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The Classification of Patients with Chronic Pain: Age as a Contributing Factor

[Aapm President'S Message]

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Outline

Graphics

Abstract

Objective: To explore the influence of age on the empirical classification of patients with chronic pain.

Design: Cluster analyses of two cohorts defined by age.

Setting: Two outpatient pain management clinics for young and older people.

Sample: The sample consisted of 340 patients between the ages of 17 and 93 years, who were consecutively assessed on admission to the multidisciplinary pain clinics. The subjects were allocated to two groups according to age; either 17 to 65 years or 66 years and older.

Measurements: Clustering was carried out using standardised scores from measures of pain (McGill Pain Questionnaire), depression (Zung or Geriatric Depression Scales), and impact of pain (Sickness Impact Profile adapted for pain).

Results: Previous classifications of younger adults were replicated in the clusters of: "Good Pain Control," "Positive Adaption to Pain," and "Chronic Pain Syndrome." A fourth cluster, "High Impact," was identified in the older group and subsequently replicated in the combined sample. This group consisted of subjects with high levels of impact of pain and depression and low levels of pain.

Conclusion: Age differences are present in the clinical presentation of chronic pain patients. Some older patients with chronic pain present with a unique constellation of clinical symptoms, and the classic patient profile of high pain, high impact, and high mood disturbance (i.e., Chronic Pain Syndrome) identified in younger to middle-aged adults does not occur as frequently in older patients. A number of explanations are presented to account for these differences, including comorbidity as well as other medical, psychological, and social factors.

Advanced age has been identified as a characteristic associated with divergent manifestations of the chronic pain experience. Differences reported thus far between groups of varying ages, although meaningful, are generally of subtle degrees, and many similarities exist. What is not yet apparent is whether there are any chronic pain presentations that are idiosyncratic to older people. Consequently, this study sought to compare and contrast empirically derived subgroups of chronic pain patients to identify any clusters that could be distinguished on the basis of age.

More than a decade ago, the apparent heterogeneity of patients with chronic pain led to a call for methods to improve the categorisation of distinct groups of pain patients as an aid to improving the efficacy of treatment.[1,2] Klapow and colleagues [3] indicated that an empirical classification of patient subgroups might do this. These authors used hierarchical cluster analysis, a multivariate statistical technique appropriate for the task, as it identifies homogenous subgroups of subjects by aggregating ("clustering") them based on their "nearness" to each other on various dimensions (i.e., measures). The result was a series of patient profiles that represent subgroups within the sample. Initial classification studies had

attempted to refine the dimensions used in the understanding of the chronic pain experience.[4] This was soon followed by the use of omnibus psychometric instruments to distinguish the common grouping characteristics of these patients. A number of studies have used clustering to develop clinically relevant typologies of pain patients.[5-10] The use of individual, albeit multidimensional, instruments has been criticised by Turk and colleagues. They argued for a multiaxial approach evaluating dimensions including cognitions, affect, psychosocial status, and behaviour. This led to an empirical classification of pain patients that attempts to predetermine cognitive behavioural treatment strategies.[11]

Past experiences in the empirical classification of chronic pain patients have imposed some order on the diverse characteristics that typify this clinical population. Comparisons of these studies are complicated by variations in the constructs and measures employed to generate clusters in these studies. A representative and pertinent example is the study reported by Klapow and colleagues.[3] This study used instruments that were either similar or identical to those already demonstrated to be valid measures of the chronic pain experience in older people.[12,13] Three clusters of chronic low back pain patients were identified when using scores of pain report, functional impact, and depression. The largest group, "Good Pain Control," was characterised by low levels of pain, depression, and disability. Comparable numbers of subjects were described as either "Chronic Pain Syndrome" or "Positive Adaption to Pain," respectively. The former cluster included subjects with high levels of pain, impact, and depression, whereas the latter group had relatively high levels of pain but with relatively low levels of impact and depression.

Samples used in clustering studies have rarely incorporated subjects of advanced age. Consequently, it is not possible to comment on the influence of advancing age on the genesis of these clusters. There are a number of findings from other studies that suggest that an exploration of this nature is warranted. In the first instance, increasing age is associated with different levels of the functional and emotional consequences of chronic pain. Older people with chronic pain report higher levels of physical impact,[14] possibly as a consequence of comorbidity.[15] Although the risk of depression associated with chronic pain does not appear to change as a function of age,[16] the number of depressive symptoms endorsed by older people may be less than their younger counterparts.[17] Older people also tend to report lower levels of anxiety.[14,17] The second issue of note also relates to chronic pain and its consequences. In addition to differences in absolute levels of pain, mood disturbance, and disability, there is the possibility that these constructs demonstrate variable relationships, one with the other, in groups delineated by age. There are a number of studies, primarily incorporating older samples, that have described divergent paths between chronic pain and its sequelae [18-23] that add weight to the argument that older people have characteristics that could potentially influence their presentation. Finally, evidence exists that has identified attribution [24] and coping style [14,25] differences between groups of disparate age. All of these factors raise the possibility that the multidimensional presentation of older people with chronic pain may differ from the typologies thus far identified in younger cohorts. Consequently, the aim of this study was to explore the influence of age on an empirical classification of patients with chronic pain.

METHOD

Subjects

Data were collected from 340 patients referred to two government-funded pain clinics in Melbourne, Australia. The North West Hospital clinic manages pain predominantly in the elderly and contributed data from 172 consecutive referrals (mean age, 73.1 ± 9.6 years). Likewise, data were obtained from 168 consecutive referrals from the Southern Memorial Hospital multidisciplinary pain clinic. This clinic is mainly for younger adults (mean age, 45.2 ± 14.1 years). When age was controlled, no clinic effect was found on the measures of pain, mood, or disability. The mean age of the total sample was 59.3 years (± 18.4 years), and all subjects had pain for longer than 3 months, with a mean of 70.6 months (± 84.6 months). There were 111 males and 229 females.

PROCEDURE

Most subjects were assessed in their homes before attending the clinic for the first appointment with a physician when they were then screened for eligibility for treatment. Patients were not included in the study if further assessment by team members was not deemed appropriate by the physician or if English was not their first language. Older persons were also excluded if they showed signs of dementia as assessed by the Abbreviated Mental Test Score [26] using a cutoff score less than 8. Patients with visual or physical impairments that would prevent them from completing all parts of the assessment were also excluded.

MEASURES

Basic demographic information was collected on all subjects, including age, gender, the duration of the pain, and pain site as described in the classification of chronic pain by the International Association for the Study of Pain.[27] A battery of psychometric instruments was used to assess selfrated pain, mood disturbance, and pain impact on function. These assessments were undertaken following referral to the clinic but prior to commencing the treatment program. The test battery was selected on the basis of previous experience with this patient population.[12,28] These instruments have been shown to quantify age differences successfully in the chronic pain experience.[14] The McGill Pain Questionnaire (MPQ) consists of adjectives that describe the sensory, emotional, and evaluative dimensions of the pain experience.[29] A composite total score, known as the pain rating index, was used in the present study. The Sickness Impact Profile (SIP), modified for pain, is a self-rated measure of pain-related impairment in daily functioning.[30] This behavioural-based measure covers 14 categories of activity that can be combined into a physical domain, a psychosocial domain, and a total impact score, the latter of which was used for the analysis in this study. Both the MPQ and the SIP have been widely used in chronic pain samples and have demonstrated reliability and validity in young adult and elderly patients.[13,31-33] The clinics used different measures of depression: the Geriatric Depression Scale (GDS)[34] at North West Hospital and the Self-Rated Depression Scale (SRDS) at the Southern Memorial Hospital.[35] The choice of different instruments reflects the need to exclude somatic symptoms when assessing depression in elderly adults who often have comorbid medical

problems.[36] Problems associated with the use of different depression inventories were circumvented by converting all measures to z-scores. In this way, any differences in the scaling properties of each depression inventory were standardised prior to undertaking cluster analysis.

STATISTICAL ANALYSIS

The entire sample was divided into two cohorts on the basis of age (Table 1) one group of patients was 65 years of age or younger (mean age, 43.3 ± 9.0), and an older group was 66 years or older (mean age, 75.3 ± 7.47). A MANOVA analysis was used initially to examine age differences in self-reported pain, depression, and functional impact and to investigate whether there were any differences in these measures between the two clinics. Separate cluster analyses were then performed to identify relatively homogeneous subtypes or "clusters" of patients from the complex multivariate data set (i.e., measures of pain, depression, and functional impact), for the young to middle-aged sample, the elderly sample, and the total sample. Cluster analysis is a multivariate statistical technique well suited to characterizing multidimensional outcomes, since it identifies relatively homogenous subject profiles by the sequential aggregation of individual cases based on their "nearness" to each other on psychometric measures.[37] The result generates one or more representative patient profiles of clinical symptoms that reflect empirically derived subgroups within the sample. This form of analysis makes no a priori assumptions about the number or type of groupings, but rather generates a classification system based on the different multivariate patterns within the data.

	Young sample (n = 170)	Elderly sample (n = 170)	Combined sample (n = 340)
Gender			
Male	62 (36.5%)	49 (28.8%)	111 (32.6%)
Female	108 (63.5%)	121 (71.2%)	229 (67.4%)
Age (years)	43.26 (±0.90)	75.28 (±0.47)	59.28 (±0.99)
Pain time (months)	76.38 (±6.51)	65.35 (±6.47)	70.56 (±4.59)
MPQ			
Pain rating index	27.09 (±1.11)	22.27 (±1.05)	24.68 (±0.78)
SIP			
Total score	16.38 (±0.86)	15.98 (±0.77)	16.18 (±0.57)
Depression			
Z-score of GDS or SRDS	0.07 (±0.07)	–0.18 (±0.08)	0.0 (±0.05)

MPQ, McGill Pain Questionnaire; SIP, Sickness Impact Profile; GDS, Geriatric Depression Scale; SRDS, Self-Rated Depression Scale.

TABLE 1. Characteristics of the sample

Cluster analysis is sensitive to differences in the scaling properties of variables as well as the number of variables that represent each construct.[38] For this reason, a z-score transformation was used to standardise all variables prior to analysis. The distance between variables was calculated using Ward's method,[39] which has been shown to be one of the most reliable clustering methods.[40] A K-means iterative partitioning procedure [41] was used to improve the homogeneity of the original cluster solution. All cluster analyses were undertaken using the MPQ pain rating index, the total score from the SIP and depression scores (either the GDS or SRDS) as dependent variables. A MANOVA analysis with subsequent Student-Newman-Keuls post hoc pairwise comparisons was used to examine between cluster differences in pain, depression, and functional impact scores as well as for age and time in pain. Between cluster differences in categorical variables, such as gender and site of pain, were examined using a chi-square analysis.

RESULTS

A MANOVA analysis revealed a significant overall difference between patients 65 years of age or younger and those 65 years of age or older [$F(3,336) = 4.6$, $p = .003$] on the dependent variables. Subsequent univariate analyses indicated that the older cohort reported significantly less pain [$F(1,309) = 14.15$, $p = .0001$] and less depression [$F(1,309) = 5.06$, $p = .025$], although pain time and functional impact were not different between the two age cohorts. There was no overall difference in pain, depression, and impact scores between the two clinics or of gender, after adjusting for age differences.

Separate cluster analyses were undertaken for the sample of young to middle-aged chronic pain patients (n = 170) and the older patients (n = 170), using the psychometric measures of pain, depression, and functional impact as dependent variables. Three clusters were identified in both the young and older cohorts. For the young subjects, the clusters first identified by Klapow and colleagues [3] were clearly replicated (Fig. 1), with 20% of patients (n = 34) falling into a "Positive Adaption to Pain" group characterised by high levels of pain, but low levels of depression and functional impact, 23% of the sample (n = 38) being classified as "Chronic Pain Syndrome" with high levels of pain, depression, and impact, and the remaining 57% of patients (n = 98) being classified as "Good Pain Control" with low scores on all dependent variables. In the older cohort, an approximation of the "Positive Adaption" cluster was identified, comprising 25% of the sample (n = 42) and 50% of patients (n = 86) could be classified as showing "Good Pain Control" (Fig. 2). The third cluster, however, was different than that identified in the younger cohort and was characterised by low levels of pain, but high levels of functional impact and relatively high levels of depression. This group, which included 25% of the sample (n = 42), was labeled as "High Impact."

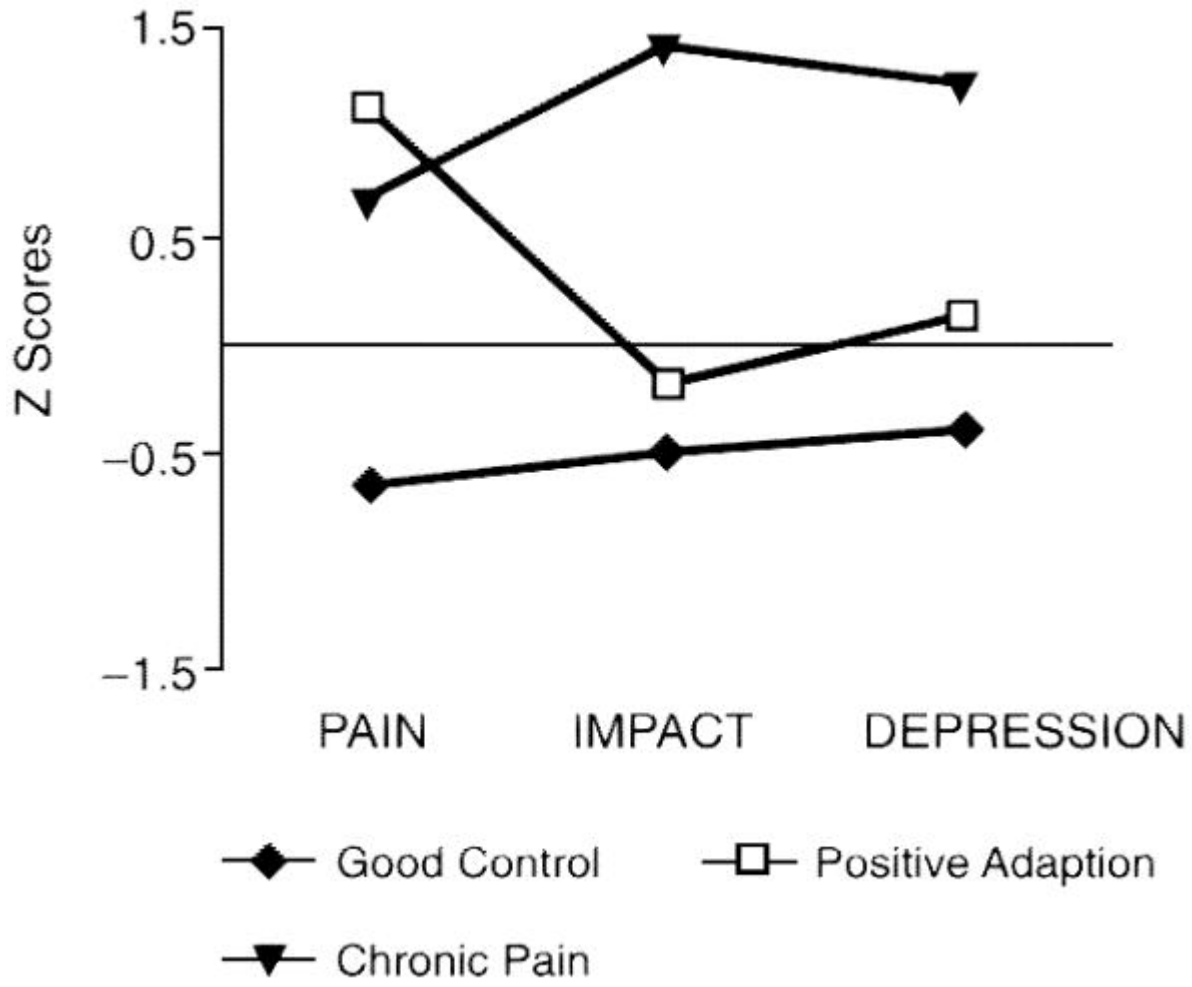

FIG. 1. Profile of cluster z-scores for younger adults.

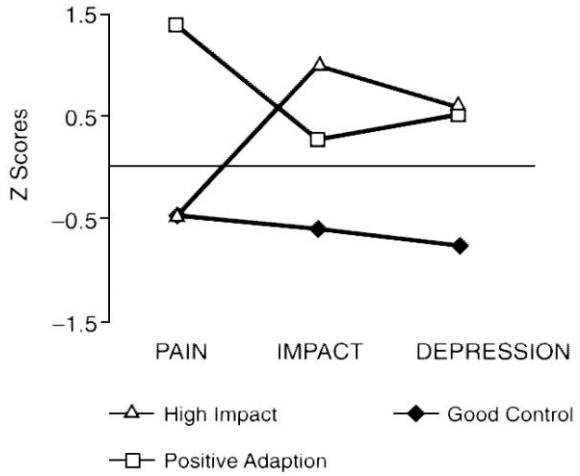

FIG. 2. Profile of cluster z-scores for older adults.

To illustrate further the uniqueness of the elderly "High Impact" cluster and the younger "Chronic Pain Syndrome" cluster, a third analysis was undertaken using the complete sample of chronic pain patients, 17-93 years of age (Fig. 3). The most parsimonious solution (the biggest step increase in the amount of variance) comprised a four-cluster result, with two clusters common to both younger and older chronic pain patients ("Positive Adaption to Pain," 20% of the sample; and "Good Pain Control," 42% of the sample). A chronic pain syndrome cluster (16% of the sample) and a high impact cluster (22% of the sample) were also identified. To enable a direct comparison with the findings of Klapow and colleagues,[3] the mean (± SEM) unstandardised scores of the MPQ, SIP, and depression scales for each of the four clusters are provided in Table 2. The subscale scores of the MPQ and SIP are also included in this table. As expected, the four clusters differed on MPQ pain rating index [$F(3,339) = 226.9$, $p < .0001$], SIP scores [$F(3,339) = 139.4$, $p < .0001$] and either SRDS depression [$F(3,169) = 83.4$, $p < .0001$], or GDS depression scores [$F(3,169) = 68.55$, $p < .0001$]. Post hoc pairwise comparisons, using Student-Newman-Keuls procedures, revealed that every cluster was significantly different from all other clusters on all of the psychometric variables. In general, the subscale scores of the MPQ followed the same between cluster pattern as the total pain index scores, with the "Chronic Pain Syndrome" cluster showing the highest levels of sensory, affective, evaluative, and miscellaneous pain, and the "Good Pain Control" cluster showing the lowest levels on these variables. Similarly, the "Chronic Pain Syndrome" cluster exhibited the highest levels of functional impact in the physical domain, although the extremely high impact on psychosocial function appears to be the major characteristic that differentiates this cluster from all others.

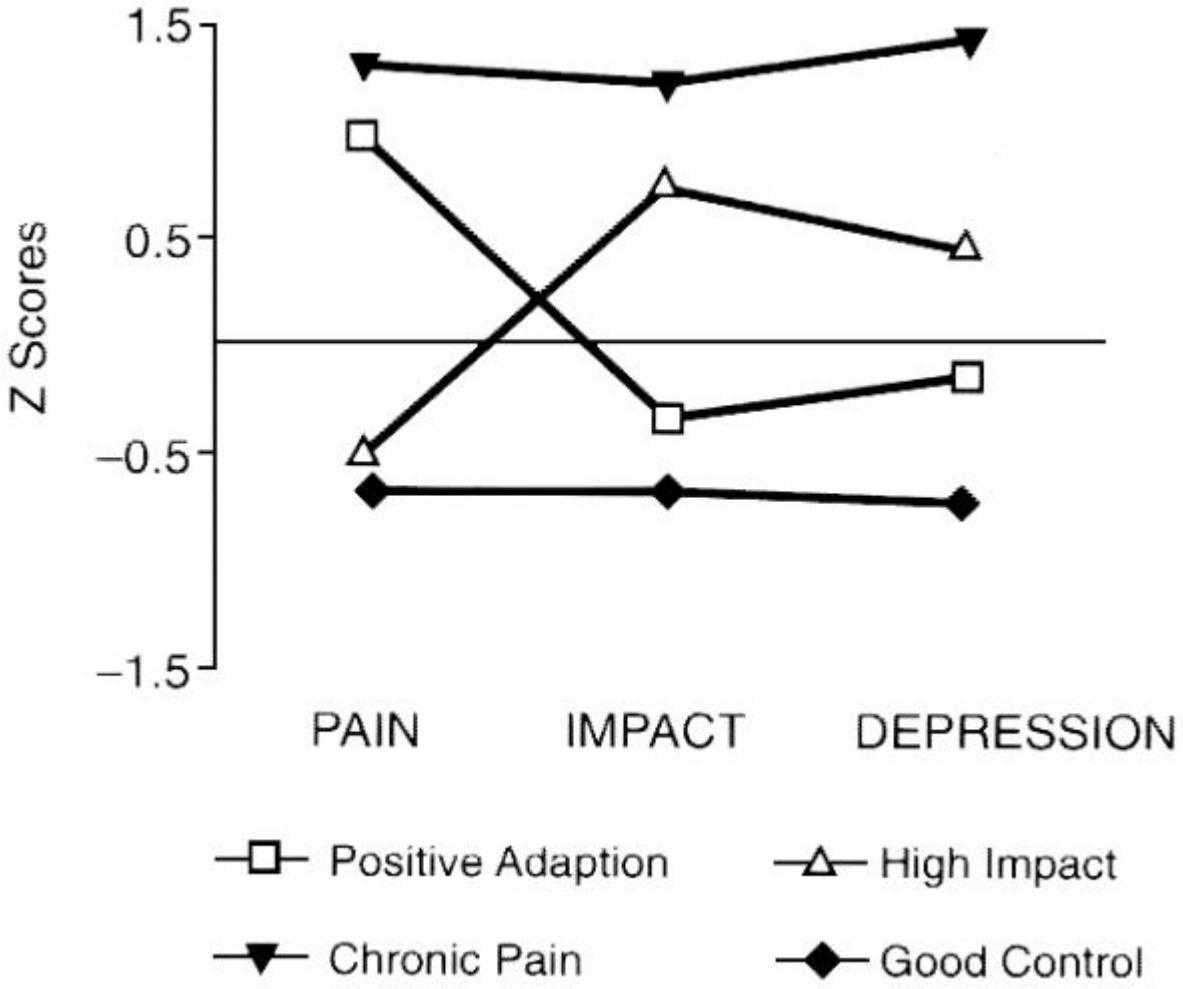

FIG. 3. Profile of cluster z-scores for combined sample.

	Positive Adaption (n = 69)	Chronic Pain Syndrome (n = 54)	High Impact (n = 74)	Good Control (n = 143)	Significance
MPQ					
Total rating	38.3 (±2.2)	42.2 (±1.3)	17.4 (±0.9)	15.1 (±0.6)	.0001*
Sensory	22.1 (±0.8)	22.0 (±0.9)	9.0 (±0.6)	8.6 (±0.4)	.0001*
Affective	5.9 (±0.4)	7.2 (±0.3)	2.2 (±0.3)	1.2 (±0.1)	.0001*
Evaluative	3.4 (±0.1)	4.1 (±0.2)	2.6 (±0.2)	2.5 (±0.2)	.0001*
Miscellaneous	6.9 (±0.4)	8.9 (±0.4)	3.6 (±0.3)	2.8 (±0.2)	.0001*
SIP					
Total rating	12.6 (±0.66)	28.7 (±1.4)	24.0 (±0.9)	9.1 (±0.4)	.0001*
Physical	12.7 (±1.3)	26.1 (±1.8)	25.0 (±1.6)	8.8 (±0.8)	.0001*
Psychosocial	14.9 (±1.4)	38.1 (±2.9)	23.5 (±1.6)	8.2 (±0.6)	.0001*
Depression					
SRDS	48.5 (±1.2)	63.6 (±0.9)	53.1 (±1.1)	40.5 (±0.9)	.0001*
GDS	9.7 (±0.8)	21.0 (±0.8)	14.9 (±0.8)	7.3 (±0.5)	.0001*

MPQ, McGill Pain Questionnaire; SIP, Sickness Impact Profile; GDS, Geriatric Depression Scale; SRDS, Self-Rated Depression Scale.

TABLE 2. Mean (±SEM) unstandardized scores of the MPQ, SIP, and depression scales for the subgroups of chronic pain patients

The demographic characteristics of the four clusters are shown in Table 3. As can be seen, there were no significant group differences in the chronicity of the pain, the site of pain, or the proportion of males and females within each cluster subgroup. However, the mean age of patients within each group was significantly different [F(3,339) = 6.48, p = .0003]. Specifically, the "High Impact Cluster" was older than the "Positive Adaption to Pain" and "Chronic Pain Syndrome" groups, while the "Chronic Pain Syndrome" group was also found to be significantly younger than the "Good Pain Control" cluster. These findings reinforce the notion that the "High Impact" cluster is more common in older chronic pain patients and that the "Chronic Pain Syndrome" cluster is seen more frequently in patients of a younger age.

	Positive Adaption (n = 69)	Chronic Pain Syndrome (n = 54)	High Impact (n = 74)	Good Control (n = 143)	Significance
Age (years)	57.0 (±2.2)	51.4 (±2.8)	64.8 (±1.8)	61.0 (±1.5)	0.0003*
Pain time (months)	81.3 (±11.8)	73.3 (±12.5)	74.1 (±10.2)	63.6 (±6.9)	0.5109
Gender					
Male (%)	24.6	39.8	24.7	37.8	0.678
Female (%)	75.4	60.2	75.3	62.2	
Pain site					
Head, neck (%)	2.5	4.9	4.3	4.4	0.2547
Legs, arm (%)	12.5	29.3	21.3	20.9	
Thoracic (%)	10.0	9.8	6.4	20.9	
Lower back (%)	55.0	34.1	44.7	29.7	
Other (%)	20.0	22.0	23.4	24.2	

TABLE 3. Demographic information on the empirically derived subgroups of chronic pain patients

In summary, the present findings indicate that two subgroups of patients, "Good Pain Control" and "Positive Adaption to Pain," occur in both older and younger adults with chronic pain. At least one subgroup of older patients, however, presented with a relatively unique profile of clinical symptoms labeled "High Impact," and a subgroup, characterised by high levels of pain, high mood disturbance, and high functional impact, labeled "Chronic Pain Syndrome," may not occur as frequently in older patients.

DISCUSSION

The weight of evidence presented in this study would suggest that age is a factor that influences the clinical presentation of patients with chronic pain. Age was not used as a variable in any of the cluster analyses, yet significant age differences were identified between cluster groupings and a number of findings highlight the importance of this factor. In the first instance, it was possible to reproduce the findings of Klapow and colleagues 3 with gratifying accuracy in the cohort of younger chronic pain patients. In light of this result, the identification of disparate patient profiles among the sample of older chronic pain subjects suggests that divergent factors are operating in older people. Given the nature of cluster analysis, a four-cluster solution from the amalgamated sample could not be assumed a priori. Consequently, the persistence of four specific groups identified in the two combined samples is further testimony to the validity of these constructs. The identification

of an age difference between the "Chronic Pain Syndrome" and "High Impact" groups was in contradistinction to the lack of differences between the groups on other demographic factors, such as chronicity of pain, site of pain, and proportion of males to females. In addition, the reproduction of the "Good Pain Control" and "Positive Adaption to Pain" clusters in each of the three analyses is an indication of the enduring quality of these constructs and refutes the notion that the older sample was altogether an aberrant group.

The reasons why older pain clinic patients do not appear to share the propensity of some younger patients to present with a "Chronic Pain Syndrome" are not readily apparent. Is the presence of a "Chronic Pain Syndrome" predominantly a phenomenon of younger patients with chronic pain? The "High Impact" group in this study possibly constitutes a variant of the "Chronic Pain Syndrome" that is idiosyncratic to older people. It should not be concluded, however, that the "Chronic Pain Syndrome" group or the "High Impact" clusters are the exclusive province of any particular portion of the age spectrum. Although the "High Impact" cluster had a greater mean age than the "Chronic Pain Syndrome" cluster, the age range for both groups incorporated younger and older subjects, respectively. What is not immediately apparent are the ramifications of a "High Impact" group for the understanding and management of older people with chronic pain. At this juncture, there is room for speculation as to the factors that may contribute to this clinical presentation, an exercise that may suggest potential avenues for intervention.

One possible explanation for the existence of the "High Impact" group lies in the increasing prevalence of multiple disease states with advancing age. The concurrence of disease with depression and disability has long been established.[42] In samples with chronic pain, comorbidity has been implicated as a factor influencing the variability of disability [15] and mood disturbance.[18,19] These findings suggest that the increased levels of comorbidity in older people may exacerbate the impact of chronic pain. For older people with comorbidity, the presence of pain, even of relatively moderate intensity, may be an additional burden and a focus for complaint that prompts referral to a speciality clinic. Thus, comorbidity may modify the consequence of chronic pain rather than pain per se. The alternative explanation, that other diseases directly affect the experience of pain, is also consistent with the finding of a "High Impact" group. This could occur in a number of ways. Dysfunction of the pain pathway as a consequence of disease could conceivably diminish pain sensibility. As an example, disorders of the central nervous system, notably infarcts of the somatosensory cortex, can impair responses to noxious stimuli.[43,44] Comorbidity may reduce the experience of pain by influencing activity levels. Reduced cardiovascular endurance or primary impairments of mobility may translate into a diminished capacity to engage in activities that would usually exacerbate nociceptive pain associated with musculoskeletal disorders. Establishing the veracity of any or all of these arguments awaits further studies.

Comorbidity does not constitute the sole explanation for the observed differences across the two age groups. Other attributes associated with aging could modulate the interface between disease and the pain experience or operate as independent factors in their own right. Among the possible explanatory candidates are age differences in attribution and coping style. The meanings ascribed to the experience of pain and the strategies employed to ameliorate its impact can have a potent effect on the report and consequences of chronic

pain.[45] The perceived threat of moderate to severe pain is similar across all ages.[46] Differences may exist in the extent to which cognitive processes contribute to levels of suffering associated with chronic pain. Limited evidence suggests that the path between pain and depression is not significantly modified by perceived control in older cohorts.[24] The implications of this finding are not immediately apparent when considering the clusters reported in this study. However, the identification of differential age effects of the impact of chronic pain, clearly earmark attribution as a potential factor in the multidimensional presentation of older people. Further studies are needed to address this issue. Insights into the relative contribution of coping strategies to reports of pain, mood state, and disability are also limited. Older people have been ascribed with a lesser repertoire of pain-coping strategies,[47] disparate levels of common strategies, and differential effects associated with their use.[14] The greater prevalence of praying and hoping as a coping strategy in older people [14,25] is unlikely to prove critical to clinical presentations, given that it fails to predict levels of pain, mood, and disability. The relative absence of ignoring pain in the armoury of older people and negative outcomes associated with diverting attention [14] may reflect the overt nature of the pathologies encountered in this age group. This situation, of diminished number and efficacy of coping resources, may aggravate the impact of moderate pain and serve as an explanation for the "High Impact" cluster.

Examining age effects is necessarily complicated by the absence of any opportunity to manipulate this attribute. The methodology used in this study only allows the inference of an effect given that age was not incorporated in the analysis as a variable. The possibility exists that differences between the groups, other than age, may explain the formation of the clusters. To some extent comorbidity, attribution, and coping strategies are examples of those factors. Of greater consequence is the prospect that the clusters are an artifact of the primary measures of pain, depression, and impact, a conclusion that may be drawn from the significant differences between the age groups in scores on the MPQ and depression inventories. The nature of cluster analysis, which aggregates subjects on the basis of relational rather than absolute characteristics, would preclude this possibility. The finding of differences in pain and depression adds further support to the notion of age as a factor shaping pain presentations, an argument forwarded to support the clustering approach in the first instance. This assumes that the differences are not due to measurement issues, a less probable explanation, particularly in the case of the depression scores that were derived from age-specific instruments.

In conclusion, the present study demonstrates age differences in the clinical presentation of chronic pain patients. One group of older patients presented with a unique constellation of clinical symptoms. In addition, the classic patient profile of high pain, high impact, and high mood disturbance (i.e., Chronic Pain Syndrome) identified in middle-aged and younger adults may not occur as frequently in older persons. Future studies should focus on the factors contributing to the formation of the "High Impact" cluster. The suggestion that comorbidity plays a significant role should be explored as well as other factors, such as coping strategies and medical diagnosis.

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