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ORIGINAL ARTICLE

Screening for depression and anxiety in spinal cord injury with DASS-21

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Study design: Comparison of two self-report instruments with a structured diagnostic interview.
Objective: To investigate the properties of the Depression Anxiety Stress Scales-21 (DASS-21) in patients with spinal cord injuries.
Setting: South Australian Spinal Cord Injuries Service, Hampstead Rehabilitation Centre, Northfield, South Australia.
Methods: Forty paraplegic or tetraplegic patients participated. Two self-report measures, DASS-21 and Brief Symptom Inventory (BSI), assessed Depression, Anxiety and Stress. These measures were compared with each other and with diagnoses based on the Mini International Neuropsychiatric Interview.
Results: Mean scores on both self-report measures were below clinical threshold levels. Prevalence rates of anxiety and depression were higher on DASS-21 than on BSI. DASS-21 was as sensitive as BSI, but had lower specificity to detect anxiety and depression.
Conclusion: DASS-21 is a promising screening measure for patients with spinal cord injury in a rehabilitation setting. It has greater sensitivity for identifying those with possible anxiety disorders than it does for those with depressive disorders.
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Introduction

Psychological disorders in spinal cord injury (SCI) are associated with poorer adjustment to injury and may compromise rehabilitation.[1–3] Therefore, accurate assessment is important for interventions aimed at reducing morbidity and mortality in SCI. The incidence of anxiety and depression in SCI exceeds that of the general population, with psychological morbidity or psychological distress estimates ranging between 20 and 30%, suggesting the need for appropriate screening tools in these patients.[4–7]

Most measures used to assess depression and anxiety in patients with SCI were standardized on people without physical disabilities or chronic medical conditions.[8] Importantly, incidence rates of depression in SCI are higher when based on self-report measures than when based on structured interviews.[9] This suggests the need to evaluate measures by co-administering potential screening tools with assessment via clinical interview. Moreover, research on the use of measures of depression in SCI often does not discriminate adequately between depression and anxiety.[3]

Accurate assessment of depression in SCI is problematic because somatic symptoms of depression correspond with physical reactions of SCI. Thus, psychological measures that focus on affective and cognitive components of depression may be more useful as screening tools for identifying individuals requiring in-depth clinical assessment.[4,8] However, deleting items, or using measures that exclude somatic items, may miss important information,[8] or lead to some clinically depressed individuals being misdiagnosed.[10]

We examined the Depression Anxiety Stress Scales-21 (DASS-21)[11] as a screening tool for Depression, Anxiety and Stress in patients with SCI. DASS-21 is quick and easy to administer, requiring less than 10 min to complete, and excludes many somatic items that may not be relevant to those with SCI.[12] The psychometric properties of DASS-21 for patients with SCI have not been evaluated. We compared DASS-21 with an established psychological test for use with persons with SCI, the Brief Symptom Inventory (BSI).[13] The performance of both DASS-21 and BSI was examined for agreement with clinician judgment based on a structured diagnostic interview: the Mini International Neuropsychiatric Interview (MINI).[14]

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Materials and methods

Participants

Patients with SCI (11 outpatients and 40 in-patients) were approached and 40 patients (30 males and 10 females; age 19–82 years, M = 49.1, SD = 16.7 years) consented to participate; 33 were in-patients and 7 were outpatients; all were fluent in English.

Individuals were excluded if they had a history of cognitive impairment, head trauma or brain injury. In-patients were recently injured individuals who were in the rehabilitation unit for the first time and patients who had been re-admitted to the rehabilitation centre with some secondary medical condition requiring further rehabilitation. The outpatients were community dwelling residents who varied in time since injury. Time since injury for the whole sample ranged from 1 month to 520 months (M = 113.9, SD = 150.3, median = 14 months).

The sample comprised 26 individuals with paraplegia and 14 with tetraplegia; 20 self-reported as having complete lesions and 9 as having incomplete lesions (the others did not know their lesion status). Twenty-four participants reported having no current partner, 11 were married, 3 involved in a *de facto* relationship and 2 had a partner but lived separately. The majority of participants were not working, receiving either a disability pension ($N = 22$), aged pension ($N = 7$) or were unemployed ($N = 3$).

Measures

Depression Anxiety Stress Scales-21 is a 21-item questionnaire with three 7-item subscales: Depression, Anxiety and Stress. Items consist of statements referring to the past week and each item is scored on a 4-point scale (0 = 'Did not apply to me at all', to 3 = 'Applied to me very much, or most of the time'). Subscale scores are calculated as the sum of the responses to the seven items from each subscale multiplied by 2. DASS-21 is derived from DASS, which is a 42-item measure of the same three constructs.[11] DASS-21 factor structure is similar to DASS but has lower factor intercorrelations, higher mean loadings and fewer cross-loadings.[15]

Brief Symptom Inventory[13] is a 53-item questionnaire, which takes less than 10 min to administer and measures nine dimensions: Somatization, Obsessive Compulsive, Interpersonal Sensitivity, Depression, Anxiety, Hostility, Phobic Anxiety, Paranoid Ideation and Psychoticism. General distress is measured by the Global Severity Index (GSI). Items ask respondents how much they were distressed by the symptoms described in each item over the past week (responses range from 0 = 'Not at all' to 4 = 'Extremely'). Scores for each of the symptom dimensions are calculated by first summing the values (0–4) for the items in that dimension and then dividing by the number of items endorsed for that dimension. The GSI is calculated using the sum of all item responses divided by the total number of responses.

Brief Symptom Inventory was chosen for comparison with DASS-21, because it has been validated for use with SCI and because it has both Depression and Anxiety subscales and includes somatic items in the Somatization subscale and the GSI.[16,17] These may provide evidence for the influence of somatic item endorsement in SCI on the performance of the two measures. Finally, patients with SCI report higher levels of distress across all nine BSI subscales and GSI compared to normative samples, and therefore elevated cutoff scores for BSI have been proposed for use with patients with SCI.[16]

Mini International Neuropsychiatric Interview English Version 5.0.0, (MINI)[14] is a brief structured interview for the main Axis I psychiatric disorders in the Diagnostic and Statistical Manual of Mental Disorders, 4th ed. (DSM-IV)[18] and the ICD-10 classification of mental and behavioural disorders.[19] The interview takes about 15 min. MINI has high reliability and concurrent validity.[14] MINI involves asking a series of yes/no questions for a number of modules that correspond to a diagnostic category. Each module has a series of initial screening questions concerning the main diagnostic criteria for each category.

Procedures

Participant's written consent was sought before administering the questionnaires. If participants were physically unable to sign, then a signatory witness to verbal consent was sought. All participants were given an information sheet outlining the nature of the study before obtaining consent. DASS-21 and BSI were administered to each patient by the first author. MINI was administered by the onsite clinical psychologist (third author) who was unaware of the participant's questionnaire results. The clinical psychologist's diagnoses based on the structured interviews were then compared to the participants' DASS-21 and BSI scores.

Statement of ethics

All institutional and governmental regulations concerning the ethical use of human volunteers were followed during the course of this research.

Results

Descriptive statistics

Table 1 shows descriptive statistics for DASS-21 and BSI. Mean scores on DASS-21 and BSI correspond to subclinical levels. Time since injury in preliminary analysis did not significantly correlate with any of the subscale scores on the DASS-21 or the BSI.

Prevalence rates of Depression, Anxiety and Stress

A comparison of the prevalence rates of Depression, Anxiety and Stress using both DASS-21 and BSI is shown in Table 2. For BSI, the frequency of participants with clinically significant scores was examined using both traditional cutoff scores and the proposed elevated cutoff scores.[16] The measure of time since injury used in this study is not directly comparable to that used by Heinrich and colleagues and therefore the group was analysed as a whole using the 'at discharge' cut scores given by Heinrich *et al*.[16]

Depression Anxiety Stress Scales-21 yields a higher prevalence than BSI for both Depression and Anxiety. The rate of anxiety using DASS-21 is also higher than BSI on each of

Table 1 Means and s.d. for DASS-21 and BSI scales ($N=40$)

	Minimum	*Maximum*	*Mean*	*s.d.*
DASS-21				
Depression	0	40	7.8	9.33
Anxiety	0	28	6.4	5.87
Stress	0	30	10.4	10.00
BSI				
Somatization	41	80	60.52	9.36
Obsessive Compulsive	38	80	53.42	11.39
Interpersonal Sensitivity	41	80	52.85	13.46
Depression	42	80	55.95	12.49
Anxiety	38	80	52.40	13.65
Hostility	39	80	51.20	11.77
Phobic Anxiety	45	80	54.80	11.70
Paranoid Ideation	42	80	53.23	12.68
Psychoticism	46	80	54.10	10.18
Global Severity Index	35	80	56.98	11.69
Positive symptom total	30	80	53.53	12.15

Abbreviations: BSI; Brief Symptom Inventory; DASS-21; Depression Anxiety Stress Scales-21.

Table 2 Prevalence rates of Depression, Anxiety and Stress according to DASS-21 and BSI scale ($N=40$)

Scale/subscale	*% sub-threshold*	*% above-threshold*
Depression measures		
DASS-21 Depression	70	30
BSI Depression	75	25
BSI Depression (elevated)	95	5
Anxiety measures		
DASS-21 Anxiety	55	45
BSI Anxiety	75	25
BSI Anxiety (elevated)	92.5	7.5
BSI Obsessive Compulsive	87.5	12.5
BSI Obsessive Compulsive (elevated)	92.5	7.5
BSI Phobia	80	20
BSI Phobia (elevated)	87.5	12.5
Stress/general distress		
DASS-21 Stress	67.5	32.5
BSI GSI	80	20
BSI GSI (elevated)	90	10

Abbreviations: BSI; Brief Symptom Inventory; DASS-21; Depression Anxiety Stress Scales-21; GSI, Global Severity Index.

the three BSI subscales that measure aspects of anxiety symptoms (Obsessive Compulsive, Anxiety and Phobia). All three DASS-21 subscales yield higher prevalence rates than BSI GSI.

Concurrent validity

Depression Anxiety Stress Scales-21 Depression had a strong positive correlation with BSI Depression ($r=0.70$, $P<0.01$). However, it also had significant positive correlations with seven other BSI subscales and with GSI. DASS-21 Anxiety correlated with BSI Anxiety ($r=0.61$, $P<0.01$), but also had significant positive correlations with seven other BSI subscales and the GSI. DASS-21 Stress correlated with eight of BSI subscales and GSI. None of the DASS-21 subscales had significant correlations with BSI Somatization, consistent with the absence of somatic items on DASS-21.

Table 3 Prevalence rates of depression and anxiety based on clinician diagnoses ($N=40$)

Diagnosis on the MINI	*% of sample*
Major depressive episode	10
Dysthymia	7.5
Depression (either diagnosis)	17.5
Panic disorder current	0
Panic disorder lifetime	5
Panic disorder lifetime (limited symptoms)	5
Obsessive Compulsive disorder	0
Social phobia	0
Agoraphobia	2.5
Post-traumatic stress disorder	2.5
Generalized Anxiety Disorder	7.5
Anxiety (any anxiety diagnosis)	17.5

Abbreviation: MINI, Mini International Neuropsychiatric Interview.

Table 4 Agreement between DASS-21 Depression, BSI Depression, BSI Depression (elevated cutoff) and clinician judgment ($N=40$)

Indices of agreement	*DASS-21 Depression (%)*	*BSI Depression (%)*	*BSI Depression (elevated) (%)*
Test sensitivity	57	57	14
Test specificity	76	82	97

Abbreviations: BSI; Brief Symptom Inventory; DASS-21; Depression Anxiety Stress Scales-21.

Comparison of DASS-21 with clinician judgment

Table 3 shows the percentage of patients in the sample with a diagnosed Axis I disorder. One patient with Agoraphobia also had a Panic condition. A patient with Post-traumatic Stress Disorder also had a diagnosis of Generalized Anxiety Disorder (GAD).

Of the four patients diagnosed with a Major Depressive Episode, DASS-21 Depression scale correctly identified three with clinical levels of depressive symptoms. Of the three participants diagnosed with Dysthymia, DASS-21 Depression correctly identified one with clinical levels of depressive symptoms, and indicated the condition as moderate. Table 4 shows the sensitivity and specificity of the Depression subscales from DASS-21 and BSI and also of the elevated cutoffs for BSI to detect all depression diagnoses (Major Depressive Episode and Dysthymia).

Of the four patients diagnosed with some form of Panic disorder, DASS-21 Anxiety identified three including the participant with Agoraphobia, and indicated that one had mild and two had severe symptoms of Anxiety. DASS-21 Anxiety correctly identified the participant who had a diagnosis of Post-traumatic Stress Disorder and indicated that this participant had extremely severe levels of Anxiety. DASS-21 Anxiety correctly identified all three participants with a diagnosis of GAD. Table 5 indicates the sensitivity and specificity of DASS-21 Anxiety and the BSI scales, which

Table 5 Agreement between DASS-21 Anxiety, BSI Anxiety-related subscales and clinician judgment ($N = 40$)

	Indices of agreement	
Scale/subscale	*Test sensitivity (%)*	*Test specificity (%)*
DASS-21 Anxiety	86	64
BSI Anxiety	86	88
BSI Anxiety (elevated)	43	100
BSI Obsessive Compulsive	43	94
BSI Obsessive Compulsive (elevated)	43	100
BSI Phobia	57	88
BSI Phobia (elevated)	57	97

Abbreviations: BSI; Brief Symptom Inventory; DASS-21; Depression Anxiety Stress Scales-21.

measure anxiety-related symptoms, and also of the elevated cutoffs for these BSI subscales to detect anxiety disorders.

Depression Anxiety Stress Scales-21 Stress is not a direct measure of GAD but is a measure of general distress. Consistent with previous research, individuals with GAD scored highest on DASS-21 Stress compared to other disorders.[20] When compared with diagnoses of GAD in this sample, DASS-21 Stress scale correctly identified all 3 patients with a diagnosis of this disorder and identified 10 other participants as having elevated levels of stress, but they did not have GAD diagnoses.

Somatic presentation

Of the three participants with a depression diagnosis but not identified by DASS-21 Depression, two were also missed by BSI Depression. BSI Depression does not contain somatic or vegetative items, but BSI does include somatic items in the Somatization subscale and the GSI. Of the three missed by DASS-21, only one had above-threshold Somatization and GSI scores, but they also had an above-threshold BSI Depression score. Thus, this case was detected without items asking about somatic symptoms. The other two cases missed by DASS-21 did not score highly on the Somatization or the GSI measures. Therefore, in this sample, individuals with a depression diagnosis, but not identified by DASS-21 Depression scale, were not missed simply because of the absence of somatic items on this scale.

Discussion

The average scores of all DASS-21 scales and BSI subscales in this sample were below clinical threshold levels, even when using the traditional cutoff scores on BSI. The clinician diagnosed seven participants with some form of depression and seven with some anxiety condition. A total of 11 different participants had either an anxiety or depression diagnosis.

Examination of DASS-21 and BSI revealed some problems for concurrent validity. DASS-21 Anxiety and Depression had strong positive associations with BSI Anxiety and Depression, respectively. However, all three scales of DASS-21 had positive associations with eight of the nine BSI subscales and with GSI. The only BSI subscale that was not associated with any of DASS-21 scales was Somatization, reflecting the absence of somatic symptom items in DASS-21. Other research using BSI in patients with SCI has found construct validity problems, indicating that the BSI may measure general distress.[16] The level of interrelatedness of DASS-21 scales with BSI may be due to the subscales of BSI loading heavily on just one construct in this population.

The present study is consistent with previous findings that rates of depression are higher with self-report measures than for a structured interview.[9] The rates of anxiety were also higher using the self-report measures. The only instance when self-report measures in the present study found lower rates of psychological symptoms than when using a structured interview was when using any of BSI elevated cutoff scores. Prevalence rates of depression and anxiety were higher using DASS-21 than BSI, even when compared to the BSI GSI measure, which includes somatic items. If measures of anxiety and depression are confounded by individuals endorsing items that correspond to the physical sequelae of SCI, then prevalence rates of these conditions on measures that include somatic items should be higher than on those measures that exclude these items. This provides some support to those who have argued that measures that do not assess somatic symptoms may be useful in screening settings.[8]

Depression Anxiety Stress Scales-21 Depression and BSI Depression were equally sensitive, although test specificity for DASS-21 Depression was lower than that for BSI Depression. Test performance of BSI Depression in this sample was similar to previous research on its use in SCI, which found a sensitivity of 0.57 and a specificity of 0.87 for this measure.[14]

Depression Anxiety Stress Scales-21 Anxiety and BSI Anxiety performed equally well at correctly identifying those with Anxiety disorders and had a high level of sensitivity. Compared to BSI subscales that measure symptoms of Anxiety, DASS-21 Anxiety and BSI Anxiety had the highest sensitivity and made the fewest false-negative errors. DASS-21 Stress correctly identified all participants with GAD. Using BSI elevated cutoff scores for identifying those with Anxiety and Depression led to lower levels of sensitivity than the original cutoffs, due to a high number of false negatives and higher specificity because they detected few or no false positives.

Measures used for screening are intended not as diagnostic tools but aim to identify those who may require further evaluation and possible intervention. In screening settings, the accuracy of assessment, or minimizing the risk of false positives, may not be as important as correctly identifying as many as possible of those who would be diagnosed and reducing the number of false negatives (sensitivity). False positives will presumably be identified in further assessment, such as at clinical interview. Comparison of DASS-21 to clinician judgment showed that this measure has clinical utility as a screening measure for assessing Depression, Anxiety and Stress in patients with SCI. In the current sample, DASS-21 may be most useful for identifying those with anxiety disorders, and the Stress scale may provide a good indicator of those with GAD. The use of DASS-21 to

identify depressed patients with SCI requires more caution because a number of patients with a depressive disorder may go undiagnosed.

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