Comparison of experimental pain and functional impact in individuals with single- and multi-site OA

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Osteoarthritis (OA) is a painful and disabling disease that can involve a single joint or progress to multiple joints. We have limited understanding whether individuals with multi-site OA exhibit altered pain processing and psychosocial function compared to those with single-site OA. Here, we perform a secondary data analysis to test the hypothesis that individuals with multi-site OA have significantly higher experimental pain and functional impact than individuals with single-site OA or no OA.

Individuals between 45 and 85 years of age underwent quantitative sensory testing (QST) and answered clinical questionnaires. Four cohorts were formed: individuals with only CMC pain (n=36), individuals with only knee pain (n=74), individuals with CMC + knee pain (n=87), and pain-free individuals (n=73). ANCOVAS were performed to identify significant differences in experimental pain and psychological variables across cohorts.

The CMC + knee pain cohort had significantly higher heat induced pain during temporal summation (*forearm at 44°C, $p=0.01$*) in comparison to all other cohorts. This trend was observed across temperatures. The CMC + knee pain cohort also had significantly lower pressure pain thresholds (*$p\leq0.01$*) compared to the CMC pain cohort but were not different from the knee pain cohort. Lastly, the CMC + knee pain cohort had the highest self-reported pain (*$p<0.01$*), disability (*$p<0.01$*), and emotional distress (*$p\leq0.03$)* compared to individuals with only CMC or only knee pain.

These results suggest knee OA compounded with CMC OA considerably increases disease impact and poor quality of life in comparison to single-joint OA. The results also support a relationship between the number of painful joints and enhanced widespread sensitivity. This study highlights the importance of measuring pain at sites other than the primary OA location. Enhancing our knowledge of symptoms and function across multiple joints could contribute to more targeted treatment and prevention of OA progression.

Table 1. Results of quantitative sensory testing, clinical pain, and function by location of primary pain cohorts. Estimated marginal means for the fully adjusted model with standard error are shown.

Estimated Marginal Means (SE)	**CMC Pain**	**Knee Pain**	**CMC + Knee Pain**	**No Pain**	**P-value Adjusted**
Quantitative Sensory Testing					
Pressure Pain Threshold, kPa					
Knee					
Medial	324.9 ± 26.5	233.9 ± 18.1	261.9 ± 17.3	324.5 ± 18.1	0.001[a,b,e,f]
Lateral	354. ± 7 26.7	271.9 ± 18.4	258.2 ± 17.3	256.6 ± 18.3	0.001[a,b,e,f]
Quadriceps	465 ±. 2 37.7	368.6 ± 25.7	364.0 ± 24.4	457.9 ± 25.8	0.01[a,b,e,f]
Trapezius	311.4 ± 30.7	226.3 ± 21.0	253.9 ± 19.9	312.9 ± 21.0	0.013[a,e,f]
Heat Pain Threshold, °C					
Knee	42.9 ± 0.6	41.5 ± 0.4	42.2 ± 0.4	42.3 ± 0.4	0.253
Forearm	42.6 ± 0.6	41.4 ± 0.4	41.9 ± 0.4	42.4 ± 0.4	0.260
Heat Pain Tolerance, °C					
Knee	46.8 ± 0.4	45.3 ± 0.3	45.7 ± 0.3	46.3 ± 0.3	0.017[a,b,e]
Forearm	46.9 ± 0.4	45.5 ± 0.3	45.7 ± 0.3	46.4 ± 0.3	0.016[a,b,e]
Temporal Summation – Heat Induced Pain					
At 44 °C					
Forearm	7.0 ± 3.5	5.4 ± 2.3	15.1 ± 2.2	7.1 ± 2.3	0.014[b,c,f]
Knee	2.6 ± 1.8	4.9 ± 1.2	6.2 ± 1.1	3.8 ± 1.2	0.256
At 46 °C					
Forearm	7.9 ± 3.3	12.0 ± 2.3	14.7 ± 2.1	6.5 ± 2.3	0.052
Knee	8.8 ± 2.9	11.5 ± 2.0	12.2 ± 1.8	8.3 ± 1.9	0.414
At 48 °C					
Forearm	12.5 ± 3.2	13.3 ± 2.3	17.0 ± 2.1	15.3 ± 2.2	0.563
Knee	13.6 ± 2.3	15.1 ± 2.2	13.4 ± 2.0	14.2 ± 2.1	0.951
Temporal Summation – Mechanical Pain					
Knee	15.4 ± 4.4	31.3 ± 3.0	30.5 ± 2.9	12.7 ± 3.0	0.001[a,b,e,f]
Hand	10.5 ± 3.1	22.2 ± 2.1	19.7 ± 2.0	10.2 ± 2.1	0.001[a,b,e,f]
Clinical Pain and Function					
GCPS score					
Pain intensity	35.5 ± 3.4	56.2 2.3	61.0 2.2	0.0 ± 2.3	0.001[a,b,d,e, f]
Disability	29.0 ± 4.4	45.0 ± 3.0	54.2 ± 2.8	0.0 ± 2.9	0.001[a,b,c,d,e,f]
WOMAC score					
Pain	4.4 ± 0.6	7.9 ± 0.4	9.0 ± 0.4	0.0 ± 0.4	0.001[a,b,d,e,f]
Stiffness	2.1 ± 0.3	3.5 ± 0.2	4.1 ± 0.2	0.1 ± 0.2	0.001[a,b,c,d,e,f]
Function	13.5 ± 2.1	25.0 ± 1.5	29.4 ± 1.3	0.2 ± 1.5	0.001[a,b,c,d,e,f]
SPPB, total score	10.4 ± 1.2	9.8 ± 0.8	7.7 ± 0.8	10.7 ± 0.8	0.035[b,f]

Number of Pain Sites	5.7 ± 0.6	5.1 ± 0.4	8.0 ± 0.4	0.3 ± 0.5	0.001
CSQ					
CSQ-diverting-attention	2.6 ± 0.2	3.1 ± 0.2	3.1 ± 0.2	2.7 ± 0.2	0.106
CSQ-reinterpret	1.2 ± 0.3	1.5 ± 0.2	2.0 ± 0.2	1.2 ± 0.2	0.002[b,c,f]
CSQ-coping	3.8 ± 0.2	4.0 ± 0.2	4.2 ± 0.2	3.1 ± 0.2	0.001[d,e,f]
CSQ-ignore	3.1 ± 0.2	2.6 ± 0.2	2.8 ± 0.2	2.4 ± 0.2	0.061
CSQ-pray	2.5 ± 0.3	4.3 ± 0.2	3.6 ± 0.2	2.9 ± 0.2	0.001[a,b,c,e,f]
CSQ-catastrophizing	0.9 ± 0.2	1.6 ± 0.1	1.9 ± 0.1	0.7 ± 0.1	0.001[a,b,c,e,f]
LOT-R	19.1 ± 0.8	16.9 ± 0.6	16.7 ± 0.5	18.8 ± 0.6	0.009[a,b,e,f]
PANAS pos affect	35.6 ± 1.3	34.3 ± 0.9	34.4 ± 0.9	37.4 ± 0.9	0.045[e,f]
PANAS neg affect	14.7 ± 1.1	14.9 ± 0.7	15.9 ± 0.7	12.9 ± 0.7	0.031[e,f]

a is significant differences between CMC Pain and Knee Pain
b is significant differences between CMC Pain and CMC + Knee Pain
c is significant differences between Knee Pain and CMC + Knee Pain
d is significant differences between CMC Pain and No Pain
e is significant differences between Knee Pain and No Pain
f is significant differences between CMC + Knee Pain and No Pain