233
	Second metacarpal	254.5 (55)	.082	.013	.044
	Tibialis anterior muscle	290.5 (57.7)	-.084	-.169	-.190
HPT (°C)	Cervical Spine	38.7 (2)	.190	-.192	.006
	Dorsal aspect of wrist	39.2 (2.3)	.206	.021	.124
	Tibialis anterior	40.4 (2.1)	.244	.047	.258
CPT (°C)	Cervical Spine	24.5 (5.1)	-.199	.153	-.006
	Dorsal aspect of wrist	23.9 (4.6)	-.360	.095	-.215
	Tibialis anterior	24.5 (4.5)	-.406*	.226	-.147

NPRS: Numerical Pain Rating Scale; FIQ: Fibromyalgia Impact Questionnaire;
PPT: Pressure Pain Threshold; CPT: Cold Pain Threshold; HPT: Heat Pain Threshold
IQR: Inter Quartile Range; r_s : Spearman's rho

* Significant at the 0.05 level (2-tailed)

** Significant at the 0.001 level (2-tailed)