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Original Research Article

The Utility of the Short Version of the Depression Anxiety Stress Scales (DASS-21) in Elderly Patients with Persistent Pain: Does Age Make a Difference?

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Abstract

Objective. This study examined the assessment of the negative emotional constructs of depression, anxiety and stress with the short version (21 items) of the Depression Anxiety Stress Scales (DASS-21) in elderly patients (age > 60 years) with persistent pain.

Design. A convenience sample of 2,045 patients attending a tertiary referral pain centre were categorized by age and included a group aged 60 years and under (n = 1,245) for assessment of age differences. Elderly patients (n = 800) were divided into 3 groups: 61–70 years (n = 366), 71–80 years (n = 308) and 81 years and over (n = 126). Patients completed the DASS-21 as part of an initial clinical assessment process.

Results. The failure rate for scale completion increased across age groups and was significantly higher in the oldest group compared to the youngest group. All scales demonstrated reasonable convergent and divergent validity. Confirmatory factor analysis confirmed a three-factor structure and is consistent with previous studies. Age differences in depression, anxiety and stress scores were also assessed. Interestingly, patients aged 60 years and under had significantly higher Depression and Stress scores compared to all other age groups. This group also had significantly higher Anxiety scores compared to patients aged 61–70 years.

Conclusions. Overall, the DASS-21 is a reliable and valid measure of depression, anxiety and stress in elderly patients with persistent pain. There are some age differences in the normative values for the reporting of mood symptoms and these need to be taken into account when assessing pain-related mood disturbance in older populations.

Key Words. Persistent Pain; Elderly; Depression; Anxiety; Assessment

Introduction

Significant associations between the negative emotional states of depression and anxiety with persistent pain have been found in many pain populations [1–3], including in older adults [4–7]. While the psychometric properties of measures of depression and anxiety have been established for younger patients with persistent pain [8–10], the validity of measures of these constructs in older pain populations is very limited [11].

A major concern regarding the assessment of depression and anxiety in older adults with pain has been the risk of overestimating severity by measures that contain items asking about somatic symptoms likely to reflect the influence of pain and various comorbidities, as well as

depression and anxiety. Pain can commonly disrupt sleep, cause fatigue, lead to withdrawal from previously enjoyed activities, and cause psychomotor retardation. While some studies have suggested that somatic symptoms from comorbid medical conditions may have limited influence on the diagnosis of depression [12], measures that include somatic symptoms have been shown to overestimate the severity of depression in young adults with persistent pain [13]. Also, the performance of a measure of depression developed specifically for older adults has been shown to be influenced by the presence of persistent pain [11]. Furthermore, age-related issues such as sensory deficits, cognitive impairment, and fatigue may compromise the suitability of self-report measures [14–16].

The Depression Anxiety Stress Scales (DASS) [17] was developed to assess the severity of the core symptoms of depression and anxiety. During the iterative development process, a third factor labeled "stress" emerged. The depression scale assesses dysphoria, anhedonia, hopelessness, self-deprecation, and a lack of interest and involvement in life, coupled with an overall devaluation of life. The anxiety scale assesses autonomic arousal, situational anxiety, and a subjective feeling of anxious affect. The stress scale assesses difficulty relaxing, nervous arousal, irritability, and impatience. Depression and anxiety are highly comorbid [18], and the DASS was designed to provide maximum discrimination between these constructs and is consistent with the tripartite model of anxiety and depression [19]. The DASS-21 is a 21-item short version of the 42-item DASS and has been used at our Pain Management Centre to measure the symptoms of depression, anxiety, and stress in older adults (i.e., over 60 years) for a number of reasons. First, the measure is short and, as part of a booklet of scales used at initial assessment at our center, reduces respondent burden and results in less respondent fatigue. Second, it does not focus on somatic symptoms, at least in relation to depression, which can artificially inflate scores given the high prevalence of physical complaints in older adults. Finally, the DASS-21 has been shown to be able to discriminate between these overlapping constructs [20].

The psychometric properties of the DASS and DASS-21 have been established in both clinical and nonclinical populations [20–23], including younger adults with pain [13]. The DASS-21 has also been validated in a sample of elderly primary care patients [24]. Confirmation of the psychometric properties of the DASS-21 in older adults with pain will provide greater confidence in the use of this measure with this population. There has been much less focus on the measurement of anxiety and stress in older adults with pain, and a multidimensional scale such as the DASS-21 would be a useful addition to the literature by providing a more comprehensive assessment of older adults with pain. It will also allow a more accurate investigation of age differences in depression, anxiety, and stress. Some studies have found no effect of age on the relationship between pain and depression/anxiety [25–27], while other research found an association between age and mood with symptoms of depression and anxiety decreasing as age increases [28–30].

This study had two aims. The first aim was to evaluate the utility of the DASS-21 when used with older adults, aged over 60, attending a tertiary-level referral pain management center. In particular, the failure rate, reliability, and validity were evaluated. Based on previous research with older primary care patients [24], we hypothesized that the DASS-21 would show good psychometric properties in an elderly population with persistent pain. Our second aim was to evaluate age differences in mood symptoms and gather age-appropriate normative values for these negative emotional states.

Method

Participants

The study is based on a convenience sample of 2,045 patients assessed at the Pain Management and Research Centre (PMRC) at the Royal North Shore Hospital, Sydney, Australia, over a 7-year period (2001–2007. The PMRC is a tertiary-level referral center, and patients are referred by either their family doctor or a medical specialist. Patients attending the center were asked to complete a number of commonly used pain assessment scales, including the DASS-21, as part of their initial multidisciplinary assessment at the clinic that included medical and psychological examinations. Additional pain history and demographic information was collected prior to this visit by self-completion questionnaires, which were mailed to patients and returned by post. Patients were grouped according to age into four groups: those aged 60 years or less; those aged 61–70 years; those aged 71–80 years; and a fourth group containing patients aged 81 years and over. Groupings were chosen to coincide with the age groups used by Nicholas, Asghari, and Blyth [31], which provide normative data on the DASS in a clinical population. Overall, there were 1,245 patients aged 60 years or less, and 800 patients aged 61 years and over.

Measures

DASS-21

The DASS-21 is a 21-item short version of the DASS with three scales of seven items labeled: depression, anxiety, and stress. Items in the DASS-21 were selected on the basis of several criteria. First, the items had good factor loadings on their relevant factor. Second, items represented all the symptoms within each scale measured in the DASS. Third, items were selected on the basis of their means, such that DASS-21 total scores for each scale were very close to half the 42-item scale score. The DASS-21 has been shown to have the same factor structure as the original 42-item version [20]. To complete the DASS-21, respondents are asked to circle a number 0, 1, 2, or 3 indicating how much the item applied to them over

the past week, where 0 equals "Did not apply to me at all," 1 equals "Applied to me to some degree, or some of the time," 2 equals "Applied to me to a considerable degree, or a good part of the time," and 3 equals "Applied to me very much, or most of the time." Throughout this document, total scores for each of the three scales are doubled so they are comparable to scores for the full 42-item version [17]. The scores on each scale range from 0 to 42, with higher scores indicating more severe levels of depression, anxiety, and stress.

Multidimensional Pain Inventory

The Multidimensional Pain Inventory (MPI) [32] assesses psychosocial variables relevant to the experience of persistent pain. For the purpose of this study, only the first two sections containing 42 items (forming eight subscales) of the 61-item measure were included. There are five subscales in section one: pain severity, interference, life control, affective distress, and support from significant other. Section two has three subscales that measure patients' perceptions of how their significant other responds to their pain: punishing responses, solicitous responses, and distracting responses. Each subscale is scored on a 0–6 scale, with higher scores indicating higher levels of each dimension. There is evidence supporting the reliability and validity of the MPI for younger adults [32,33].

SF-36 Health Survey Questionnaire

The SF-36 Health Survey Questionnaire (SF-36) [34] is a general health-related quality of life questionnaire with eight subscales representing generic health concepts, considered to be universal and representative of basic human functions and well-being. These eight health concepts are: physical functioning, social functioning, role limitations (physical), bodily pain, general health, mental health, role limitations (emotional), and vitality. The score for each of the eight subscales ranges from 0 to 100. A higher score indicates better health-related quality of life on that concept. The SF-36 is one of the most widely used generic measures of health-related quality of life in the world, and there is evidence for the reliability and validity of this measure in older adults with persistent pain [35].

None of the measures were modified in any way (e.g., font size) to account for sensory loss in participants.

Psychometric Evaluation

In order to gauge the severity of depression, anxiety, and stress symptoms in this sample, categories were derived using the means and standard deviations (SD) of the DASS-21 scores from a population with similar demographic characteristics [24]. Consequently, these definitions are age adjusted and differ from those listed in the DASS manual [17]. "Normal" was defined as up to but not including the mean of each scale (D:0–8, A:0–6, S:0–13). "Moderate" severity was defined by the mean of each scale up to but not including 1 SD above the mean (D:9–16, A:7–12, S:14–22). "Severe" was defined by the mean plus 1 SD up to but not including 2 SDs above the mean (D:17–24, A:13–18, S:23–31), while "extremely severe" was defined as 2 SDs above the mean up to the maximum score for each scale (D:25–42, A:19–42, S:32–42).

Failure to complete one of the three scales of the DASS-21 was defined as having one or more unscorable items out of the seven items for that scale, where an unscorable item was defined as no response or more than one response for an item. Age group differences in failure rates for each scale were calculated using the χ^2 statistic.

To examine the contribution of various sociodemographic variables to success or failure to complete a scale, a multivariable logistic regression analysis was conducted for each of the three DASS-21 scales. The dependent variable was coded as a dichotomous variable (success/failure). Predictor variables included gender, education level, birthplace, and age. Gender was coded as a dichotomous variable (male/female), educational status was coded as a dummy variable (post-high school qualification, completed secondary schooling, between 9 and 11 years of education, less than 9 years of education, or other), birthplace was coded as a dichotomous variable (Australia/not Australia), and age was coded as a dummy variable (less than or equal to 60 years of age, between 61 and 70 years, between 71 and 80 years, and greater than or equal to 81 years). Odds ratios (OR) with 95% confidence intervals (CIs) were calculated to determine the significance of the predictor variables.

The reliability of the three scales was assessed by examination of internal consistency (Cronbach's α coefficient). A value of 0.70 or above was considered indicative of good reliability [36].

The convergent and divergent validity of the scale was examined in patients aged over 60 years as one group. Convergent validity was determined by the extent to which the DASS-21 scales correlated positively with other measures of emotional distress. Divergent validity was determined by the extent to which the scales correlated negatively with measures that theoretically should be opposed to these scales [37]. Due to the large number of intercorrelations, strict criteria were set for significance: $r \geq 0.40$ and $P < 0.001$.

Construct validity was assessed using confirmatory factor analysis (CFA). Based on previous research with the DASS-21 [20,24], we attempted to replicate a three-factor structure. Items were allowed to load on a single latent factor only, and the latent factors were allowed to covary. The data were screened for normality of distribution. No outliers were detected. Due to the sensitivity of the likelihood ratio test to sample size and its basis on the central χ^2 distribution, which assumes a perfect model fit in the population, the χ^2 statistic was not used as a measure of model fit [38]. Instead, goodness of fit was evaluated using a number of indices, including: standardized root mean square residual (SRMR), goodness of fit index (GFI),

adjusted GFI (AGFI), comparative fit index (CFI), and root mean square error of approximation (RMSEA) [39]. A 90% CI around the RMSEA value was used to assess the precision of the RMSEA estimate [40]. We used Hu and Bentler's [41] recommended cutoffs to indicate goodness of fit, which were 0.05 or less for SRMR, 0.80 or above for GFI/AGFI, 0.95 or above for CFI, and 0.06 or less for RMSEA.

Participants were removed from this analysis if more than one item out of seven items in any of the three DASS scales was missing or if more than two items in total out of the 21 items were missing. There were 131 participants who fitted these criteria and who were excluded from this section of the analysis, which left 669 participants from the original 800 participants. Of the remaining 669 participants, mean replacement was used to replace a missing item in a scale, and this occurred for 92 participants. An independent samples *t*-test revealed no significant differences between these groups on gender, pain duration, and pain intensity measured on a Numerical Rating Scale. However, the excluded group were significantly older (M = 74.04, SD = 8.25) than the included group (M = 71.80, SD = 7.46), t [798] = 3.08, $P = 0.002$.

Age differences in DASS-21 scale scores were examined using analysis of variance (ANOVA) with post hoc comparisons with Scheffé adjustment.

All analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 17.0 and the Analysis of MOment Structures statistical software package, version 17.0 (SPSS, Chicago, IL).

Procedure

On arrival at the PMRC, patients were given a booklet of scales, including the DASS-21, and asked to complete the booklet as part of a multidisciplinary assessment of 2–3 hours. No assistance in completing the scales was given by staff. However, printed instructions appeared at the beginning of each scale. Additionally, there was no restriction placed on significant others assisting patients to complete the scales. Finally, there was no follow-up by staff to ensure the scales were completed.

Ethics Approval

The use of the data set for this study was approved by the Hospital's Ethics Committee.

Results

Sample Characteristics

The demographic and pain-related characteristics of the sample are presented in Tables 1 and 2. The percentage of females in each age group increased as age increased, comprising 55.4% of the youngest group (≤60 years) and 61.9% of the oldest group (≥81 years). The majority of patients in each age group were either married or in a *de facto* relationship. The number of patients widowed increased as age increased and comprised 49.6% of the oldest group. Approximately 80% of patients aged over 60 years and 88% of patients aged 60 years or younger reported nine or more years of education. Most patients, ranging from 74.5% of the youngest group to 61.5% of the oldest group, were born in Australia. The proportion of patients in each age group working decreased as age increased with 38.8% of the youngest group in full-time or part-time work, and only 2.8% of the oldest group working.

Pain duration was lowest in the youngest age group with a median of 39 months and highest in the age group aged 61–70 years at 69 months. The mode of onset of pain was most likely to be as a result of a work accident (33.4%) or car accident (15.7%) in the youngest group, while over half (55.6%) of the oldest group reported that their pain began for no obvious reason. Approximately half of each age group reported pain in two or more major sites. Other pain sites reported included the lower back and lower limbs, upper shoulder and upper limbs, and head, face, and mouth.

Severity of Depression, Anxiety, and Stress Symptoms

Approximately 60% of the patients aged 60 years and over were categorized as "normal" for depression (58.5%), anxiety (57.8%), and stress (63.2%), while approximately one fifth of patients were categorized as "moderate" for depression (20.3%), anxiety (22.2%), and stress (23.0%). The remaining patients were either categorized as "severe" or "extremely severe," with approximately 10% of patients falling into one of these categories.

Failure to Complete Rates for Each Scale

Failure rate increased as age increased with just over one quarter of the oldest group (≥81 years) missing one or more items on a scale compared with just over 10% of the youngest group (≤60 years). There was a significantly higher failure rate for the depression, anxiety, and stress scales in all the older groups (61–70, 71–80, ≥81 years) compared with the youngest group (≤60 years). There was also a significantly higher failure rate for all scales in the oldest group (≥81 years) compared with the youngest old group (61–70 years). Non-completion of individual items, examined in patients aged over 60 years as one group, ranged from 6.6% to 11.8% of patients across the three scales.

A multivariable logistic regression analysis found that age was a significant predictor of failure for the depression (OR = 1.47 [95% CI: 1.28–1.69], $P < 0.001$), anxiety (OR = 1.35 [95% CI: 1.17–1.56], $P < 0.001$), and stress (OR = 1.32 [95% CI: 1.15–1.52], $P < 0.001$) scales. Birthplace (OR = 0.71 [95% CI: 0.52–0.97], $P = 0.034$) was also a significant predictor of failure for the stress scale. Gender and education level did not predict failure for any scale.

Table 1 Demographic characteristics

	Age Group (Years)							
	≤60 N = 1,245		61–70 N = 366		71–80 N = 308		≥81 N = 126	
	N (%)							
Gender								
Male	555	(44.6)	158	(43.2)	128	(41.6)	48	(38.1)
Female	690	(55.4)	208	(56.8)	180	(58.4)	78	(61.9)
Marital status*								
Married/*de facto*	607	(61.9)	225	(69.9)	157	(60.2)	53	(46.9)
Never married	222	(22.7)	16	(5.0)	16	(6.1)	3	(2.7)
Separated/divorced	139	(14.2)	51	(15.8)	27	(10.3)	1	(0.9)
Widowed	12	(1.2)	30	(9.3)	61	(23.4)	56	(49.6)
Educational status*								
Post-high school qualification	419	(44.4)	117	(39.5)	66	(28.2)	22	(21.6)
Completed secondary schooling	95	(10.1)	20	(6.8)	22	(9.4)	14	(13.7)
Between 9 and 11 years of education	316	(33.5)	107	(36.1)	99	(42.3)	45	(44.1)
Less than 9 years of education	71	(7.5)	22	(7.4)	16	(6.8)	12	(11.8)
Other	43	(4.6)	30	(10.1)	31	(13.2)	9	(8.8)
Birthplace*								
Australia	729	(74.5)	212	(66.9)	184	(70.5)	67	(61.5)
Other countries	250	(25.5)	105	(33.1)	77	(29.5)	42	(38.5)
Current work status*								
Full-time/part-time work	367	(38.8)	49	(16.2)	6	(2.5)	3	(2.8)
Home duties	67	(7.1)	35	(11.6)	28	(11.5)	14	(13.1)
Unemployed due to pain	369	(39.0)	42	(13.9)	8	(3.3)	1	(0.9)
Retired	34	(3.6)	168	(55.4)	195	(80.2)	87	(81.3)
Other†	109	(11.5)	9	(3.0)	6	(2.5)	2	(1.9)

* Not all patients reported their marital status, educational status, birth place, or current work status (missing rates for these variables ranged from 24.2% for educational status in the ≤60 group to 10.3% for marital status in the ≥81 group).
† Categories included: in retraining, unemployed due to reasons other than pain, student, and voluntary work.

Reliability

The DASS-21 generally showed good reliability for all age groups for all scales with the exception of the 71–80 years age group on the anxiety scale, although at $\alpha = 0.68$, the reliability index only just failed to meet the criteria for good reliability ($\alpha = 0.70$) (Table 3).

Validity

As expected from past research with elderly patients with persistent pain [42], there were significant correlations between the three scales of the DASS-21 and measures of similar constructs. All DASS-21 scales were significantly associated with the affective distress and interference subscales of the MPI. There were also significant negative associations between all DASS-21 scales and the social functioning, general health, mental health, and vitality subscales of the SF-36, and individually between the depression scale and the role limitations-emotional subscale of the SF-36, where a higher score on the SF-36 indicates better health-related quality of life. Also, the DASS-21 depression and stress scales were significantly and negatively associated with the life control subscale of the MPI (Table 4).

CFA

The goodness of fit indices for a correlated three-factor model are presented in Table 5. The model was initially tested with all parameters fixed, which produced an adequate fit according to the criteria specified. Four additional models were tested after examination of the modification indices at each step and suggested that error terms for certain items should be correlated. Correlated errors are frequently the result of redundancy in item content [43]. The fifth and final model contained all the correlated error terms of the previous models and satisfied the criteria for goodness of fit for the following indices: SRMR = 0.041, GFI = 0.92, AGFI = 0.89, and RMSEA = 0.060 (90% CI = 0.055–0.066). However, the CFI (0.93) failed to satisfy the criteria for goodness of fit (≥0.95).

Examination of the standardized structure coefficients for the final model revealed that all items loaded on their

Table 2 Pain-related characteristics

	Age Group (Years)							
	≤60 N = 1,245		61–70 N = 366		71–80 N = 308		≥81 N = 126	
	N (%)							
Pain duration*								
Median (months) (standard deviation)	39.0	(95.5)	69.0	(151.5)	49.5	(177.3)	57.0	(222.6)
Mode of onset of pain*								
Accident at work	350	(33.4)	29	(9.4)	7	(2.9)	4	(3.7)
At work but not involving an accident	82	(7.8)	12	(3.9)	3	(1.2)	1	(0.9)
Accident at home	40	(3.8)	16	(5.2)	16	(6.6)	7	(6.5)
Car accident	165	(15.7)	19	(6.2)	9	(3.7)	2	(1.9)
After surgery	113	(10.8)	55	(17.9)	50	(20.6)	12	(11.1)
After illness	31	(3.0)	22	(7.2)	22	(9.1)	3	(2.8)
Pain just began, no obvious reason	167	(15.9)	102	(33.2)	108	(44.4)	60	(55.6)
Other reasons	101	(9.6)	52	(16.9)	28	(11.5)	19	(17.6)
Pain site*								
Head, face, and mouth	68	(6.1)	15	(4.6)	18	(6.5)	6	(5.3)
Cervical region	14	(1.3)	4	(1.2)	1	(0.4)	1	(0.9)
Upper shoulder and upper limbs	116	(10.5)	25	(7.6)	11	(4.0)	5	(4.4)
Lower back, lower spine, sacrum	73	(6.6)	16	(4.9)	27	(9.8)	8	(7.0)
Lower limbs	55	(5.0)	24	(7.3)	26	(9.4)	6	(5.3)
Lower back and lower limbs	157	(14.2)	62	(19.0)	51	(18.5)	25	(21.9)
Two or more major pain sites	588	(53.1)	163	(49.8)	131	(47.5)	53	(46.5)
Other†	36	(3.3)	18	(5.5)	11	(4.0)	10	(8.8)

* Not all patients reported their mode of onset of pain or pain site (missing rates for these variables ranged from 21.1% for mode of onset of pain in the 71–80 group to 9.5% for pain site in the ≥81 group).
† Other pain sites included: thoracic region, abdomen, pelvic region, anal, perianal, and genital areas.

respective factor except for items 2, 4, and 19 on the anxiety scale, which had coefficients less than 0.40, implying that they may not be representative items for the anxiety scale. A factor loading of 0.40 and above was considered significant [44]. The three factors (depression, anxiety, and stress) were highly correlated. Correlations among the three factors were: 0.78 (depression–anxiety), 0.81 (depression–stress), and 0.84 (anxiety–stress).

Table 3 Values of Cronbach's alpha for the DASS-21 by scale and age group

	Age Group (Years)		
Scale	61–70 N = 366	71–80 N = 308	≥81 N = 126
DASS-21-depression	0.90	0.88	0.89
DASS-21-anxiety	0.77	0.68	0.70
DASS-21-stress	0.88	0.88	0.88

DASS = Depression Anxiety Stress Scales.

Age Differences in Depression, Anxiety, and Stress

A series of ANOVAs with age group as the independent factor and the DASS-21 scales as the dependent factors showed a significant effect of age group for all of the scales, including: depression ($F_{[3,1765]} = 25.61$, $P < 0.001$), anxiety ($F_{[3,1749]} = 9.79$, $P < 0.001$), and stress ($F_{[3,1751]} = 43.91$, $P < 0.001$). Post hoc analyses with Scheffé adjustment showed that patients aged 60 years and under had significantly higher depression and stress scores compared with all other age groups. This group also had significantly higher anxiety scores compared with patients aged 61–70 years (Table 6).

Discussion

This study is one of the few to evaluate measures of depression, anxiety, and stress in older adults with persistent pain. It is also the first to evaluate the utility of the DASS-21 in older adults with persistent pain. It confirms that the DASS-21 is a suitable instrument for measuring depression, anxiety, and stress in patients over 60 years attending a tertiary referral pain management center.

Table 4 Correlations between the DASS-21 scales and other scales for patients aged >60 years (N = 800)

Scale	M (SD)	1	2	3
1-DASS-21-depression	10.00 (10.37)	1.00		
2-DASS-21-anxiety	7.36 (7.36)	0.61*	1.00	
3-DASS-21-stress	11.36 (10.04)	0.74*	0.65*	1.00
MPI-pain severity	4.04 (1.17)	0.33	0.31	0.33
MPI-interference	4.16 (1.23)	0.49*	0.40*	0.51*
MPI-life control	3.29 (1.26)	–0.45*	–0.36	–0.40*
MPI-affective distress	3.00 (1.29)	0.55*	0.44*	0.61*
MPI-support	4.88 (1.43)	0.01	0.01	0.03
MPI-punishing responses	1.79 (1.48)	0.24	0.25	0.32
MPI-solicitous responses	3.48 (1.62)	0.16	0.15	0.16
MPI-distracting responses	2.15 (1.47)	0.18	0.16	0.20
SF-36-physical functioning	34.62 (25.63)	–0.31	–0.33	–0.22
SF-36-social functioning	51.80 (28.98)	–0.49*	–0.40*	–0.53*
SF-36-role limitations-physical	20.11 (32.99)	–0.22	–0.19	–0.16
SF-36-bodily pain	27.19 (18.57)	–0.36	–0.35	–0.32
SF-36-general health	53.80 (25.02)	–0.47*	–0.42*	–0.42*
SF-36-mental health	64.29 (20.65)	–0.67*	–0.50*	–0.63*
SF-36-role limitations-emotional	56.28 (43.56)	–0.46*	–0.34	–0.37
SF-36-vitality	59.58 (12.44)	–0.51*	–0.46*	–0.51*

* $P < 0.001$.
DASS = Depression Anxiety Stress Scales; MPI = Multidimensional Pain Inventory; SF-36 = Short-Form 36; SD = standard deviation.

Our analysis showed that failure rates increased as age increased, and within older adults, failure rates were significantly higher in the "oldest" old group (aged 81+ years) compared with the "youngest" old group (aged 61–70 years). We also found that for the stress scale, failure rates were influenced by birthplace. In the oldest old group, one quarter of patients missed one or more items in each scale (which means that 75% did not). This is a surprisingly high completion rate and also likely to be a worst case scenario given that the DASS-21 was one of several in a booklet of measures. It is also important to bear in mind that the criterion for failure was strict, with patients only having to miss one item out of seven to qualify for failure. The failure rate could be reduced by providing assistance in completing the scales. In the clinical setting where this study took place, there was no particular assistance given for the special challenges of assessment in older adults, including sensory deficits, cognitive impairment, and fatigue. Alternatively, there are a number of statistical procedures available for managing missing data [45].

The DASS-21 was found to be reliable and valid with a three-factor structure. This is consistent with findings from previous studies [20], including one with older adults [24]. Another finding consistent with previous research [24] was the relatively poorer internal consis-

Table 5 Confirmatory factor analysis for patients aged >60 years (N = 669)

Free Parameters	χ^2	df	CMIN (χ^2/df)	SRMR	GFI	AGFI	CFI	RMSEA (90% CI)
All fixed	805.06	186	4.33	0.047	0.89	0.87	0.90	0.071 (0.066–0.076)
19, 4	735.50	185	3.98	0.044	0.90	0.88	0.91	0.067 (0.062–0.072)
2, 4	683.04	184	3.71	0.042	0.91	0.89	0.92	0.064 (0.059–0.069)
5, 16	650.71	183	3.56	0.041	0.91	0.89	0.93	0.062 (0.057–0.067)
18, 6	625.13	182	3.44	0.041	0.92	0.89	0.93	0.060 (0.055–0.066)

CMIN = minimum value of the discrepancy C; SRMR = standardized root mean square residual; GFI = goodness of fit index; AGFI = adjusted GFI; CFI = comparative fit index; RMSEA = root mean square error of approximation; CI = confidence interval.

Table 6 Means and standard deviations for the DASS-21 by age group

	Age Group (Years)										
	≤60		61–70		71–80		≥81				
Scale	M	(SD)	M	(SD)	M	(SD)	M	(SD)	*F*	*P*	Significant post hoc comparisons
DASS-21-depression	15.01	(12.22)	10.03	(10.31)	10.19	(10.41)	9.41	(10.56)	25.61	<0.001	Age group ≤ 60 higher than all other age groups
DASS-21-anxiety	9.65	(9.57)	6.91	(7.57)	7.92	(7.11)	7.31	(7.29)	9.79	<0.001	Age group ≤ 60 higher than age group 61–70
DASS-21-stress	17.34	(11.22)	12.01	(9.98)	11.43	(10.31)	9.02	(9.26)	43.91	<0.001	Age group ≤ 60 higher than all other age groups

Notes: *F* and *P* values are results from one-way between-subjects analysis of variance.
Post hoc comparisons used Scheffé adjustment with significance determined at $P < 0.01$.
DASS = Depression Anxiety Stress Scales.

tency of the anxiety scale, especially in patients aged 71 years and above, compared with the depression and stress scales. This may be due to the higher somatic content of some of the items in the anxiety scale, such as item 2: "I was aware of dryness of my mouth," item 4: "I experienced breathing difficulty," item 7: "I experienced trembling (e.g., in the hands)," and item 19: "I was aware of the action of my heart in the absence of physical exertion." These are all symptoms that may be more prevalent in older adults and less likely to discriminate between those with and without anxiety, although this remains to be demonstrated with the DASS-21 in an elderly non-pain population. Additionally, dry mouth is a common side effect of some medications commonly prescribed for pain and other conditions. These items may have been more frequently endorsed by elderly patients with pain and led to reduced variability in the scores for this scale. Support for this hypothesis also comes from the age group mean scores for the anxiety scale, which, while statistically significantly different, are a lot closer than the mean scores for the depression and stress scales. However, it must be borne in mind that the reliability coefficient for the two oldest groups only narrowly failed to meet the criteria for good reliability. Overall, caution must be taken in interpreting internal consistency estimates as α is a function of the number of items in a scale and increases systematically as the number of items in a scale increases. Construct validity was demonstrated through significant associations with other measures of mood disturbance.

The second aim of the study was to investigate the question of whether depression, anxiety, and stress levels change with age. Given that the psychometric properties of the DASS-21 have now been established in older adults with persistent pain, it is possible to examine age differences in depression, anxiety, and stress. We found significantly lower depression and stress scores in patients over 60 years compared with patients aged 60 years or less. We also found significantly lower anxiety scores in patients aged 61–70 years compared with patients aged 60 years or less. These findings on age differences are consistent with some previous findings [28–30], but not others [25–27].

There are a number of possible reasons for age differences in depression, anxiety, and stress. First, there may be a bias in referrals in that providers may be more likely to refer younger patients with more severe psychopathology to a tertiary-level pain management center relative to older patients. The second is artifactual in that physical symptoms are more common in older patients and may inflate scores, although we found lower scores in older adults. The third reason relates to a cohort effect or a differential exposure to risk as well as protective factors across age groups. A study by Jorm et al. [46] found that depression and anxiety decline as age increases, which, they argue, is due to a significant reduction in exposure to a number of risk factors, the most important being work-related stressors. Our study shows that work-related stressors reduce significantly as age increases. The majority of patients in the older age groups are retired, and being unemployed due to pain, a significant work-related stressor becomes much less prevalent as age increases, which may partially account for lower DASS-21 scores in the older age groups. Another potential reason for age differences is that "ageing of the brain may affect emotional responsiveness" [46] (p. 1262). Research has shown that older adults are less likely to attend to and remember negative compared with positive emotional material [47]. Another possibility may relate to acceptance of pain [48]. It is conceivable that older people in pain may be more accepting of their pain as something to be expected after 60 or more years of active life. Conversely, persisting pain may be less accepted by younger people as

they have not had so many life experiences and may associate persisting pain with older age. There is some evidence for this perspective [49].

There are a number of limitations that must be considered when interpreting these results. First, this sample represents older adults with persistent pain attending a tertiary-level referral pain center and may not be representative of all elderly people in the community with persistent pain. Additionally, cognitive status was not assessed; however, our results are similar to Gloster et al. [24], who did exclude participants with cognitive impairment. Finally, as there was no restriction placed on patients receiving assistance in completing the scales, failure rates could have been influenced by assistance from significant others.

In summary, this study has demonstrated the suitability of the DASS-21 as a measure of depression, anxiety, and stress in patients over 60 years attending a tertiary referral pain management center. The measure was found to be reliable and valid with a three-factor structure and overcomes a number of challenges to the assessment of depression, anxiety, and stress in this population. The finding of age-related differences in depression and anxiety confirms some previous findings, but the strength of this study is that these findings were achieved with a measure validated for use with elderly pain patients. This study should also facilitate further investigation into age differences in depression, anxiety, and stress in patients with persistent pain.

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