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## Perceived Stress Scale Psychometric Validation for Malaysian Diabetic Patients

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### ABSTRACT

**Aims:** The purpose of this study was to provide factorial analytic findings, construct validation and normative data for the Malaysian diabetic patients. Gender difference was also examined with racial response to PSS-10.

**Study design:** Population base cross sectional survey.

**Place and Duration of Study:** Penang between Nov 2009 and March 2010.

**Methodology:** Cluster random sampling technique was employed for the selection participants in the community. A total of 1924 diabetic patients with age  $\geq 18$  (mean age = 39.51) were approached; 992 of them were female and 932 of them were male. People rated how often they had experienced these feelings in the last week on a five-point Likert scale from 0 = never to 4 = very often. The scale was translated into Malay language independently by two psychological counselors who had at least a master's degree and bilingual efficiency. The LISREL 8.30 program was used to assenting factor analysis. Chi-square ( $\chi^2$ )/df (degree of freedom) ratio, GFI (goodness of fit index), AGFI (adjusted goodness of fit index) and root mean square error of approximation (RMSEA) were used to evaluate the fit of the model (two-factor).

**Results:** Barlett's test of sphericity was 1603.417 ( $p < 0.001$ ) and Kaiser-Meyer-Olkin measure of the sampling adequacy was 0.83. Varimax rotation was conducted with these two identified factors. Factor A integrated items 1, 2, 3, 6, 9 and 10, labeled as 'Perceived Avoidance' while Factor B containing items 4, 5, 7, 8 and labeled as 'Perceived

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Controllable'. Item variance showed 45.73 per cent of accountability with Factor A and 13.43 per cent with Factor B. Mandatory factor analysis for the two-factor of Malaysian version of PSS yielded: GFIs:  $\chi^2 (39) = 127.846, p < 0.001, \chi^2/df = 4.1$ ; GFI = 0.97; AGFI = 0.96; RMSEA = 0.06 and CFI = 0.99.

**Conclusion:** PSS-10 is a reliable tool for assessing the stress measures among diabetic living of the society. High stress level is identified among the females as compared to male diabetic patients. Overall the whole cohort has high perceived stress level.

*Keywords: Diabetes mellitus; Malaysia; perceived stress scale; PSS-10; stress;*

## 1. INTRODUCTION

Increase disease burden of diabetes is a thread to medical professionals worldwide, World Health Organization (WHO) estimates a rise of 55% approx in current (2007) diabetes patients by 2025 (International Diabetic Federation Atlas, 2006). In 2001, 16.7 million adults in the United States were estimated to have been diagnosed with DM (Mokdad et al., 2003). Findings have been equivocal in regards to whether transient or chronic stress interferes with metabolic control (Aguilar-Zavala et al., 2008; Farrell et al., 2004; Marin et al., 2007; Seiffge-Krenke and Stemmler, 2003; Spiess et al., 1994; Stewart-Knox, 2005).

Aside from the potential physiological impact, chronic stress may interfere with a person's capacity to adhere to lifestyle factors that are essential to diabetic health. Interrupted sleep also results from chronic stress (Åkerstedt et al., 2007), which is particularly concerning in a diabetic population given recent findings that insufficient quantity and/or poor quality of sleep are associated with obesity and metabolic dysfunction (Martins, et al 2008; Spiegel et al., 2005). Although the definitions of stress have varied, it is generally characterized as physiological and psychological consequences that occur when the demands placed on a person exceed their individual and social resources (Compas, 1987; Compas et al., 1994; Lazarus and Folkman, 1984). How a stressor interacts with individual characteristics in producing certain adaptive or maladaptive outcomes depends on two critical processes that are theorized to mediate the relationship between the environment and individual, cognitive appraisal and coping strategies (Lazarus and Folkman, 1984). Appraisal essentially involves evaluating the importance of a stressor to one's personal well-being (Lazarus and Folkman, 1984). Coping responses can alter the effect of a stressor on individual functioning by increasing or decreasing the negative effects of stressors, in turn exacerbating or alleviating related psychological distress (Compas, 1987; Compas et al., 1993; Herman-Stabl et al., 1995).

It is important to emphasize that stress appraisals are determined not solely by the stimulus condition or the response variables, but rather, by the persons' interpretations of their relationships to their environments (Cohen, Kessler, and Gordon, 1997). The only empirically established index of which researchers are aware that falls into the category of general appraisal instrument is the Perceived Stress Scale (PSS) (Cohen et al., 1983). The PSS was developed based on Lazarus's concept of appraisal. The PSS measures the degree to which situations in one's life are appraised as stressful (Lazarus and Folkman, 1984). The 14 items in the original scale were designed to tap the degree to which respondents find their lives unpredictable, uncontrollable and overloading. The PSS was found to be a good measure to

possess good psychometric qualities (e.g. adequate reliability and predicted associations with other indices of stress; Cohen and Williamson, 1988).

The factor structure and psychometric properties of the PSS were examined with psychiatric patients. Beck Depression inventory was also used for the predictive validity of the PSS. Factor analysis of the PSS established that the scale consisted of two factors. The first factor was comprised primarily of items reflecting adaptational symptoms. The second factor was found to reflect coping ability (Hewitt et al., 1992).

Extensive normative data on 2,387 respondents are available for not only the original 14-item version of the PSS, but also ten-item (PSS-10) and four-item versions, which provide a rich reference base for studying perceived stress across gender, SES, age groups, race and other characteristics. Although all three versions provide strong psychometric data and are related to relevant outcomes in expected ways, Cohen and Williamson (1988) noted the relative superiority of, and therefore, recommend the 10-item version. Roberti et al. (2006) updated psychometrics of the PSS-10 and explanatory factor analysis revealed a two factor structure measuring Perceived Helplessness and Perceived Self-efficacy. Items 1, 2, 3, 6, 9 and 10 were loaded in the first factor and items 4, 5, 7 and 8 were loaded in the second factor. In the present study, the 10-item version is used. The purpose of this study was to provide factorial analytic findings, construct validation and normative data for the Malaysian diabetic patients to PSS-10 scale. Gender difference was also examined with racial response to PSS-10.

## **2. EXPERIMENTAL DETAILS**

### **2.1 Participants**

A population based survey was conducted in Penang during Nov 2009 to March 2010. Penang is one of the fourteen states located in the northwest of Malaysia and comprises of the mainland and Penang Island. Its population is 1580.0 thousand. Different ethnic groups inhabiting the state are Chinese (46.1%), Malays (42.9%), Indians (10.6%), and other minorities (0.4%) (Department of Statistics, Malaysia, 2010).

Sample size with 50% response rate, 5% margin of error and 95% confidence interval is 239 (1580,000 total population) but literature shows that population based survey must contain a sample of minimum 1500 to 2000 disease population (per 2-3 million population). We are assuming that population based survey should be in this range of sample so our sample size is pre-determine in a figure of 1924 (1.58 million population).

Cluster random sampling technique was employed for the selection participants in the community. Participants were approached in plazas, malls, shopping marts and invited to take part in this survey. To avoid bias all the three main ethnic groups were included according to the racial distribution in the country.

### **2.2 Instrument**

The PSS-10, (Cohen et al., 1983) measures an individual's appraisal of their life as stressful (i.e. unpredictable, uncontrollable and overloading). Item examples include, 'How often have you felt nervous or stressed?' and 'How often have you felt confident about your ability to handle your personal problems?' People rated how often they had experienced these

feelings in the last week on a Likert scale from 0 = never to 4 = very often. PSS-10 scores were obtained by reversing the scores on the four positive items; the items were 4, 5, 7 and 8. Total scores range from 0 to 40, with higher scores indicating greater overall distress. Coefficient alpha reliability was 0.86 for a newly diagnosed breast cancer population consistent with alphas from 0.75 to 0.86 in the general literature (Cohen et al., 1983).

The PSS-10 was used for its improved internal reliability and factor structure over other versions of the PSS (Cohen and Williamson, 1988). The translation of scale into Malay language was done with a qualitative method that is a one-way translation (translation and control of the questionnaire with a different group of translators after inquiry (Savasır, 1994). The scale was translated into Malay language independently by two psychological counselors who had at least a master's degree and bilingual efficiency. Later, center of language and translation (USM) selected the best anonymous version among two translations; also, the researcher and co-researchers compared the match and contrast between the translations. The reconcile version was then back translated to the original language by a native speaker of the English language and fluent in Malay language. Few minor discrepant items were found. Finally, a Malay language teacher reviewed the absolute form and her suggestions were added into the translation. Then, this form was presented to the researcher team working on this project.

### **2.3 Procedure**

Verbal consent was taken from the respondents and instructions were given to fill the questionnaires. All questionnaires were anonymous so to maintain the privacy participants were asked to fold the questionnaire after filling. Ethical approval was obtained from the Social and Behavioural Research Ethics Committee, Universiti Sains Malaysia.

The LISREL 8.30 program Chicago: Scientific Software International Inc. was used to assenting factor analysis. A maximum likelihood was used for the estimation method, and the integrated two-factor model was tested. Chi-square ( $\chi^2$ )/df (degree of freedom) ratio, GFI (goodness of fit index), AGFI (adjusted goodness of fit index) and root mean square error of approximation (RMSEA) were used to evaluate the fit of the model (two-factor). The following criteria were used to indicate goodness of fit: GFI, AGFI and CFI (comparative fit index) 0.90 and higher, RMSEA 0.08 or lower and Chi-square/df ratio 3 or lower (Bentler, 1990; Bollen, 1990; Cole, 1987).

### **3. RESULTS**

Principal component factor analysis was done for the analysis of 10 item PSS dimensionality with a sample of 1924 diabetic patients. Principle determination of factors to rotate based on; hypothesis that the measure was two-dimensional, the scree test and the interpretability of the factor solution. A total of 1924 diabetic patients with age  $\geq 18$  (mean age = 39.51) were approached, 992 of them were female and 932 of them were male.

Barlett's test of sphericity was 1603.417 ( $p < 0.001$ ) and Kaiser-Meyer-Olkin measure of the sampling adequacy was 0.83, which supported the use of these data in a factor analysis for further investigation. Initial analysis yielded two components with Eigenvalues exceeding 1, accumulating the total of 59.16 per cent of the variance. Scree-plot inspection indicated two factors. Varimax rotation was conducted with these two identified factors. Factor A integrated

items 1, 2, 3, 6, 9 and 10, labeled as 'Perceived Avoidance' while Factor B containing items 4, 5, 7, 8 and labeled as 'Perceived Controllable'.

In this study, the Malaysian adaptation of PSS showed that the Factor A consisted of all the items of negative experiences and the Factor B consisted of all items of positive experiences. But on synchronizing the factor loading, item 5 and 9 both cross loaded onto both factors. Depending on different scope of studies as to establish equivalence and as theoretically item 5 was an item of positive experience so it was incorporated in 'controllable' factor, but item 9 remained in 'avoidance' factor. Item variance showed 45.73 per cent of accountability with Factor A and 13.43 per cent with Factor B. Detailed descriptive information and factor analytical findings for 10 scale items are presented in Table 1.

On the first phase of model evaluation, six items related to 'Avoidance' were specified to identify with Perceived Avoidance Factor, and other four 'Controllable' related items were specified to identify with Perceived Controllable. Mandatory factor analysis for the two-factor of Malaysian version of PSS yielded: GFIs:  $\chi^2(39) = 127.846$ ,  $p < 0.001$ ,  $\chi^2/df = 4.1$ ; GFI = 0.97; AGFI = 0.96; RMSEA = 0.06 and CFI = 0.99. This information indicated a good fit but the high  $\chi^2/df$  ratio reflects the probability of large sample size.

**Table 1: Varimax-rotated factor loadings, communalities, Eigenvalues, explained variance of Malaysian version of Perceived Stress Scale (2-factor model)**

Item no.	Communalities	Factor A Avoidance	Factor B Controllable	M	SD
1	0.53	0.72		2.09	0.99
2	0.59	0.77		1.95	1.15
3	0.48	0.65		2.29	1.14
5	0.55	0.60	0.52	1.77	1.01
6	0.51	0.70		1.96	1.05
9	0.60	0.71	0.45	2.37	1.03
10	0.64	0.75		1.41	1.17
4	0.51		0.71	1.59	0.97
7	0.60		0.75	2.01	0.95
8	0.61		0.77	1.86	0.97
Eigenvalue		4.57	1.34		
% of Variance	Total 56	45.73	13.43		

Standard variance values and multiple correlations of the items of Malay version of PSS – 10 were presented in Table 2.

The mean [Mean (M) = 19.35] and standard deviation [SD = 6.84] were computed for the total score and two factors of the Malaysian version scale. Perceived Avoidance [M = 11.98; SD = 4.82] and Perceived Controllable [M = 7.23; SD = 2.09]. Independent sample t-Test was used to identify the difference in between gender in the perception of stress. Findings suggested significant difference between male (M = 18.67; SD = 5.13) and female (M = 21.37; SD = 7.24) on the PSS – 10 and the total score, ( $t(1924) = 3.91$ ,  $p < 0.001$ ). One way ANOVA computed no significant ( $p < 0.91$ ) difference of perceived stress among different races.

Cronbach's alpha reliability coefficients for the PSS – 10 were: PSS – 10 total score (ten items; 0.81); Perceived Avoidance factor (six items; 0.87) and Perceived Controllable (four

items; 0.75). Finally the correlation analysis with total Perceived stress score to Factor A (0.71,  $p < 0.01$ ) and Factor B (0.49,  $p < 0.01$ ) indicating that subjects with more health complaints have higher level of perceived stress.

**Table 2: Multiple correlations of the items of two-factor model.**

Characteristics	$\lambda$	SE	$t$	$R^2$
<b>Perceived Avoidance</b>				
1	0.65	0.04	16.13	0.44
2	0.73	0.05	18.21	0.57
3	0.61	0.05	13.55	0.39
6	0.67	0.05	15.98	0.48
9	0.63	0.05	15.31	0.40
10	0.77	0.04	20.12	0.67
<b>Perceived Controllable</b>				
4	0.57	0.05	10.12	0.35
5	0.79	0.05	17.27	0.59
7	0.55	0.05	11.01	0.31
8	0.63	0.05	14.09	0.42

#### 4. DISCUSSION

Significance of this study was to sought out the applicability of PSS – 10 among diabetic patients in general population. Since long it was argued that a psychometrically evaluation reflects the global measure of perceived stress and whether it could provide valuable information about the relationship between pathology and stress index. PSS measures the extent to which situations in one's life are appraised as stressful (Cohen et al., 1983).

In the objective line of this study, a translation and adaptation of PSS into Malaysian language was accomplished. Confirmatory factor analysis was conducted to explore the 2-factor model. Results revealed a two-factor model structure measuring Perceived Avoidance and Perceived Controllable, which is consider as the novelty of the study. The current study findings show that the PSS-10 is a reliable and valid instrument for the assessment of perceived stress among diabetic patients at community level. Gender difference to perceived stress was observed in this study, that is in the parallel line of findings of Mirowsky and Ross (1995) stated that gender influences the appraisal process of stressful events in ways that are consistent with the differing socialization patterns of males and females. Matud (2004) examined gender differences in stress and coping in a large sample (1566 women and 1250 men) between 18 and 65 years old, with different socio-demographic characteristics. The results of multivariate analysis of covariance, after adjusting for sociodemographic variables, indicated that the women scored higher than the men in chronic stress and minor daily stressors. Although there was no difference in the number of life events experienced in the previous 2 years, the women rated their life events as more negative and less controllable than the men.

The use of PSS-10 with both researcher and counselors working with university students will obtain the data for the future implication and baseline applications. However, this instrument can be used with the general population as mentioned in the original version, hence this study is one of its own kind with the subjects of pathological disorder (diabetes mellitus) from general population.

The major gap in such type of cross-cultural research methodologies on health outcomes is that the most of measurements have been developed in English-speaking countries and there are relatively few measurements which have been properly constructed or appropriately translated and evaluated in non-English-speaking culture (Hutchinson et al., 1996). Therefore the adaptation of Malaysian PSS-10 will give researcher the opportunity to conduct cross-cultural studies related with the appraisal of stress in the society and in concern with the other cultural or pathological variables. In future it would be helpful to identify and minimize the stressors from the community as to ensure healthy living.

#### **4. CONCLUSION**

Psychometric validation of perceived stress scale in Malay version shows that the PSS-10 is a reliable tool for assessing the stress measures among diabetic living of the society. High stress level is identified among the females as compared to male diabetic patients. Overall the whole cohort has high perceived stress level.

#### **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

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