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Validity and factor structure of the AUSCAN Osteoarthritis Hand Index in a community-based sample[1]

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Summary

Objective—The AUStralian CANadian Osteoarthritis Hand Index (AUSCAN) is a self-report assessment of hand pain, stiffness, and function. Prior studies have examined its validity in small clinical samples and family-based samples. This study examined measurement properties of the AUSCAN in a large, community-based sample, extending knowledge about the scale's generalizability.

Methods—Participants (*N* = 1730, mean age = 61 years, 65% female, 30% African American) were enrolled in the Johnston County Osteoarthritis Project. We examined the internal consistency, construct validity, and factor structure of the AUSCAN among the total sample, as well as in subgroups according to gender, race, presence of hand pain, and presence of radiographic hand osteoarthritis (OA).

Results—Internal consistency was high for the total scale and subscales among the full study sample and all subgroups (Cronbach's alphas = 0.89–0.96). Construct validity was also supported, as grip and pinch strength were more strongly correlated with the AUSCAN function subscale than with the

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pain and stiffness subscales. Factor analysis showed that for the full sample and most subgroups, all pain items loaded on one factor (standardized regression coefficients 0.59–0.81) and all function items loaded on another (standardized regression coefficients 0.61–0.78), supporting the intended subscale structure of the scale. However, for African Americans, a different factor pattern emerged, with three function items loading on a factor with the pain items.

Conclusions—Results support the validity of the AUSCAN in a general sample of adults, as well as across demographic and clinical subgroups, although the subscale structures differed slightly by race.

Keywords

Osteoarthritis; Hand; AUSCAN; Validity

Introduction

The AUStralian CANadian Osteoarthritis Hand Index (AUSCAN) is a self-report assessment of hand pain, stiffness, and function[1,2]. Studies have shown this measure has acceptable reliability, construct validity, and responsiveness[1–5]. We recently reported that among a large sample of adults with familial hand osteoarthritis (OA), the AUSCAN showed acceptable factorial validity, with three distinct subscales[5]. Because the AUSCAN is a relatively new scale, it is important to examine its utility and measurement properties in a variety of populations and settings to evaluate the generalizability of this scale.

This study adds to prior research using the AUSCAN in several valuable ways. First, this is the first study to examine the AUSCAN in a large, community-based sample. Prior studies have involved small clinical samples[1–3] and family-based samples[4,5]. Examining the AUSCAN in a community sample allows the opportunity to assess its overall utility among adults with and without hand OA. While the AUSCAN was originally developed among patients with OA, it may also have broader application if its measurement properties extend across a more general sample. Second, this study sample includes a substantial proportion of African Americans, providing the opportunity to examine the AUSCAN's measurement properties according to race. This is a significant addition to prior research on the AUSCAN because this scale has not been previously validated among African Americans, and other studies have shown that there are racial differences in pain reporting among individuals with arthritis[6,7]. Third, this sample also includes a substantial proportion of men, which is important because prior studies using the AUSCAN have involved predominantly samples of women[1–5], and the scale's measurement properties have not been examined specifically among men. Fourth, this study will extend our previous analyses examining the factorial validity of the AUSCAN[5]. For measures including multiple subscales (i.e., pain, stiffness, and function), is it important to examine whether each of the subscales measures a discrete domain corresponding to the attribute it proposes to assess. This is particularly important because the AUSCAN scale developers have endorsed the use of the subscales individually[4]. We found that the AUSCAN and its subscales had significant construct validity in a sample of individuals with familial hand OA[5]. This study examines whether the AUSCAN's intended factor structure is valid in a larger, more diverse and generalizable sample.

Patients and methods

Subjects

The cross-sectional sample was composed of individuals enrolled in the Johnston County Osteoarthritis Project who completed the AUSCAN during a follow-up assessment approximately 5–7 years after their baseline assessment. The Johnston County Osteoarthritis

Project is a population-based prospective study of OA of the knee and hip in rural North Carolina. Details of the protocol are reported elsewhere[8]. Briefly, this study involved civilian, noninstitutionalized adults aged 45 years and older who resided in six townships in Johnston County. Participants were recruited by probability sampling, with over-sampling of African Americans.

Classification of Radiographic Hand OA

Hand radiographs were obtained on the same day as the clinic exam (in which AUSCAN was completed). Radiographs were obtained by a standard protocol, postero-anteriorly and focused on the third metacarpophalangeal joint. We classified individuals as having hand OA if they had radiographic evidence of Kellgren Lawrence (KL)[9] grade ≥2 OA in at least one distal interphalangeal (DIP) joint, as well as at least two other interphalangeal or carpometacarpal (CMC) joints. KL grading is a standard (and the most common) method for assessing radiographic hand OA. This classification mirrors the criteria used for the Genetics of Generalized Osteoarthritis (GOGO) study[5,10]. In addition, we used an alternate classification of hand OA to examine whether results differed if a less strict definition of OA was employed. For this alternate definition, we classified individuals as having hand OA if they had radiographic evidence of KL grade ≥2 OA in any hand joint. At the time of this interim analysis 39% of the hand radiographs had been assessed. The remainder had not yet been read, and those participants were excluded from analyses stratified by hand OA status. The group whose radiographs were read had a higher proportion of whites (81% vs 63%, $P < 0.001$) and were older (mean ages = 63.4 years vs 59.5 years, $P < 0.001$), but the groups did not differ according to gender or presence of hand pain.

Australian Canadian Osteoarthritis Hand Index

The AUSCAN is a 15-item scale measuring pain (5 items), stiffness (1 item) and function (9 items) during the preceding 48 h. All items are rated on a scale of 0 (none) to 4 (extreme). AUSCAN items are described in detail elsewhere[1]. Briefly, this scale assesses: pain at rest and during gripping, lifting, turning, and squeezing objects; stiffness severity immediately after wakening in the morning; and difficulty with turning, fastening, opening, carrying, grabbing, and squeezing various objects. The AUSCAN was developed through an interactive process involving expert opinion from health care providers (rheumatologists, physiotherapists, orthopedic surgeons) and interviews with patients. Items retained for this scale were those that had a prevalence >60% in the sample population and a mean importance rating >2.0 (on a scale of 1–5). Internal consistency of the subscales was excellent (Cronbach's alpha = 0.90–0.98). Test–retest reliability was also acceptable for each of the subscales (intraclass correlation coefficient = 0.70–0.86). Construct validity was confirmed against a variety of measures, including the Dreiser Index[11,12].

Grip and Pinch Strength

We examined the associations of AUSCAN subscales to pinch and grip strength. Strength measures were performed on both hands. Grip strength was measured with a Jamar Hydraulic Hand Dynamometer (reported in kilograms), and pinch strength was measured with a Jamar Hydraulic Pinch Gauge (Bolingrock, IL) (also reported in kilograms). Three trials were conducted, and an average of the three trials was calculated. Participants completed grip and pinch strength measures at the same visit as questionnaire measures (AUSCAN and self-reported pain).

Self-Reported Pain

To assess hand pain, participants were asked, “On MOST days, do you have pain, aching, or stiffness in your hand?” If participants indicated that they had hand pain, they were asked to rate their pain as mild, moderate, or severe. These questions were asked separately for the right and left hands. Using these questions, we created four-point scales indicating participants pain levels (0 = no pain to 3 = severe pain) in right and left hands.

Statistical Analyses

We first examined the internal consistency of the AUSCAN scale, as well as the pain and function subscales, using Cronbach's alpha. Cronbach's alpha measures the extent to which items measure the same characteristic[13]. To examine construct validity of the subscales, we assessed correlations of all three AUSCAN subscales with hand strength (grip and pinch strength for both right and left hands) and the self-reported right and left hand pain (four-point scale). To support construct validity of the AUSCAN subscales, the function subscale should have the highest correlation with hand strength, and the pain sub-scale should have the highest correlation with the single-item pain measure. We also examined correlations among the AUSCAN subscales. Based on previous research[5], we expected moderate correlations among the subscales, but very high correlations may indicate overlap between the scales. The AUSCAN stiffness subscale (1 item, scale of 0–4) and the self-reported hand pain items (scale of 0–3) were not normally distributed. Therefore Spearman's rank-order coefficient was used for any correlations involving either of these two variables. All other associations were examined using a Pearson correlation coefficient.

To further assess the construct validity of the pain and function subscales, which were of particular interest, we examined the partial correlations of these subscales to hand strength and the self-reported hand pain items. This analysis allowed us to test the associations of each subscale with strength and pain while controlling for the other subscale. To support the construct validity of these subscales, the function subscale should remain significantly associated with strength when controlling for the pain subscale, and the pain subscale should remain significantly associated with the single-item pain measures when controlling for function. These partial correlations were also age- and sex-adjusted. We examined these partial correlations in right and left hands.

To assess the factorial validity of the AUSCAN, we conducted factor analyses of the pain and subscale items. Because it is not possible to have a single-item factor, the AUSCAN stiffness subscale was excluded from all factor analyses. We first conducted an exploratory factor analysis (SAS Proc Factor) with the number of factors not specified[14,15]. We used an oblique rotation (promax) since we expected the subscales to be correlated. For the exploratory factor analysis, we used the scree test to examine the number of factors that best fit the data[16]. The scree test plots eigenvalues against factors. The eigenvalue for a given factor measures the variance in all variables that is accounted for by that factor. In a scree test, the point where the plot (of eigenvalues vs factors) changes slope indicates the number of factors that should be retained. We then conducted a second factor analysis, constrained to two factors. We chose to retain two factors because the AUSCAN items in the analyses are intended to represent two subscales (pain and function). For all factor analyses, items were considered to load on a factor if the associated coefficient was >0.4[17].

All analyses examining internal consistency, construct validity, and factorial validity were conducted for the whole sample, as well as separately for men and women, three different age groups (45–54, 55–64, and 65+), Caucasians and African Americans, those with and without current self-reported hand pain, and those with and without radiographic hand OA (using the two different definitions described above).

Results

The study sample (N = 1730) was 65% female and had a median age of 60 years (Table I). Approximately 70% were Caucasian and 30% were African American. Among those whose radiographs have been read at the time of this analysis, 46% had radiographic hand OA when defined as KL ≥2 in at least one DIP joint and two other interphalangeal or CMC joints; 71% had radiographic evidence of KL ≥2 OA in at least one hand joint. About 40% of participants reported that they experienced hand pain on most days. The median AUSCAN score was 20, indicating that participants, on average, rated their pain and functional difficulty to be “mild”. Median AUSCAN scores for subgroups were: men = 16, women = 23, Caucasian = 20, African American = 19, hand OA = 24, no hand OA = 17, hand pain = 31, and no hand pain = 15.

Internal Consistency/Reliability

Internal consistency was acceptable for the total scale (Cronbach's alpha = 0.96, average inter-item correlation = 0.64), as well as the pain and function subscales (Cronbach's alphas = 0.94 and 0.95, respectively; average inter-item correlations = 0.74 and 0.67, respectively). Internal consistency was also acceptable for all subgroups, including men and women, Caucasians and African American, all age groups, those with and without radiographic hand OA (using both definitions), and those with and without self-reported hand pain. Cronbach's alpha levels were lowest for participants with no self-reported hand pain, but these were still well within the acceptable range (0.91–0.94).

Construct Validity

Correlations between AUSCAN subscales and the hand strength and hand pain measures support the scale's construct validity. Specifically grip and pinch strength were more strongly correlated with the AUSCAN function subscale than with the pain and stiffness subscales (Table II). Correlations with the right and left hand pain items were similar for all three subscales. We also found moderate to substantial correlations among AUSCAN subscales, with the highest association between pain and function (r = 0.81). Correlations within all subgroups (gender, race, all age groups, radiographic hand OA, and hand pain) were similar to those of total sample. With respect to gender, associations of AUSCAN subscales with pinch and grip strength were slightly weaker for men than women, but these were all statistically significant for both groups and followed patterns similar to those shown in Table II. Also, among those in the highest age group (65+), the correlation of right hand pain severity with the AUSCAN function sub-scale (r = 0.56) was slightly greater than the correlation with the pain subscale (r = 0.54).

Analysis of partial correlations also supported the AUSCAN subscales' construct validity in the total sample. When controlling for the AUSCAN pain subscale, the function subscale was still significantly associated with grip and pinch strength (Table III). The AUSCAN pain subscale was not significantly associated with hand strength in this analysis. When controlling for the AUSCAN function subscale, the pain subscale was still significantly associated with the right and left hand pain items. The AUSCAN function subscale also remained significantly associated with the self-reported hand pain items, but not as strongly as the pain subscale (Table III). Partial correlations for subgroups (gender, race, all age groups, radiographic hand OA, hand pain) showed patterns similar to those shown for the total sample (data not shown), except for a few minor deviations. For those in the middle age group (55–64 years), the partial correlations of self-reported hand pain items with the AUSCAN function subscale (r = 0.18–0.19) were slightly higher than correlations with the AUSCAN pain scale (r = 0.15–0.17) For those with no hand pain, the only difference was that the AUSCAN pain subscale was not significantly associated with grip or pinch strength. For those with no OA based on the definition of KL ≥2 disease in at least one DIP joint and two other interphalangeal or CMC joints, partial correlations of the AUSCAN pain and function subscales with the self-reported hand pain item were the same for the right hand (r = 0.17 for both subscales). For those with no OA based on the definition of KL ≥2 disease in at least one joint, partial correlations of the AUSCAN pain and function subscales with the self-reported hand pain item were the same for the left hand (r = 0.16 for both subscales).

Factor Analysis

Results of the exploratory factor analysis with the number of factors not specified are shown in Table IV for the full sample. Results were similar for all subgroups (gender, race, all age groups, both classifications of radiographic OA, hand pain). This analysis yielded three factors, with three of the AUSCAN function subscale items ("turning faucets", "turning doorknob or handle", and "buttoning") loading on a separate factor. The "buttoning" item also had a loading >4.0 on the factor with other function items. While the AUSCAN items loaded on three factors in this analysis, results of the scree test suggested that a one factor solution was the best fit (average eigenvalue = 0.75, eigenvalue of factor 1 = 9.17, eigenvalue of factor 2 = 0.72, and eigenvalue of factor 3 = 0.56).

Next, we conducted factor analyses with two factors specified, since the AUSCAN items we included were intended to measure two constructs (pain and function). For the total sample, all pain subscale items clearly loaded on one factor and all function items on another. Together, the two factors accounted for 98% of the common variance. Results for the total sample are not shown but were similar to the factor loadings for the Caucasian group shown in Table V. Results of this analysis were similar for men, women, all age groups, Caucasians, participants with and without radiographic hand OA (using both definitions), and participants with and without self-reported hand pain. Among African American participants, three of the function subscale items ("turning faucets", "turning doorknob or handle", and "buttoning") loaded on a factor with the pain items (Table V). The remainder of the function subscale items loaded on a factor together. Because sample size can influence factor analytic results and thus may have contributed to the observed differences between Caucasian and African American groups, we randomly divided the Caucasian participants in the sample into two groups that were approximately the same size as the African American group. We conducted factor analyses (with two factors specified) on these two separate Caucasian groups and found that the factor loadings were similar to each other and to those for the full sample.

Discussion

This study examined the measurement properties of the AUSCAN Osteoarthritis Hand Index in a large, community-based sample. Prior studies have confirmed the validity of this scale in clinical and family-based samples, all with radiographic hand OA[1–5]. Results of this study extend knowledge regarding the AUSCAN's validity in a more general population, as well as across demographic and clinical subgroups. We observed high levels of internal consistency, both for the total AUSCAN score and the subscales. Furthermore, internal consistency was acceptable for all subgroups we examined, including individuals without self-reported hand pain and individuals without radiographic hand OA. Cronbach's alphas for the total scale and subscales were above 0.90. This may indicate some item redundancy, and it is possible that the number of items could be reduced. Similar to prior results among a sample of individuals with familial hand OA[5], we found strong correlations among the AUSCAN subscales, particularly pain and function (r = 0.81). This is likely due to similarity between some activities queried in the pain and function subscales (i.e., turning objects, squeezing/wringing).

Results of this study also support the construct validity of the AUSCAN subscales. Specifically, the grip and pinch strength were more strongly associated with the AUSCAN function subscale than the pain and stiffness subscales. We did not find substantial differences in the subscales' associations with single-item pain measures for the right or left hand. This may be partly due to the fact that these hand pain items have a limited distribution (scale of 0–3) and may not be sensitive to small differences in pain. Our previous work showed that among a sample of individuals who all had hand OA, the same single-item pain measure was more highly correlated with the AUSCAN pain subscale than with the AUSCAN stiffness and function subscales[5]. Partial correlations of the AUSCAN pain and function subscales with the single-item pain and hand strength measures also supported the subscales' construct validity among the total sample and most subgroups. In these analyses, the single-item pain measure was more strongly associated with the AUSCAN pain subscale than the function subscale, except among individuals in the middle age group (55–64; in which the correlation with the AUSCAN function subscale was very slightly higher) and those without radiographic hand OA (in which these associations were approximately equal). This may indicate some weakness in the construct validity and specificity of the AUSCAN pain subscale among these subgroups. However, as stated above, it also may be related to limitations in our single-item hand pain measures.

The exploratory factor analysis of the AUSCAN indicated a one factor model best fit the data. This suggests there may be some item overlap between the subscales. However, our factor analysis with two factors specified supported the intended subscale structure of the AUSCAN for the total sample and most subgroups we examined. Specifically, all pain items loaded on one factor and all function items on another. There was a minor deviation from this pattern for the subgroup of patients who reported that they did not have current hand pain on the single-item measure. For this group, one item (“pain at rest”) did not load on either factor. This is likely because the majority of individuals in this subgroup do not have current hand pain at rest. However, overall results of this study do not show any major problems with the validity or utility of the AUSCAN for this subgroup of individuals.

Among African Americans, there was a more notable difference in the factor structure of the AUSCAN pain and function items when two factors were specified. Three of the items on the function subscale loaded on a factor with the five pain subscale items. These results suggest that for African Americans, the AUSCAN pain and function subscales may not measure two discrete domains of pain and function as expected. Prior research on the Western Ontario McMaster University Osteoarthritis Index (WOMAC), an index of lower extremity pain, stiffness, and function[18], indicated that scale items clustered according to the type of activity, rather than according to pain, stiffness, and function subscales[19,20]. However, we did not observe a clear factor pattern corresponding to activity type in this analysis. The function items that loaded on the factor with the pain items relate to tasks that generally require less strength (turning faucets and doorknobs, buttoning) than the remainder of the function items that loaded on a factor together (i.e., opening a jar, carrying full pot, picking up large, heavy objects). However, it is not clear why the less difficult function items share more variance with the pain items (which relate to tasks of varying difficulty) than with the other function items. Differential item functioning analysis may help to identify how AUSCAN items perform across racial groups[21]. Cognitive interviewing would also help to examine individuals' thought processes when responding to these items. This may be particularly useful for the pain items, such as “gripping”, “lifting”, “turning”, and “squeezing” that do not indicate a specific level of task difficulty as the function items do (i.e., “picking up large, heavy objects”). There may be individual differences in the types and difficulty of tasks that individuals think about when responding to pain items (i.e., pain when lifting a heavy item or a light item). It would be valuable to examine whether these cognitive processes vary according to race and other demographic characteristics.

The racial differences observed in this study add to prior research showing that African Americans and whites differ in their experience and descriptions of pain[7,22]. The potential impact of this differing factor structure of the AUSCAN among African Americans is not clear from these analyses and warrants further research. Because the subscales may not discretely measure pain and function as expected, their sensitivity to change may not be optimal when used independently (rather than as part of a total AUSCAN score). Longitudinal studies are needed to assess the AUSCAN subscales' ability to detect change in this demographic group. In addition, further research is needed to understand factors underlying racial differences in self-reported hand pain and function. It is possible that the observed racial difference may be attributed to social or cultural factors rather than being a “true” racial difference.

In summary, results of this study support the validity of the AUSCAN in a community sample composed of adults with and without OA. While the AUSCAN was originally designed and validated for use among individuals with radiographic hand OA, this study indicates its utility may be broader, suitable for assessing hand pain, stiffness, and function in more general adult samples. This study also supported the AUSCAN's construct validity and factor structure among men, women, and Caucasians separately, though there are questions about the factor structure among African Americans. Overall, results suggest that the AUSCAN has acceptable measurement properties and can be a valuable tool for assessing the impact of OA on pain and function in the community.

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Table I

Sample characteristics (*N* = 1730)

	Median (IQR) or %
Age	60.2 (52.6, 68.4)
Female	64.7%
Race	
African American	29.6%
BMI	29.3 (26.1, 33.5)
CES-D	3.0 (0.0, 7.0)
Radiographic hand OA*	
KL ≥2 in ≥3 hand joints (including ≥1 DIP)	45.8%
KL ≥2 in at least one joint	70.7%
AUSCAN total (scale: 15–75)	19.5 (15.0, 34.0)
AUSCAN pain (scale: 5–25)	6.0 (5.0, 12.0)
AUSCAN stiffness (scale: 1–5)	2.0 (1.0, 3.0)
AUSCAN function (scale: 9–45)	11.0 (9.0, 20.0)
Grip strength, right (kg)	26.0 (19.3, 35.7)
Grip strength, left (kg)	23.7 (180, 33.3)
Pinch strength, right (kg)	5.3 (3.8, 7.2)
Pinch strength, left (kg)	5.2 (3.5, 7.0)
Self-reported right hand pain	
None	59.0%
Mild	18.6%
Moderate	17.0%
Severe	5.4%
Self-reported left hand pain	
None	60.7%
Mild	17.8%
Moderate	16.5%
Severe	5.0%

IQR = interquartile range; BMI = body mass index: weight (kg)/height (m^2); CES-D = Centers for Epidemiological Studies Depression Scale, range 0–48.

*These proportions based on 687 participants with hand radiograph data.

Table II
Correlations among AUSCAN subscales, hand strength, and hand pain (total sample)

	AUSCAN pain	AUSCAN stiffness	AUSCAN function*
		r*	
AUSCAN pain	1.00		
AUSCAN stiffness	0.67	1.00	
AUSCAN function	0.81	0.64	1.00
Grip strength, right	−0.27	−0.22	−0.40
Grip strength, left	−0.26	−0.22	−0.40
Pinch strength, right	−0.19	−0.16	−0.29
Pinch strength, left	−0.21	−0.18	−0.31
Self-reported right hand pain	0.59	0.59	0.57
Self-reported left hand pain	0.60	0.60	0.58

All correlations are statistically significant ($P < 0.01$). Note: Correlations involving the AUSCAN stiffness scale and the self-reported hand pain are Spearman correlation coefficients; other correlations are Pearson correlation coefficients.

* Higher AUSCAN function score indicative of worse function; therefore, negative correlation with strength variables is expected.

Table III

Partial correlations of AUSCAN pain and function subscales to hand strength, and hand pain (total sample)

	AUSCAN pain		AUSCAN function	
	r*	***P*-value**	***r****	***P*-value**
Grip strength, right	−0.01	0.621	−0.24	<0.001
Grip strength, left	−0.01	0.679	−0.23	<0.001
Pinch strength, right	−0.02	0.482	−0.14	<0.001
Pinch strength, left	−0.01	0.652	−0.14	<0.001
Self-reported right hand pain	0.22	<0.001	−0.15	<0.001
Self-reported left hand pain	0.23	<0.001	−0.14	<0.001

*Note: Partial correlations (Spearman) represent the association of one subscale with the strength or pain item while controlling for the other subscale. Correlations are also adjusted for age and sex.

Table IV
Factor analysis of AUSCAN pain and function subscales – number of factors not specified (total sample)

	Factor 1	Factor 2	Factor 3
	Standardized regression coefficients		
Pain items			
At rest	−0.03	**0.58**	0.20
Gripping objects	0.12	**0.81**	0.01
Lifting objects	0.18	**0.75**	0.01
Turning objects	0.06	**0.83**	0.06
Squeezing objects	0.12	**0.80**	0.05
Physical function difficulty items			
Turning faucets	0.04	0.07	**0.78**
Turning doorknob/handle	0.03	0.10	**0.82**
Buttoning	**0.42**	0.06	**0.43**
Fastening jewelry	**0.53**	0.05	0.32
Opening jar	**0.77**	0.13	0.00
Carrying full pot, one hand	**0.86**	0.07	0.00
Peeling vegetables or fruit	**0.63**	0.07	0.22
Picking up large, heavy objects	**0.82**	0.11	−0.03
Wringing out washcloth	**0.47**	0.20	0.29

Bold values indicate items that loaded on the factor represented in that column.

Table V
Factor analysis of AUSCAN pain and function items (two factors specified)

	Caucasian (*N* = 1181)		African Americans (*N* = 491)	
	Factor 1	**Factor 2**	**Factor 1**	**Factor 2**
				Standardized regression coefficients
Pain items				
At rest	0.10	**0.58**	**0.72**	0.05
Gripping objects	0.07	**0.85**	**0.73**	0.19
Lifting objects	0.11	**0.80**	**0.69**	0.26
Turning objects	0.07	**0.87**	**0.75**	0.14
Squeezing objects	0.12	**0.84**	**0.76**	0.18
Physical function difficulty items				
Turning faucets	**0.71**	0.05	**0.72**	0.07
Turning doorknob/handle	**0.73**	0.10	**0.76**	0.08
Buttoning	**0.79**	0.04	**0.50**	0.37
Fastening jewelry	**0.78**	0.05	0.40	**0.49**
Opening jar	**0.61**	0.26	0.03	**0.88**
Carrying full pot, one hand	**0.69**	0.20	0.05	**0.90**
Peeling vegetables or fruit	**0.79**	0.07	0.36	**0.56**
Picking up large, heavy objects	**0.66**	0.22	0.07	**0.82**
Wringing out washcloth	**0.70**	0.22	0.38	**0.52**

Bold values indicate items that loaded on the factor represented in that column.