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Persistence of Pain Quality in Community-Dwelling Older Adults with Chronic Non-cancer Pain

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Abstract

Longitudinal assessment of chronic geriatric pain is complicated by an age-associated plateau in pain severity and increase in widespread pain, calling for innovative measures such as pain quality descriptors that characterize how pain may feel. We characterized persistence of pain quality and its relation to severity, activity interference and distribution of sites, in a population-based sample of adults aged 70 years with chronic pain (n=398). Persistent pain quality was defined as reporting descriptors within the same category: sensory, cognitive/affective, or neuropathic at baseline and 18 months. A count variable indicated number of persistent categories. Pain quality was highly persistent. Adjusted for baseline covariates, individuals endorsing 3 persistent categories were 2-2.5x more likely to experience more widespread pain at 18 months compared to fewer persistent categories. No associations were noted in changes in pain severity or interference.

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A comprehensive pain assessment that includes diverse pain quality descriptors may improve individualized pain management.

Keywords

Chronic pain; geriatric; pain; senior; neuropathic; sensory

INTRODUCTION

Chronic geriatric pain is a complex condition to assess and treat. Older age is associated with several highly prevalent comorbid pain conditions including both musculoskeletal and neurologic conditions¹. The impact of pain in older persons goes far beyond physiologic risks to include impaired cognitive function, depression, sleep disturbance, diminished socialization, increased healthcare use and costs, and impaired functional abilities². Despite the prevalence and potential impact, stoic attitudes of older adults in pain, myths about pain being a natural element of aging, and fears about potential addiction, can lead to underreported and undertreated pain in this population^{1,3}. Cognitive impairment and sensory deficits in hearing and vision, conditions more common in older adults, are also barriers to effective communication of symptoms and its treatment. These complexities are compounded when assessing longitudinal changes in pain.

Furthermore, traditional clinical pain measures, i.e. pain severity and pain location, are also less informative in the setting of chronic geriatric pain. Pain severity (also referred to as pain intensity in the literature) is the pain rating from 0 to 10. Evidence from population-based studies of elders with pain have reported that age is not associated with pain severity, suggesting a plateau effect of pain severity among older age groups⁴⁻⁷. Pain location refers to painful areas on the body, commonly joints. While back and knee pain are the most common sites of chronic geriatric pain, the prevalence of multi-site or widespread pain ranges from 63% to 75%^{4,8} among older adults. The high prevalence of multi-site pain has led to conceptualization of distribution of pain sites or a count of number of pain sites in epidemiologic research studies⁸⁻¹¹. Because of the challenges in geriatric pain assessment, clinicians could benefit from innovative measures and methods that can capture new information not otherwise collected with traditional clinical pain measures to assess longitudinal changes in chronic pain among older adults.

Longitudinal changes in pain severity, pain interference (rating for pain-related interference in activities, range 0-10) and distribution of pain sites have been used to assess the natural course of chronic pain and pain-associated conditions among older adults^{8,12} but less attention has been focused on pain quality. Pain quality is based on the idea that all pain does not feel the same way. The Gate Control theory suggests that there is a plasticity associated with nerve transmission in pain pathways that changes the experience, effectively creating different kinds of pain experiences or pain qualities¹³. Pain quality is assessed using verbal descriptors that characterize how pain may feel such as “aching”, “sharp” or “troublesome”¹⁴. These pain quality descriptors have been used to distinguish between nociceptive pain (resulting from tissue injury) and neuropathic pain (resulting from nerve

injury or abnormal nerve functioning), although the evidence is largely based on adults with one pain condition as opposed to older adults with multiple prevalent comorbid pain conditions^{13,15,16}.

Research on pain in aging is based on the assumption that the geriatric pain experience has unique characteristics in comparison to pain in younger populations¹⁷. Our prior published work suggests that older adults use highly variable pain qualities to describe chronic pain.¹⁸ We used factor analysis on 20 pain quality descriptors and derived 3 categories: cognitive/affective, sensory and neuropathic¹⁸. We found that over half of older adults with chronic pain endorsed descriptors in all 3 categories, likely representing multiple physiological mechanisms for pain. Questions remain in regards to whether pain quality changes over time and how best to assess longitudinal changes in pain when traditional clinical pain measures may not be adequate for chronic geriatric pain.

If older adults endorse persistent pain quality descriptors over time, that information could be used to target appropriate interventions to better manage their unique pain.

The **Maintenance Of Balance, Independent Living, Intellect, and Zest in the Elderly (MOBILIZE)** Boston Study (MBS) is a prospective longitudinal cohort study with a comprehensive set of measures for pain and pain-associated conditions in a population-based sample of adults aged 70 years, and thus uniquely suited to address the gap in the literature on persistent pain quality among older adults with chronic pain. The aims of this study were to characterize persistence of pain quality over 18 months and determine its relation to other pain outcomes including severity, distribution of pain sites, interference, and pain-associated chronic conditions among older adults living with chronic pain. We hypothesize that pain quality persists in chronic geriatric pain and that persistence of pain quality will be associated with multi-morbidity for pain-associated conditions and other pain measures.

MATERIAL AND METHODS

Participants and Procedures

Using a door-to-door population-based recruitment, 680 persons enrolled in MBS completed baseline and 18 month follow up assessments. Participants selected for this study had chronic pain defined as a pain severity rating of greater than 0 at baseline and 18 months and endorsed at least one pain quality descriptor at each time point (n=398). The sample was recruited from the population aged 70 and older living in the community within a 5-mile radius of the Hebrew Rehabilitation Center (HRC) in Boston (including parts of 5 nearby towns). A detailed description of the study methods has been published¹⁹. In addition to the age criteria, eligible persons were able to communicate in English, planned to be in the area for the subsequent 2 years, and were able to walk across a small room without personal assistance (although use of a walker or cane was allowed). Domestic partners or spouses aged 65 and older were also permitted to enroll. Exclusion criteria were: diagnosis of a terminal disease and evidence of moderate to severe cognitive impairment as determined by Mini-Mental State Exam (MMSE)²⁰ score less than 18. Baseline and 18-month follow-up assessments were conducted in two parts: a home visit and subsequent clinic examination

conducted within 4 weeks at the HRC. The institutional review boards of the HRC and collaborating institutions approved all protocols for the study and informed consent procedures. Participants provided written informed consent at the start of the baseline home visit.

Measures

Pain Quality—The MBS instrument for assessing pain quality was adapted from the short-form McGill Pain Questionnaire (SF-MPQ)²¹ and comprised of a list of 20 commonly used pain quality descriptors as determined by geriatricians and investigators of the study (Supplemental Table 1). Participants were instructed to answer No or Yes to each descriptor that best describes any chronic pain, not pain that is new and occurring in the past week or so. Three categories of pain quality descriptors were derived: (1) cognitive/affective, (2) sensory, and (3) neuropathic¹⁸. An example of descriptors in each category are: (1) cognitive/affective: “nagging”, (2) sensory: “throbbing”, (3) neuropathic: “burning”.

Persistent pain quality was defined as participants reporting descriptors within the same category at baseline and 18 month follow up assessments. Non-persistent pain quality was defined as endorsing descriptors within the category at baseline only. A count variable was created for number of persistent categories which was divided into 3 groups: (1) those with 1 category in common at baseline and 18 months, (2) those with 2 persistent categories in common at baseline and 18 months, (3) those who endorsed descriptors in all 3 categories at both time points.

Pain severity and interference

Global pain severity and interference were assessed using the severity and interference subscales of the Brief Pain Inventory (BPI)²². Pain severity was the average of 4 separate items for worst pain, least pain, pain on average, and pain now for “pain in the past week that has lasted more than a week or two”; each rated on a 11-point numeric rating scale (NRS). The interference subscale consists of 7 items which assess the degree to which pain interferes with general activity, mood, walking ability, normal work, relations with other people, sleep, and enjoyment of life, rated on a 0-to-10 NRS where 0 represents “does not interfere” and 10 indicates “interferes completely.” Pain interference score is the average of the 7 ratings.

Distribution of Pain Sites

Distribution of pain sites was assessed using a 13-item joint pain questionnaire for chronic musculoskeletal pain in hands and wrists, shoulders, back, hips, knees, or feet lasting 3 or more months in the previous year and present in the previous month, adapted from the Women’s Health and Aging Study^{12,23,24}. Responses were categorized into three groups: (1) no pain; (2) single-site pain; (3) more than one pain site (multisite pain) (4) widespread pain²⁵. Widespread pain was defined based on an adapted version of the American College of Rheumatology (ACR) criteria for fibromyalgia (a condition characterized by widespread pain): pain above and below the waist, pain on the right and left sides of the body, and axial pain (back pain)²³.

Presence of chronic conditions

Self-reported physician-diagnosed chronic conditions included rheumatoid arthritis (RA), spinal stenosis or disc disease, asthma or lung disease, and stroke. Presence of heart disease was based on report of heart attack, congestive heart failure, angina pectoris, pacemaker, or cardiac arrhythmia. Peripheral neuropathy was assessed using Semmes-Weinstein monofilament testing²⁶. Peripheral arterial disease (PAD) was defined based on an ankle-brachial index of less than 0.90 and the Rose Intermittent Claudication questionnaire²⁷. Research nurses were trained to assess the clinical criteria for the diagnosis of osteoarthritis (OA) of the knees and hands defined by the American College of Rheumatology^{28,29}. Diabetes mellitus was assessed using an algorithm based on laboratory measures from the baseline clinic visit including random glucose (≥ 200 mg/dL) and glycosylated hemoglobin ($\geq 7\%$), use of antidiabetic medications, and self-reported diabetes mellitus. Depression was defined as score ≥ 16 on a modified version of the 20-item Centers for Epidemiologic Studies Depression Scale^{30,31}. Multi-morbidity for pain-associated conditions was defined as a diagnosis of 2 or more of the following conditions: osteoarthritis, peripheral neuropathy, peripheral arterial disease, rheumatoid arthritis, spinal stenosis/disc disease.

Sociodemographic and Health Characteristics

Demographic characteristics age, sex, race, years of education, and income was collected at the home visit. A full description of the sample using a comprehensive set of sociodemographic and health characteristics, including cognitive function (MMSE score)³², body mass index, visual deficits, and daily analgesic use, has been published¹⁸.

Statistical Analysis

Out of the three possible categories of descriptors, the denominator in each persistent versus non-persistent category comparison was the number of people endorsing that category at baseline. The total number of persistent categories endorsed was also calculated, ranging from 1-3.

Descriptive statistics were used to examine the distribution of sociodemographics and pain outcomes by category-specific persistence and number of persistent categories. Ordinal logistic regression (proportional odds) models, with covariate adjustment for age, gender, education, race, baseline distribution of pain sites, Physical Activity Score for the Elderly, body mass index, Mini-Mental State Examination, lung disease, heart disease, diabetes mellitus, and peripheral arterial disease were used to estimate odds ratios (ORs) and 95% CIs to determine the odds of more widespread pain (or increasing number of pain sites) at 18 months according to number of persistent categories. Ordinary least squares regression models were used to estimate marginal means scores for baseline pain severity and interference according to number of persistent categories adjusted for age and sex. Estimated marginal means were also determined for mean differences in pain severity and interference scores from baseline to 18 months adjusted for age, sex and baseline score. We performed analyses using SAS software, version 9.4 (SAS Institute, Inc., Cary, NC).

RESULTS

Of the 680 participants who completed the baseline and 18 month follow-up assessments, 398 individuals (58.5%) had chronic pain lasting at least 18 months and endorsed at least one pain quality descriptor at both time points. Sensory pain was most persistent with 93.0% of those endorsing sensory descriptors at baseline repeating sensory descriptors at 18 months (Table 1). The prevalence of persistence was 86.5% for cognitive/affective and 80.6% for neuropathic pain. Supplemental Table 1 presents the baseline prevalence of each descriptor included in the MBS instrument and the prevalence of persistence. Broadly, the most prevalent descriptors were also the most persistent. More women than men reported persistent cognitive/affective and neuropathic pain relative to their non-persistent counterparts (Table 1). Those with persistent cognitive/affective pain had lower levels of education relative to those with non-persistent cognitive/affective pain. Those endorsing persistent cognitive/affective and persistent neuropathic pain had a higher baseline prevalence of asthma/lung disease relative to their non-persistent counterparts (Supplemental Table 2).

Persistence in each category according for baseline pain severity and interference, and distribution of pain sites is presented in Table 2. Individuals with persistent cognitive/affective and persistent neuropathic pain had a higher prevalence of more severe pain and interference and widespread pain at baseline relative to their non-persistent counterparts. Those who endorsed all 3 categories at both time points had a higher baseline prevalence of more severe pain, interference and widespread pain compared to those with fewer persistent categories. In total, 12 participants endorsed completely different categories at baseline and 18 months, and because persistence in one category was the reference group, these participants were excluded from the adjusted models.

Adjusted for age and sex, baseline mean scores for pain severity and interference were associated with the number of persistent categories indicating a linear trend between increasing severity or interference and increasing number of persistent categories ($p < .0001$) (Table 3). Those with one persistent category experienced a modest improvement in pain severity (mean difference = $-.44$, 95% CI $-.81, -.08$) over 18 months. Mean differences in pain severity between baseline and 18 months for those endorsing 2 or 3 categories were non-significant (Table 3). A similar pattern was noted for pain interference with a modest improvement between baseline and 18 months in those with one persistent category (mean difference = $-.62$, 95% CI $-1.10, -.15$), and no statistically significant change in those with 2 or 3 persistent categories. Mean differences in pain severity and interference scores from baseline to 18 months were non-significant comparing persistence in each of the descriptor categories with their non-persistent counterparts.

Adjusted for baseline covariates and distribution of pain sites, individuals with persistent pain quality in all 3 categories were more likely to report more widespread pain compared to those with 1 persistent category (AOR 2.51, 95% CI 1.36, 4.66) and 2 persistent categories (AOR 2.20, 95% CI 1.31, 3.69) (Table 4). No significant differences were noted in the probability of more widespread pain at 18 months between those endorsing 1 and 2 persistent categories (AOR 1.12, 95% CI $.62, 2.02$). (Table 4).

DISCUSSION

Accurate and comprehensive assessment of pain are essential to the nursing care of older adults. Challenges associated with assessing longitudinal changes in chronic geriatric pain call for innovative measures such as pain quality and an evidence base to support those measures. As hypothesized, we found that pain quality was highly persistent over 18 months among older adults with chronic pain. We also found that persistent pain quality in all 3 categories was associated with more widespread pain than those with fewer categories. However, we found no statistically significant association with persistent pain quality in any one category or number of categories and changes in pain severity or pain-related interference in activity over 18 months. No specific category of persistent pain quality was associated with any prevalent pain-associated condition or multi-morbidity for those conditions.

Over 90% of all participants endorsed persistent sensory pain; therefore no meaningful comparisons could be made between persistent versus non-persistent sensory pain. Our findings suggest that sensory pain could potentially be characteristic of most geriatric pain that persists over time. Almost three-quarters of the sample endorsed persistent cognitive/affective pain. Cognitive/affective pain could represent the meaning that older adults attribute to their experience of pain or affective distress associated with pain. Considering the prevalence of persistent cognitive/affective pain, longitudinal assessment and documentation of pain quality could lead to consideration for ancillary treatments to pain, i.e. antidepressants, cognitive-behavioral therapy, or counseling which are in line with the multimodal approach to pain management which engages a multidisciplinary team to develop a treatment plan^{33–35}. While structured interdisciplinary programs that include psychological treatments, rehabilitation, and medical management are beneficial, access to these programs is limited and costly^{35,36}. More study is needed to determine whether the benefits of interdisciplinary treatment plans are worth the investment in cost and increased access.

Persistence was least prevalent in the neuropathic category in that just under 20% of the sample with baseline neuropathic pain did not report neuropathic descriptors at 18 months; thus, neuropathic pain may be the most likely to change over time compared to sensory or cognitive/affective pain. We found that only 3% of the sample endorsed distinctly different categories at both time points suggesting that among those with chronic geriatric pain there is some level of persistent pain quality. These findings add to our understanding that the qualitative nature of chronic pain in the geriatric population is relatively stable over time. The contribution of age-related physical changes in pain perception also remains unclear and could be a topic for future research.

Our findings suggest that older adults with highly variable reports of pain quality (3 categories of descriptors) that persist over time are 2–2.5x more likely to report more widespread pain compared to those with fewer persistent categories. Those with less variability (fewer than 3 categories) did not have an increased likelihood of more widespread pain. This finding is clinically significant because more widespread pain has been associated with greater disability^{4,8,9,37}. This finding also points to the vulnerability of geriatric

patients with complaints of pain where the description of pain quality could seem haphazard or varied. The risk is for these complaints to be ignored or disregarded when they could represent an ongoing problem that could lead to more widespread pain and other potentially serious consequences of pain. Longitudinal assessment and tracking of pain quality could be used to identify these patients and inform targeted intervention and prevention strategies.

There were no statistically significant changes in pain severity over 18 months according to number of persistent categories. This finding is consistent with other epidemiological evidence that suggests a plateau effect of pain severity in older age groups^{4,38,39}. Therefore, older adults with 3 persistent categories had a greater probability of more disseminated pain (increased pain sites, no change in pain severity) as opposed to worsening pain (increased pain severity, no change in pain sites) in comparison to those with fewer than 3 categories. Those with 1 or 2 persistent categories did not have a greater probability of either worsening or more disseminated pain. Results for pain interference scores were similar to pain severity however our sample was a relatively high functioning group. Because pain interference is a global measure for all kinds of activities, it lacks the ability to distinguish between Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs). Future studies are needed to better assess the functional impact of pain quality and its effect on older adults' quality of life.

Although the mean changes in pain severity scores between baseline and 18 months were not statistically significant, the point estimates for those with 1 or 2 persistent categories were negative, whereas the point estimate for 3 categories was positive. Combined with the increased likelihood of more widespread pain for 3 persistent categories, these findings suggest that there could be a potential threshold effect for those endorsing all 3 categories. It is unlikely that larger sample sizes would improve statistical power to detect mean differences in pain severity from baseline to 18 months given the preponderance of evidence to suggest that pain severity is not associated with age among older adults⁴⁻⁷. Alternatively, longitudinal assessment of pain severity and location of each pain quality could be used in future research to study the relation between pain quality and other pain characteristics. Frequency of pain quality or how often each pain quality is experienced could also be an alternative measure for future studies to determine whether older adults' experiences of pain quality are predominantly in one category or if each category is experienced equally.

The primary limitation of this study is that the sample sizes for persistent relative to non-persistent pain quality limit the inferences that can be made with direct comparisons of specific categories of persistent versus non-persistent pain quality. The relative proportion of persistent versus non-persistent pain quality could be representative of the population-at-large but requires further longitudinal epidemiological studies to corroborate this finding. Longitudinal analyses were based on two assessments approximately 18 months apart and a longer duration or life-course perspective could better capture any dynamics in the nature of chronic geriatric pain. Also we did not account for the clinical progression of the diagnosed pain conditions or any efforts taken by participants to slow that progression which could affect pain quality though most prevalent geriatric pain conditions are insidious. Although our sample represents a diverse population of urban and suburban elders that is representative of typical clinical presentation of older adults with chronic pain and multiple

comorbidities, cultural variations in pain perception and communication could be an important issue in reporting of pain qualities^{1,3,40}. Also our results may not be generalizable to older adults with significant cognitive impairment because the instrument has not been specifically validated in that population. Less than 1% of responses were missing for all descriptors (except for “gnawing” for which there was 10% missing) among older adults with chronic pain including those with mild cognitive impairment (see supplemental table 1 for specific descriptors). Other factors can affect perception of pain and require further study including: history of addiction or drug abuse, or effects of prescribed and non-prescribed treatments. There is limited research on addiction in this population, and in a prior study of the MBS sample, however, only 5% of MBS participants with chronic pain were using a daily opioid analgesic; half of those with pain were not using any regular analgesic medication⁴¹.

CONCLUSION

Most older adults with chronic pain reported similar verbal descriptors for pain quality at baseline and 18 months indicating a high prevalence of persistent pain quality. The most variable descriptions of pain quality were associated with more widespread pain. Therefore, older adults with what appear to be haphazard or varied complaints of pain that persist over time could be the most vulnerable to serious consequences of pain. Future studies are needed to better understand the contribution of pain quality to the overall experience of chronic geriatric pain and its functional impact.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- Pain severity plateaus and widespread pain increases with age complicating assessment
- Longitudinal pain quality assessment using descriptor categories is an innovative approach
- Pain quality was highly persistent over 18 months in chronic geriatric pain
- Increased variability in persistent categories was associated with more widespread pain
- Varied descriptions of pain quality point to vulnerability in older adults with chronic pain

Table 1

Baseline Characteristics according to Persistence of Pain

Quality over 18 months among older adults with chronic pain (n=398)

	Total		Sensory		Cognitive/Affective		Neuropathic	
	N= 398	%	Non-persistent N= 13	Persistent N= 370	Non-persistent N= 46	Persistent N= 294	Non-persistent N= 54	Persistent N= 224
	%	%	%	%	%	%	%	%
Age								
70-75	31.9	30.8	31.2	34.8	32.0	38.9	31.3	
75-79	35.7	30.8	35.7	43.5	35.4	40.7	33.9	
80-85	21.6	30.8	21.9	17.4	21.4	13.0	24.6	
>85	10.8	7.7	10.3	4.4	11.2	7.4	10.3	
Women	67.8	69.2	68.4	43.5	74.5***	53.7	73.7**	
Race								
White	76.6	84.6	75.9	76.1	78.2	79.6	72.2	
Black	16.1	15.4	16.3	15.2	16.0	16.7	19.3	
Other	7.3	0.0	7.9	8.7	5.8	3.7	8.5	
Education								
<high school	10.6	7.7	10.8	2.2	12.6	11.1	12.5	
H.S. graduate	22.4	30.8	22.2	11.1	21.1	13.0	23.2	
College graduate	67.0	61.5	67.0	86.7	66.3*	75.9	64.3	
Income <\$15,000/y	22.9	23.1	23.2	15.2	24.2	16.7	27.2	
BMI ³								
< 25	29.1	30.8	28.3	21.7	30.2	25.9	28.4	
25-29.9	40.1	46.2	40.7	56.5	37.2	37.0	40.4	
30	30.9	23.1	31.0	21.7	32.6	37.0	31.2	
MMSE < 24 ⁴	9.6	0.0	9.5	8.7	10.2	3.7	12.5	
Daily analgesic use ⁵	31.4	7.7	32.7	19.6	37.0*	16.7	41.1*	

Note.

Participants with global pain severity score >0 at baseline and 18 months were categorized based on endorsement of any one descriptor in the specified category at both time points (persistent) or at baseline only (non-persistent). Chi-square test for between group differences (1df)

*, p<.05;
**, p<.01;
***, p<.0001. (Statistical significance for persistent versus non-persistent sensory pain is not presented due to relative difference in sample sizes.)

Table 2

Baseline pain measures according to persistent pain quality at 18 months among older adults with chronic pain (n=398).

Pain Measure	Sensory		Cognitive/Affective		Neuropathic		Number of Persistent Categories ¹		
	Non-persistent	Persistent	Non-persistent	Persistent	Non-persistent	Persistent	1	2	3
	N = 13	N = 370	N = 46	N = 294	N = 54	N = 224	N = 68	N = 134	N = 184
	%	%	%	%	%	%	%	%	%
Pain severity tertiles (range 1-10)									
1.75	46.2	31.6	63.0	21.4	46.3	19.2	70.6	37.3	13.6
< 3.67	46.2	31.4	23.9	34.7	29.6	34.8	19.1	35.1	34.2
3.67	7.7	37.0	13.0	43.9***	24.1	46.0***	10.3	27.6	52.2 [†]
Pain Interference tertiles ² (range 1-10)									
0.45	61.5	29.9	66.7	21.9	44.4	23.9	66.2	29.9	18.7
2.45	23.1	35.1	22.2	36.3	31.5	33.8	22.1	41.8	33.5
> 2.45	15.4	35.1	11.1	41.8***	24.1	42.3***	11.8	28.4	47.8 [†]
Pain Distribution ³									
No sites	46.2	15.1	23.9	12.3	24.1	9.4	31.3	18.7	7.6
Single site	23.1	28.1	37.0	25.9	24.1	25.5	32.8	32.1	23.4
Multi-site	15.4	36.8	30.4	37.5	33.3	41.1	31.3	34.3	40.8
Widespread	15.4	20.0	8.7	24.2*	18.5	24.1*	4.5	14.9	28.3 [†]

Note.

¹ Number of persistent categories presented as a count variable of persistence in each category. N=12 participants endorsed distinct categories at both time points.

² Global pain severity and interference (tertiles) was assessed using Brief Pain Inventory (BPI).

³ Pain sites assessed were hands and wrists, shoulders, back, hips, knees, or feet lasting 3 or more months in the previous year and present in the previous month. Distribution of pain sites was then collapsed into 4 categories. Widespread pain included pain above waist, below waist; and axial skeletal pain in back or chest. Chi-square tests for between group differences (1df)

* p<.05,

p<.0001. (Statistical significance for persistent versus non-persistent sensory pain is not presented due to relative difference in sample size.) Mantel-Haenszel chi-square test for trend

[†] p<.0001.

Table 3

Adjusted mean differences¹ in pain severity and interference scores from baseline to 18 months according to number of persistent categories² (n=386)

	1 category		2 persistent categories		3 persistent categories	
	Baseline Mean (95% CI)	Mean difference from BS to 18 mo (95% CI)	Baseline Mean (95% CI)	Mean difference from BS to 18 mo (95% CI)	Baseline Mean (95% CI)	Mean difference from BS to 18 mo (95% CI)
Pain severity (range 1-10)	1.80 (1.40, 2.20)	-.44 (-.81, -.08)	2.69 (2.40, 3.00)	-.06 (-.32, .19)	3.79 (3.53, 4.05)	.22 (-.01, .46)
Pain interference (range 1-10)	0.61 (.14, 1.09)	-.62 (-1.10, -.15)	1.82 (1.48, 2.16)	-.16 (-.48, .17)	3.10 (2.79, 3.41)	.23 (-.08, .54)

Note.

¹Estimated marginal mean scores in pain and interference adjusted for age and sex. Mean differences are scores at 18 months subtracted from baseline scores adjusted for age and sex.

²Number of persistent categories presented as a count variable of endorsement of descriptors within the same category at both time points. CI confidence interval

Odds ratios (OR)¹ for more widespread² pain at 18 months according to number of persistent pain quality categories (n=310)³

Table 4

Number of persistent categories	Unadjusted		Adjusted for demographics ⁴		Adjusted for all covariates ⁵	
	OR	95% CI	OR	95% CI	OR	95% CI
3 categories	3.57	2.04, 6.27	2.57	1.43, 4.62	2.51	1.36, 4.66
1 category	1.00	Reference	1.00	Reference	1.00	Reference
2 categories	1.25	.71, 2.19	1.11	.62, 1.98	1.12	.62, 2.02
1 category	1.00	Reference	1.00	Reference	1.00	Reference
3 categories	2.88	1.79, 4.64	2.31	1.41, 3.80	2.20	1.31, 3.69
2 categories	1.00	Reference	1.00	Reference	1.00	Reference

Note.

¹ Estimates based on an ordinal logistic regression (proportional odds) model for more widespread pain (increasing number of pain sites) at 18 months according to number of persistent categories. Participants with the highest degree of widespread pain at baseline were excluded (n=76).

² Estimates adjusted for age, gender, education, race, baseline distribution of pain.

³ Estimates adjusted for age, gender, education, race, baseline distribution of pain, Physical Activity Score for the Elderly, body mass index, Mini-Mental State Examination, lung disease, heart disease, diabetes mellitus, peripheral arterial disease.

CI=confidence interval.