

ORIGINAL ARTICLE

RELIABILITY AND CONSTRUCT VALIDITY OF THE MALAY VERSION OF THE DEPRESSION ANXIETY STRESS SCALES (DASS) IN AUTOMOTIVE ASSEMBLY WORKERS IN MALAYSIA

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ABSTRACT

To examine the reliability and construct validity of the Malay Version of the Depression Anxiety Stress Scales (DASS), a validation study was conducted in 184 automotive assembly workers. The internal consistency and construct validity were assessed using Cronbach's alpha coefficient and exploratory factor analysis. The Cronbach's alpha coefficients for DASS-Depression, DASS-Anxiety and DASS-Stress were 0.91, 0.88 and 0.89, respectively, indicating satisfactory internal consistency. Exploratory factor analysis showed three meaningful common factors that could explain the three theoretical constructs of this instrument. These results suggested that the Malay version DASS is reliable and valid for assessing the self-perceived depression, anxiety and stress among Malaysian automotive workers.

Keywords: Depression Anxiety Stress Scales, DASS, Validation

INTRODUCTION

The Depression Anxiety Stress Scales (DASS) is a 42-item self-perceived measure of core symptoms of depression, anxiety and stress. Since its development by Lovibond and Lovibond¹ using data collected over the period 1979-1990, DASS has been extensively used in different settings and different cultures²⁻¹⁰. The DASS was originally developed to assess the full range of core symptoms of anxiety and depression while providing maximum discrimination between the scales of anxiety and depression¹¹. However, it was revealed that the control items tended to form a third group in their analyses of scale structure consisting items characterized by chronic non-specific arousal. More items relating to agitated/easily upset, difficulty relaxing, impatient, nervous arousal and irritable/overactive were added to this group and the third scale, the stress scale was developed¹². The first version of these scales, containing 14-item for depression, 12 items for anxiety, and 16 items for stress, was labelled as a Self Analysis Questionnaire (SAQ). After minor revision of the SAQ scales into 14-item per scale, the final version was named as the Depression Anxiety Stress Scales (DASS). Lovibond and Lovibond¹ have also derived a short-form of the questionnaire containing 21-item, 7-item for each scale, and called as DASS-21¹.

Nowadays, the DASS1 has been validated in different languages in Australia¹³, United States of America (USA)¹¹, United

Kingdom (UK)¹², Canada¹⁴, Spain¹⁵ and Netherlands¹⁶. These studies concluded that the DASS appears to be an excellent instrument for measuring features of depression, hyper-arousal, tension and consistent with the tripartite model of anxiety and depression as proposed by Clark and Watson¹⁷. There is evidence that the DASS is a valid and reliable instrument when used in general population samples^{12,13,18}.

Increasing occurrences of mental health problems such as depression, anxiety and stress among workers presents practical demands for employers and occupational health practitioners to assess self-perceived depression, anxiety and stress symptoms in workers with a reliable and validate instrument. Considering these demands, the Depression Anxiety Stress Scales (DASS) would seem to be a promising instrument for use in occupational healthcare for screening the depression, anxiety and stress symptoms. Nieuwenhuijsen *et al*¹⁶ have shown that the psychometric properties of the DASS are suitable for use in a population of workers absent from work because of mental health problems and can be helpful in ruling out cases with an anxiety disorder or depression in a population of employees with mental health problems.

Since the DASS is a brief, simple, easy to complete, and its application in research settings for assessing self-perceived depression, anxiety and stress are well documented and has never been available in Malay version; it was decided

to translate and examine the reliability and validity of this instrument designed to screen the depression, anxiety and stress symptoms in Malaysian automotive assembly workers.

METHODOLOGY

Study design

This is a cross-sectional study designed to validate the Malay version of the DASS among 184 automotive assembly workers in two major plants in Pahang, Malaysia. This study is a part of a national research project entitled "Occupational Stress Intervention Study in Petrochemical and Automotive Assembly Plants: Developing and Evaluating a Stress Management Program at Workplaces" (OSIS) under the research program 'Quality of Work Life-National Occupational Risk Management Study and National Injury Prevention' (NORMS) funded by the Malaysia's Ministry of Science, Technology and Innovation (MOSTI) under its 8th Malaysia Plan.

Ethical Approval

The research protocol was reviewed and approved by the Research and Ethics Committee, School of Medical Sciences, Universiti Sains Malaysia Health Campus, Kelantan, Malaysia. Permission to carry out the study was obtained from the Managers of Human Resources of both automotive assembly plants. Consent from the workers were obtained through written informed consents before participating in the study.

Translation

Several steps were followed during translation of the DASS. Firstly, the DASS was translated into Malay language by two trained research officers who were fluent in both Malay and English. The second step involved editing and making needed modifications to the Malay version. Thirdly, back translation into English by one of the authors who was not shown the original English text to ensure high face validity. The backward translation was compared with the original items to ensure it did not affect the construct of instrument. Once the back translation was found to be acceptable, the Malay version of the DASS-21 was pilot tested to assess its face and content validity in Malaysian automotive workers. A convenience sample of 50 workers from an automotive assembly plant in Kota Bharu, Kelantan were recruited in June 2004. Any comments and difficulties that participants encountered during pilot study were recorded by researchers. All records were reviewed and necessary changes were made to make it more understandable.

Questionnaire

The DASS consisted 14-item self-report of three scales (DASS-Depression scale, DASS-Anxiety scale and DASS-Stress scale) and divided into subscales of 2-5 items with similar content. The DASS-Depression scale comprised of seven subscales including dysphoria, hopelessness, devaluation of life, self-depreciation, lack of interest/involvement, anhedonia, and inertia. The DASS-Anxiety scale comprised of four subscales including autonomic arousal, skeletal musculature effects, situational anxiety and subjective experience of anxious affect. The DASS-Stress scale is sensitive to levels of chronic non-specific arousal containing five subscales namely easily upset/agitated, impatient, difficulty relaxing, nervous arousal and irritable/over-reactive¹. Subjects are asked to use a 4-point severity/frequency scale (0=Did not apply to me at all, 1=Applied to me to some degree, or some of the time, 2=Applied to me a considerable degree, or a good part of the time, and 3=Applied to me very much, or most of the time) to rate the extent to which they have experienced each state over the past week.

There were two procedures of cut-off values to classify individuals into five levels of severity ratings of the self-perceived of core symptoms of depression, anxiety and stress (1=Normal, 2=Mild, 3=Moderate, 4=Severe, and 5=Extremely severe) provided by the DASS manual 1 (Table 1). Firstly, scores for DASS-Depression, DASS-Anxiety and DASS-Stress are calculated by summing the scores for the relevant items and converting these scores into percentile scores. Based on the cut-off percentiles, workers scoring less than 78 percentile are considered normal; 78 to 87 percentiles as mild; more than 87 to 95 percentiles as moderate; more than 95 to 98 percentiles as severe; and more than 98 to 100 percentiles as extremely severe. Secondly, the raw scores for each subscale (DASS-Depression, DASS-Anxiety and DASS-Stress) are summed and converted into z scores. Based on the z scores, workers scoring less than 0.5 are considered normal; 0.5 to 1.0, mild depression, anxiety or stress; more than 1.0 to 2.0, moderate depression, anxiety or stress; more than 2.0 to 3.0, severe depression, anxiety or stress; and more than 3.0, extremely severe depression, anxiety or stress¹. Age, income per month, duration of work, education level, gender and marital status was also obtained from the participants.

Table 1. General guidelines for the DASS severity ratings

| Severity Ratings | Z Score | Percentile | DASS-Depression | DASS-Anxiety | DASS-Stress |
|---------------------|-------------|------------|-----------------|--------------|-------------|
| 1. Normal | < 0.5 | < 78 | 0 - 9 | 0 - 7 | 0 - 14 |
| 2. Mild | 0.5 - 1.0 | 78 - 87 | 10 - 13 | 8 - 9 | 15 - 18 |
| 3. Moderate | > 1.0 - 2.0 | > 87 - 95 | 14 - 20 | 10 - 14 | 19 - 25 |
| 4. Severe | > 2.0 - 3.0 | > 95 - 98 | 21 - 27 | 15 - 19 | 26 - 33 |
| 5. Extremely Severe | > 3.0 | > 98 - 100 | ≥ 28 | ≥ 20 | ≥ 34 |

Data Collection

Workers were met at their worksite during working hours. The supervisors were asked to send their workers during rest hour to the room set aside for data collection. Recruitment of workers was done through the list of workers provided by the supervisors. Before self-administering the questionnaire, medical check ups were given as an appreciation for the workers' cooperation. The universal sampling method was used in this study. The DASS was distributed and self-administered to those workers and trained research officers were checked the returned questionnaires onsite to assure completeness. An average of 15 minutes was utilised to complete the DASS.

Statistical analysis

Data entry and analysis was done using the SPSS version 12.0.1⁹. Mean and standard deviations were calculated for continuous variables, and frequency and percentages for categorical variables. Internal consistency was evaluated by Cronbach's alpha coefficients for each scale. The construct validity of the instrument was examined using the exploratory factor analysis (EFA) with principal component extraction method and varimax rotation.

RESULTS

Demographic characteristics

A total of 184 workers of two major assembly plants on July 2006 were agreed to participate. The response rate was 100%. Table 2 summarizes the demographic characteristics of the study population. The average age, income per month and duration of work of the workers were 39.8 years, RM 3521.70 and 12.3 years, respectively. The majority were males (88.6%), married (93.5%) and at least have diploma and above (86.4%).

Reliability (internal consistency)

Result of the corrected Item Total Correlations (ITCs) and

Table 2. Demography characteristics of 184 automotive assembly workers

| Variable | Freq. | % |
|--------------------------|---------------------|---------------------|
| Age (years) | 39.8 ^a | 6.7 ^b |
| Income per month (RM) | 3521.7 ^a | 2097.9 ^b |
| Duration of work (years) | 12.3 ^a | 5.6 ^b |
| Education level | | |
| 1. Primary school | 7 | 3.8 |
| 2. Secondary school | 121 | 65.8 |
| 3. Higher school | 56 | 30.4 |
| Gender | | |
| 1. Male | 163 | 88.6 |
| 2. Female | 21 | 11.4 |
| Marital Status | | |
| 1. Single | 12 | 6.5 |
| 2. Married | 172 | 93.5 |

^a Mean and ^b Standard Deviation

Cronbach's alpha coefficients for all 42-item of the three DASS scales namely DASS-Depression, DASS-Anxiety and DASS-Stress were given in Table 3. Values for all corrected ITCs for the DASS-Depression were greater than 0.50 (range:

Table 3. Item-total correlations and Cronbach's alpha coefficients for the Malay version of DASS

| Item Summary | Reliability ^a | |
|--|--------------------------|--------------------|
| | ITC ^b | Alpha ^c |
| DASS-Depression | | |
| Q13 Sad and depressed | 0.69 | |
| Q26 Down-Hearted and blue | 0.74 | |
| Q10 Nothing to look forward to | 0.56 | |
| Q37 Nothing future hopeful | 0.54 | |
| Q21 Life not worthwhile | 0.68 | |
| Q38 Life meaningless | 0.57 | |
| Q17 Not worth much as a person | 0.60 | 0.91 |
| Q34 Felt worthless | 0.60 | |
| Q16 Lost interest in everything | 0.55 | |
| Q31 Unable become enthusiastic | 0.66 | |
| Q3 Couldn't experience positive | 0.60 | |
| Q24 Couldn't get enjoyment | 0.54 | |
| Q5 Couldn't get going | 0.70 | |
| Q42 Difficult to work up initiative | 0.60 | |
| DASS-Anxiety | | |
| Q2 Dryness of mouth | 0.50 | |
| Q4 Breathing difficulty | 0.60 | |
| Q19 Perspired noticeably | 0.44 | |
| Q23 Difficulty swallowing | 0.57 | |
| Q25 Aware of action of heart | 0.71 | |
| Q7 Shakiness | 0.69 | |
| Q41 Trembling | 0.55 | 0.88 |
| Q9 Situations made anxious | 0.55 | |
| Q30 Feared would be "thrown" | 0.49 | |
| Q40 Worried about situations/panic | 0.61 | |
| Q15 Feeling of faintness | 0.58 | |
| Q20 Scared without any good reason | 0.61 | |
| Q28 Felt close to panic | 0.38 | |
| Q36 Terrified | 0.38 | |
| DASS-Stress | | |
| Q1 Upset by trivial things | 0.50 | |
| Q11 Upset easily | 0.68 | |
| Q39 Agitated | 0.48 | |
| Q14 Impatient when delayed | 0.64 | |
| Q32 Difficulty to tolerating interruptions | 0.64 | |
| Q35 Intolerant kept from getting on | 0.57 | 0.89 |
| Q8 Difficult to relax | 0.55 | |
| Q22 Hard to wind down | 0.59 | |
| Q29 Hard to calm down | 0.64 | |
| Q12 Using nervous energy | 0.57 | |
| Q33 State of nervous tension | 0.69 | |
| Q6 Over-react to situations | 0.76 | |
| Q18 Touchy | 0.31 | |
| Q27 Irritable | 0.40 | |

^a Internal consistency reliability, ^b Corrected item-total correlation;

^c Cronbach's alpha

Table 4. Factor Loadings for the Malay version of DASS

| Item Summary | Factor Loadings ^a | | |
|--|------------------------------|----------|----------|
| | Factor 1 | Factor 2 | Factor 3 |
| DASS-Depression | | | |
| Q13 Sad and depressed | 0.70 | 0.21 | 0.24 |
| Q26 Down-Hearted and blue | 0.70 | 0.29 | 0.26 |
| Q10 Nothing to look forward to | 0.49 | 0.29 | 0.29 |
| Q37 Nothing future hopeful | 0.62 | 0.13 | -0.03 |
| Q21 Life not worthwhile | 0.65 | 0.26 | 0.25 |
| Q38 Life meaningless | 0.70 | 0.10 | 0.06 |
| Q17 Not worth much as a person | 0.50 | 0.20 | 0.37 |
| Q34 Felt worthless | 0.76 | 0.09 | 0.10 |
| Q16 Lost interest in everything | 0.47 | 0.33 | 0.30 |
| Q31 Unable become enthusiastic | 0.68 | 0.08 | 0.33 |
| Q3 Couldn't experience positive | 0.51 | 0.31 | 0.28 |
| Q24 Couldn't get enjoyment | 0.44 | 0.32 | 0.35 |
| Q5 Couldn't get going | 0.71 | 0.26 | 0.16 |
| Q42 Difficult to work up initiative | 0.59 | 0.36 | 0.09 |
| DASS-Anxiety | | | |
| Q2 Dryness of mouth | -0.05 | 0.36 | 0.53 |
| Q4 Breathing difficulty | 0.10 | 0.06 | 0.73 |
| Q19 Perspired noticeably | 0.26 | 0.06 | 0.44 |
| Q23 Difficulty swallowing | 0.42 | -0.11 | 0.62 |
| Q25 Aware of action of heart | 0.23 | 0.09 | 0.77 |
| Q7 Shakiness | 0.09 | 0.29 | 0.68 |
| Q41 Trembling | 0.26 | 0.29 | 0.41 |
| Q9 Situations made anxious | 0.05 | 0.42 | 0.53 |
| Q30 Feared would be "thrown" | 0.42 | 0.11 | 0.47 |
| Q40 Worried about situations/panic | 0.26 | 0.46 | 0.47 |
| Q15 Feeling of faintness | 0.12 | -0.01 | 0.72 |
| Q20 Scared without any good reason | 0.20 | 0.58 | 0.47 |
| Q28 Felt close to panic | 0.34 | 0.43 | 0.18 |
| Q36 Terrified | 0.37 | 0.38 | 0.17 |
| DASS-Stress | | | |
| Q1 Upset by trivial things | 0.08 | 0.52 | 0.31 |
| Q11 Upset easily | 0.23 | 0.68 | 0.14 |
| Q39 Agitated | 0.30 | 0.53 | -0.03 |
| Q14 Impatient when delayed | 0.07 | 0.61 | 0.26 |
| Q32 Difficulty to tolerating interruptions | 0.15 | 0.71 | -0.05 |
| Q35 Intolerant kept from getting on | 0.31 | 0.69 | -0.02 |
| Q8 Difficult to relax | 0.31 | 0.60 | 0.19 |
| Q22 Hard to wind down | 0.44 | 0.45 | 0.39 |
| Q29 Hard to calm down | 0.42 | 0.41 | 0.25 |
| Q12 Using nervous energy | 0.49 | 0.50 | 0.06 |
| Q33 State of nervous tension | 0.60 | 0.48 | 0.17 |
| Q6 Over-react to situations | 0.13 | 0.83 | 0.18 |
| Q18 Touchy | 0.16 | 0.21 | 0.27 |
| Q27 Irritable | 0.49 | 0.11 | 0.45 |

^a Principal Components Analysis with Varimax rotation

0.54 to 0.74) indicating that each item of this scale had good correlation with the other items comprising the overall scale score. Whereas, the values of the DASS-Anxiety and DASS-Stress scales were satisfactory - the values of corrected ITCs were greater than 0.40 (range: 0.50 to 0.76) except for three items. Two items of the DASS-Anxiety scale (Q28 'Felt close to panic', 0.38 and Q36 'Terrified', 0.38); and one item of the DASS-Stress scale (Q18 'Touchy', 0.31) were moderate values of corrected ITCs. Internal consistency of the Malay version of the Malay version of DASS was higher, with Cronbach's alpha coefficients for DASS-Depression, DASS-Anxiety and DASS-Stress were 0.91, 0.88 and 0.89, respectively.

Construct validity

Table 4 presents the results of EFA. All 42-item of the three DASS scales (DASS-Depression, DASS-Anxiety and DASS-Stress) were included in this analysis. EFA shows that the Factor 1 corresponded to the DASS-Depression. All items of this scale were loaded with the greatest loading, ranging from 0.44 to 0.74. The Factor 2 was corresponded to all items of the DASS-Stress with the greatest loading, ranging from 0.41 to 0.77, except four items. Three items of the DASS-Stress scale (Q29 'Hard to calm down'), (Q33 'State of nervous tension') and (Q27 'Irritable') were loaded in Factor 1 with loadings of 0.42, 0.60 and 0.49, respectively. One item (Q18 'Touchy') was loaded in Factor 3 with loading of 0.27. The Factor 3 was corresponded to the DASS-Anxiety. Three items of this scale (Q20 'Scared without any good reason', Q28 'Felt close to panic' and Q36 'Terrified') were loaded in Factor 1 with loadings of 0.58, 0.43 and 0.38 respectively.

DISCUSSION

The internal consistency of the DASS shows that the Cronbach's alpha coefficients for DASS-Depression, DASS-Anxiety and DASS-Stress were 0.91, 0.88 and 0.89, respectively. There is no absolute criterion for the reliability of an instrument¹⁸. Anastasi²⁰ has suggested that the Cronbach's alpha coefficient should be at least 0.85 if an instrument is to be used to draw inferences concerning an individual. Based on this criterion, we assumed that our Malay version of the DASS-Depression, DASS-Anxiety and DASS-Stress scales possess adequate reliability and therefore confirmed the adequacy of the internal consistencies of these scales. These findings were comparable to samples those obtained from first year psychology students at the University of New South Wales in Australia¹³, general adult of UK population¹², patients presenting for assessment and treatment at the Phobia and Anxiety Disorders Clinic, Center for Stress and Anxiety Disorder in USA¹¹, outpatients diagnosed with psychiatry illnesses using Diagnostic and Statistical Manual of Mental Disorder (DSM) and non-clinical volunteers in Canada¹⁴, students from the School of Psychology of the University of Barcelona¹⁵ and workers with mental health problem in Netherlands¹⁶ with Cronbach's alpha coefficients for DASS-Depression, DASS-Anxiety and DASS-Stress were ranged from 0.91 to 0.97, 0.81 to 0.95 and 0.88 to 0.97, respectively.

The results of EFA showed that three factors were clearly associated with the constructs of DASS-Depression; DASS-Anxiety, and DASS-Stress as proposed by Lovibond and Lovibond (1995) although some changes may be necessary to improve the items of DASS-Stress scale. In line with the findings of other studies¹¹⁻¹⁶, the construct validity of the DASS was satisfactory. In our study, EFA shows that Factor 1 corresponded to all items of the DASS-Depression scale. All items of the DASS-Anxiety containing items enquiry symptoms of autonomic arousal, skeletal musculature effects and situational anxiety, except for three items that enquiry subjective experience of anxious affect symptom were loaded in Factor 3. Our study suggested that this item more strongly associated with DASS-Stress scale. Meanwhile, all items of the DASS-Stress scales were corresponded to Factor 2 except for four items that related to symptoms of difficulty relaxing, nervous arousal and irritable or over reactive symptoms.

There are a number of limitations of the study that may restrict its generalizability. Firstly, the sample size was rather small. A clear gender bias in the sample size selection was present and sample has been drawn from a very specific population. Therefore, we could not infer this finding to the Malaysian worker population. Secondly, no formal diagnostic structured interview using the Fourth Diagnostic Statistical Manual of Mental Disorder (DSM-IV) and the Tenth International Classification of Disease for Mental Disorder (ICD-10) tools was conducted in order to provide a 'gold standard' against which to validate the DASS for its use in automotive workers as well as various working population in Malaysia. Thirdly, this study is on standard reliability/construct validity. We did not compare it to similar instrument that measures the same psychopathology such as the Hospital Anxiety and Depression Scale (HADS), the Beck Anxiety Inventory (BAI), Beck Depression Inventory (BDI). However, previous studies have shown that the DASS does possess adequate convergent validity¹³. Crawford and Hendry¹² have shown that the DASS-Depression was highly correlated with sAD-Depression scale (0.78). Similarly, the correlation between DASS-Depression and HADS-Depression (0.66) was significantly higher than the HADS-sAD correlation ($t=4.19$, $p<.001$). DASS-Anxiety scores also exhibited a high convergent validity. The correlation between DASS-Anxiety and sAD-Anxiety (0.72) was significantly higher than that between the sAD and HADS-Anxiety scales (0.67). Meanwhile, Lovibond and Lovibond¹³ reported that BAI²¹ and DASS-Anxiety scale were highly correlated ($r=0.81$), as were the BDI²² and DASS-Depression scale ($r=0.74$).

CONCLUSIONS

This study demonstrated that the three scales of DASS were reliable and valid for assessing the core symptoms of depression, anxiety and stress among Malaysian automotive assembly workers although some changes may be necessary to improve DASS-Stress items. It should also be emphasized that the current study offers only preliminary findings. Complete

validation demands the application of the psychometric scales in larger samples and more sophisticated methodology, including the use of test-retest reliability, confirmatory factor analysis to test the fit of the model, and convergent validity of the instrument.

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