# Validity, reliability and factorial structure of the Job Stress Inventory for Thai dentists

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## Abstract

*Objectives:* No instrument for assessing dentists' job stress has been developed in Thailand. The objectives of this study were to describe the development of a Job Stress Inventory (JSI), a new self-report measure, and to assess its reliability, validity and factorial structure.

*Methods:* A systematic random sample of 733 practicing dentists in Thailand was sent a mailed questionnaire that included the JSI and other questions. The JSI consisted of 30 items in a 5-point Likert format; a higher score reflected a higher level of job stress. Reliability was assessed by Cronbach's alpha internal consistency coefficients. Construct validity was examined by exploratory factor analysis. Criterion validity was assessed through correlation to the Maslach Burnout Inventory (MBI).

*Results:* An exploratory factor analysis with principal components solution revealed a five-factor structure that explained 58.8% of the total variance. The overall JSI scores and all of the subscales exhibited high internal consistency, with Cronbach's alphas ranging from 0.77 to 0.94. All items passed criteria for item convergent and discriminant validities. There were moderate correlations between the JSI and MBI's subscales (r = -0.34-0.56).

*Conclusion:* This study indicated that the JSI is a reliable and valid measure and has possible utility for assessing dentists' job stress in heterogeneous practice settings.

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*Key words: dentist; factor analysis; job stress; reliability; validity*

## Introduction

The most commonly accepted definition of stress is that proposed by Lazarus: "stress arises when individuals perceive that they cannot adequately cope with the demands being made on them or with threats to their well-being"[1]. The emphasis on coping with demand prompts the development of two important theoretical models for occupational stress. These are the demand-control model by Karasek and Theorell[2] and the effort-reward imbalance model by Siegrist[3]. According to the demand-control model, a higher level of stress is expected in workers with high psychological demands of work and low job control. In contrast to the demand-control model which emphasizes job control, the effort-reward imbalance model emphasizes the rewards, including money, esteem, career opportunities, and job security. A state of emotional distress is expected under high-effort and low-reward conditions.

Dental profession has long been recognized as a stressful career. The monitoring of levels of job stress in dentistry is particularly important since there is evidence suggesting that job stress negatively affects the quality of patient care[4]. Literature has linked occupational stress with mental and physical health problems[5]. Dentists are susceptible to professional burnout, anxiety disorders and clinical depression, due to the nature of dental practice. In addition, the correlation between job stress and turnover intention among dental personnel is also established[6]. Given the importance of quality of care, dentists' well being, and retention of dentists in practice, psychometrically sound measures of job stress among dental professionals are required.

Numerous scales have been developed and utilized to measure job stress of dentists and other healthcare workers[7–9]. For instance, Wilson et al[7] reported a 30-item instrument consisting of 5 scales, namely time-, job-, income-, staff-, and patient-related. The instrument was designed to assess occupational stress in UK general dental practitioners. Gorter et al[8] in the Netherlands developed the Dentists' Experienced Work Stress Scale (DEWSS), an instrument covering common aspects of dental work of Dutch dentists. The developers of the instrument have demonstrated satisfactory reliability and validity. Most of previous research on dentists' job stress have been conducted in the United States and the European Communities, which dentists predominantly work in private settings. Research evidence from other healthcare workers demonstrates that public healthcare organizations encompass different sets of stressors that tend to emphasize on aspects of the organization, such as lack of resources and difficulties with other staff[10]. Very few research on dentists' job stress has, however, been conducted among dentists working in public settings[11]. In a pluralistic healthcare system, such as in the case of Thailand, a significant number of dentists are practicing in either public or private sectors. No instrument has been developed in Thai or designed specifically to measure dentists' job stress in such public-private mix. The lack of a psychometrically validated measure hinders the research into issues of comparative stress levels in public and private settings. This leaves several healthcare manpower problems inadequately unexplored from the organizational psychology perspective, including the recruitment and retention of dentists in public/private sectors and the 'brain-drained' phenomenon from public to private sectors.

This research is an initial effort to develop a new self-report instrument, the Job Stress Inventory (JSI),

to measure job stress among Thai dentists. The purposes of this study were to describe the development of the JSI, and to assess its reliability, validity and factorial structure. It is hoped that the instrument will facilitate further research about possible effects of job stress on dentist retention and turnover intention.

## Materials and Methods

### Participants

A systematic random sample of 2,412 dentists was obtained from the 2004 registrar of the Thai Dental Council. After two rounds of mailed questionnaires, 1,020 dentists responded, yielding a response rate of 42.3%. Of these, 287 dentists were excluded due to the following non-active practicing status: retired, deceased, staying abroad, non active practicing, pursuing higher degree education, and being in academic/administrative careers. This left a total of 733 active practicing dentists who were included in this study. The initial sample size of 2,412 was inflated to compensate for non-respondents and excluded subjects. With a requirement of at least 10 individuals per item for a factor analysis[12], it would require a sample size of about 300 individuals for the 30-item JSI. Since a direct comparison of private and public dentists is planned for in the forthcoming publication, together with the fact that Thai dentists are almost equally divided in private and public sectors, the study aimed for a total of approximately 600 dentits; private and public groups of 300 each. The final effective sample of 733 dentists was deemed suitable for the purpose.

### Instruments

Item development of the JSI began with a review of the literature and existing instruments used in the measure of job stress[7-8,13]. To maximize content validity, the items were drawn from multiple sources as recommended in the psychological assessment literature. The items were further selected by the author according to the following criteria: their application to dental professionals, widespread use, and adaptability to heterogeneous settings. The widespread use criterion refers to the presence of a particular item in more than one publication. Non-widespread use items were left out since their inclusion would result in a cumbersome scale with too many items.

Thirty declarative Likert-type items were written to reflect the dimensions of experiences of job stress in dental practice. Items were rated on a 5-point Likert scale (1 = least stress, 2 = little stress, 3 = moderate stress, 4 = very stress, 5 = most stress). The item ratings were summed and then averaged to derive a mean score for the JSI. The possible range for the JSI mean score is between 1 and 5 - the higher the score, the higher the level of job stress. The instrument was piloted with 20 dental graduate students with past or current dental practice experiences.

A self-rated, single-item measure was included in the questionnaire to assess how stressful in the current primary practice was perceived to be by asking, 'How stressful was doing dental care in current primary practice?' Dentists were grouped into five subgroups according to self-rating of job stress: least stressful, little stressful, moderate stressful, very stressful, and most stressful.

The Maslach Burnout Inventory (MBI)[14] was used as a criterion for validity check, since burnout is commonly characterized as the result of chronic stress manifesting itself in psychological and physical

exhaustion. The risk of burnout is particularly high if there is a prolonged imbalance between situational demands and coping resources. The MBI is considered to be the standard measure for the assessment of occupational burnout. It consisted of three subscales: Emotional Exhaustion (EE-9 items), Depersonalization (D-5 items), and Personal Accomplishment (PA-8 items). The response format of frequency was used. Items can be rated on a 7-point Likert scale, ranging from 0 (never) to 6 (every day). Items scores were then summed to create subscales. High scores on the EE and D subscales and low scores on PA indicate burnout. Reported subscale reliability coefficients range from 0.68 to 0.87[15]. The validity of the scale has been tested and found to be satisfactory[16].

## Data collection

Questionnaires were mailed to participants along with a researcher-addressed, stamped envelope. An attached letter explained the aim of the study and assured confidentiality. Those who did not respond by 4 weeks were sent another questionnaire package. Since a number of dentists may work in multiple practices, the respondents were asked to limit their considerations of job stress to their current primary practice. For government dentists, the definition of primary practice referred to the government facility under which he/she was employed. The primary practice for private dentists referred to the hospital/clinic on which he/she spent the largest portion of working hours in a weekly schedule[17]. The time period for consideration was specified in one calendar year: January 1st–December 31th, 2004. Participation was voluntary and consent was implied by return of the completed questionnaires.

## Data analysis

Data analyses were performed using the Statistical Package for Social Sciences Program Version 10.0. Construct validity estimates the ability of an instrument to measure the underlying construct of interest. An exploratory factor analysis was used to explore construct validity for the JSI. The number of factors selected was determined by the following criteria: eigenvalues of 1.0 or greater and scree plot[18]. The final decision to retain a factor solution was determined by interpretability of the solution. Once the subscales were identified, the internal consistency of the JSI and its subscales were assessed using Cronbach's alpha coefficients. Internal consistency refers to the consistency with which an instrument measures an attribute. The internal consistency for group comparisons is satisfied if Cronbach's alpha coefficient $\geq 0.70$ is achieved. To support the reliability of the instrument further, the standard error of the mean (SEM) of the JSI was calculated. A general rule has been adopted that the SEM should be approximately 5% or less for a reliable instrument[19].

Construct validity was also assessed by item convergent validity and item discriminant validity[20] Item convergent validity refers to an item's correlation with its own hypothesized subscale score. It is satisfied if correlation achieved is equal to or greater than 0.40. Item discriminant validity assesses whether an item considered has a higher correlation with its hypothesized subscale than with other subscales and is reported in this study as % success rate. Known-group validity refers to differences in JSI scores among groups of individuals known to differ in level of job stress. It was assessed by comparing JSI scores between the five subgroups according to self-rating of job stress, using the Analysis of Variance (ANOVA) test. The greater the F statistic from the ANOVA, the better the JSI is at discriminating among the groups. It was hypothesized that dentists in more

severe stress groups would have worse (higher) JSI scores. Known-group validity was also assessed by comparing JSI scores according to 1) whether or not to encourage one own child to become a dentist and 2) decision making to choose dentistry over again. It was hypothesized that dentists who encourage their own child to become a dentist, as well as those who decide to choose dentistry over again, would have better (lower) JSI scores. Criterion validity establishes the relationship between the instrument and some other criterion. Testing of criterion validity in this study employed the MBI as the criterion instrument. The global JSI was expected to correlate positively with the EE and D subscales and negatively with the PA subscale of the MBI. The correlational effect sizes are designated as small (0.10), medium (0.30), and large (0.50) on the basis of Cohen's guidelines[21].

## Results

The sample in this study consisted of 66.4% female dentists with the mean ($\pm$ SD) age of 37.1 ($\pm$ 9.1) years. Approximately 47.6% were single. The proportions working in private and public sectors were 45.2% and 54.8%, respectively.

### Construct Validity

A principal components solution yielded five factors with eigenvalues greater than unity. Loadings for the five factors were obtained after a Varimax (orthogonal) rotation. The sorted factor loadings above 0.35 are presented in Table 1 and eigenvalues with percentage of total variance in Table 2. The JSI did not meet the criteria for unidimensionality identified by Zeller and Carmines[22]. The amount of variance explained by the first extracted factor was not large (17.82%); 17 items did not have loadings 0.3 or greater on the first factor; and not all the items had lower loadings on secondary factors than on the first factor. Thus a multi-factor solution would be more meaningful than a one-factor model.

Factor 1 (17.82% of the variance, 9 items) had to do with patient-related aspects of dental care: coping with uncooperative patients; coping with patients with unrealistic expectation; and coping with fearful patients. Factor 2 (11.35% variance, 5 items) referred to job condition issues: problems with colleagues; inappropriate physical working conditions; and equipment breakdown and defective materials. Factor 3 (10.20% variance, 6 items) included those items concerned with health system reform: too much paperwork; lack of supervision; and worried about adaptation to system changes. Factor 4 (10.06% variance, 4 items) concerned job characteristics: practice isolation; repetitive work; and risk of cross-infection. Factor 5 (9.39% variance, 6 items) had to do with time pressure issues: constant time pressure; working behind schedule; and too much workload. Altogether the five factors account for 58.8% of the total variance of JSI scores (Table 2). Examining sampling adequacy of the analysis yielded a Keiser Mayer Olkin statistic of 0.931, which confirmed that items were adequately correlated.

Table 1 also presents descriptive findings of each item with percentage of respondents showing job stress from moderate to severe levels (scores 3 to 5). The top three items which most dentists considered stressful were item 2 "Patients have unrealistic expectations" 73.5%; item 1 "Coping with difficult patients" 69.0%; and item 5 "Coping with uncooperative/ noncompliant patients" 63.7%. All of these were in the patient-related subscale of the JSI. On the other hand, the three least stressful items were: item 11 "Interpersonal problems with colleagues" 33.4%; item 22 "High competition from other dentists" 34.2%;

**Table 1** Factor loadings* of scale items in the Job Stress Inventory among Thai dentists

| Scale items | % Stress | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
|---|---|---|---|---|---|---|
| 1. Coping with difficult patients | 69.0 | .809 | | | | |
| 2. Patients have unrealistic expectations | 73.5 | .804 | | | | |
| 3. Treating fearful patients | 61.1 | .762 | | | | |
| 4. Patients are dissatisfied with dental care | 56.3 | .759 | | | | |
| 5. Coping with uncooperative/noncompliant patients | 63.7 | .750 | | | | |
| 6. Fear of making mistake | 54.5 | .631 | | | | |
| 7. Risk of complaint/litigation by patients | 52.9 | .578 | | | .360 | |
| 8. Quoting fees and collecting payments | 49.5 | .521 | | | | |
| 9. Patients being late or missing appointments | 42.0 | .520 | | | | |
| 10. Lack of fairness from superior | 34.5 | | .773 | | | |
| 11. Interpersonal problems with colleagues | 33.4 | | .758 | | | |
| 12. Inappropriate physical working conditions | 46.9 | | .709 | | | |
| 13. Equipment breakdown and defective materials | 47.1 | | .611 | | | |
| 14. Interference of illness with care delivery | 42.7 | | .371 | | | .357 |
| 15. Too much paperwork | 56.7 | | | .807 | | |
| 16. Worried about adaptation to changes in dental system | 57.5 | | | .672 | | |
| 17. Lack of proper supervision | 51.2 | | .464 | .600 | | |
| 18. Lack of time for catch up with new technology | 61.1 | | | .595 | | |
| 19. Not making enough income | 56.7 | | .392 | .460 | | |
| 20. Having to perform differently from one's skill | 46.0 | | | .428 | | |
| 21. Feeling of isolation in practice | 54.2 | | | | .704 | |
| 22. High competition from other dentists | 34.2 | .354 | | | .609 | |
| 23. Repetitive nature of work | 60.9 | | | | .568 | |
| 24. Risk of cross-infection | 62.3 | | | | .502 | |
| 25. Working under constant time pressures | 54.0 | | | | | .630 |
| 26. Working behind schedule | 40.9 | .354 | .351 | | | .606 |
| 27. Interference of work with private/family life | 47.5 | | | | .567 | .599 |
| 28. Too much work/patients | 49.5 | | .366 | .427 | | .572 |
| 29. Lack of time for maintaining social relations | 47.0 | | | | .562 | .569 |
| 30. Long working hours | 58.0 | .384 | | | | .560 |

* Suppressed all factor loadings below .35

and item 10 "Lack of fairness from superior" 34.5%.

Approximately 30.2% of dentists reported JSI scores between 3.0 and 3.9 (moderate stress). Another 1.5% reported JSI scores of 4.0 and above (severe to most severe). Combining the two groups, 31.7% of dentists in this study were found with job stress ranging from moderate to most severe levels. The mean ($\pm$ SD) overall JSI score was 2.62 ($\pm$ 0.64) as shown in Table 2. The patient-related factor showed highest mean score (2.76).

**Table 2** Factor analysis, mean and standard deviation (SD), and internal consistency (Cronbach's alpha) of the Job Stress Inventory

| Factor (number of items) | Mean* | (SD) | Eigenvalues | %Variance explained | Cronbach's alpha |
|---|---|---|---|---|---|
| Factor 1: Patient-related (9) | 2.76 | (0.79) | 5.35 | 17.82 | 0.897 |
| Factor 2: Job condition (5) | 2.37 | (0.81) | 3.41 | 11.35 | 0.794 |
| Factor 3: Health system reform (6) | 2.67 | (0.72) | 3.06 | 10.20 | 0.799 |
| Factor 4: Job characteristics (4) | 2.63 | (0.82) | 3.02 | 10.06 | 0.767 |
| Factor 5: Time pressure (6) | 2.58 | (0.83) | 2.82 | 9.39 | 0.852 |
| Overall (30) | 2.62 | (0.64) | 17.66 | 58.83 | 0.939 |

* Scores range from '1-least stressful' to '5-most stressful'

Examining the frequency of missing data for each item revealed that 13 items had no missing. The numbers of items with 1 (0.1%) and 2 (0.3%) missing data were 8 and 5 items, respectively. Four items had more than 2 missing data with missing rates range from 0.5% to 2.0%. Item 10 "Lack of fairness from superior" had the highest missing rate (15 individuals, 2.0%), followed by item 17 "Lack of proper supervision" (9 individuals, 1.2%) (data not in table).

**Item Convergent and Discriminant Validity**

Results of tests of item convergent validity and item discriminant validity are presented in Table 3. All items met the criterion for item convergent validity (item-subscale correlations of $\geq$0.40). All (100%) of item-subscale correlations were higher with the item's own subscale than with any other JSI subscales. This met the criterion for item discriminant validity.

**Table 3** Results of tests of item convergent validity and item discriminant validity for the JSI

| Factor | Convergent validity | | Discriminant validity |
|---|---|---|---|
| | Range of correlations | Success rate (%)* | Success rate (%)** |
| Factor 1: Patient-related | 0.59-0.83 | 100 | 100 |
| Factor 2: Job condition | 0.63-0.80 | 100 | 100 |
| Factor 3: Health system reform | 0.66-0.77 | 100 | 100 |
| Factor 4: Job characteristics | 0.66-0.85 | 100 | 100 |
| Factor 5: Time pressure | 0.73-0.81 | 100 | 100 |

* Percentage of item-subscale correlations $\geq$ 0.40

** Percentage of item-subscale correlations higher with the item's own subscale than with any other subscales

## Known-group Validity

The results from the ANOVA test followed by Scheffe test showed that JSI scores for all five subgroups of dentist with varying levels of self-rated stress were significantly different from one another ($F$ = 291.25, $p$ < .001, Fig. 1). Dentists in the most stressful group had the highest JSI scores (3.69), while those in the least stressful group had the lowest JSI scores (1.67).

Figure 2 shows the results of known-group validity testing based on whether or not to encourage one own child to become a dentist. It was found that dentists who would encourage their own child had the lowest JSI scores (2.44), while those who would not encourage their own child had the highest JSI scores (2.94). Post hoc comparisons showed that all three groups were significantly different from one another. Figure 3 shows that dentist who decided to chose dentistry over again had the lowest JSI scores (2.46), as hypothesized ($F$ = 27.80, $p$ < .001).

## Criterion Validity

In this study, criterion validity was assessed by the MBI (Table 4) with subscale reliability coefficients ranging from 0.68–0.91. The correlation between the overall JSI and EE subscale of the MBI was large and positive as hypothesized (r = 0.56, $p$ < .001). A positive and moderate correlation was found between the overall JSI and the D subscale of the MBI ($r$ = 0.38, $p$ < .001). The correlation between the overall JSI and PA subscale of the MBI was moderate and negative as hypothesized ($r$ = −0.34, $p$ < .001).

## Internal consistency

Evaluation of internal consistency of the overall JSI obtained a Cronbach's alpha value of 0.94
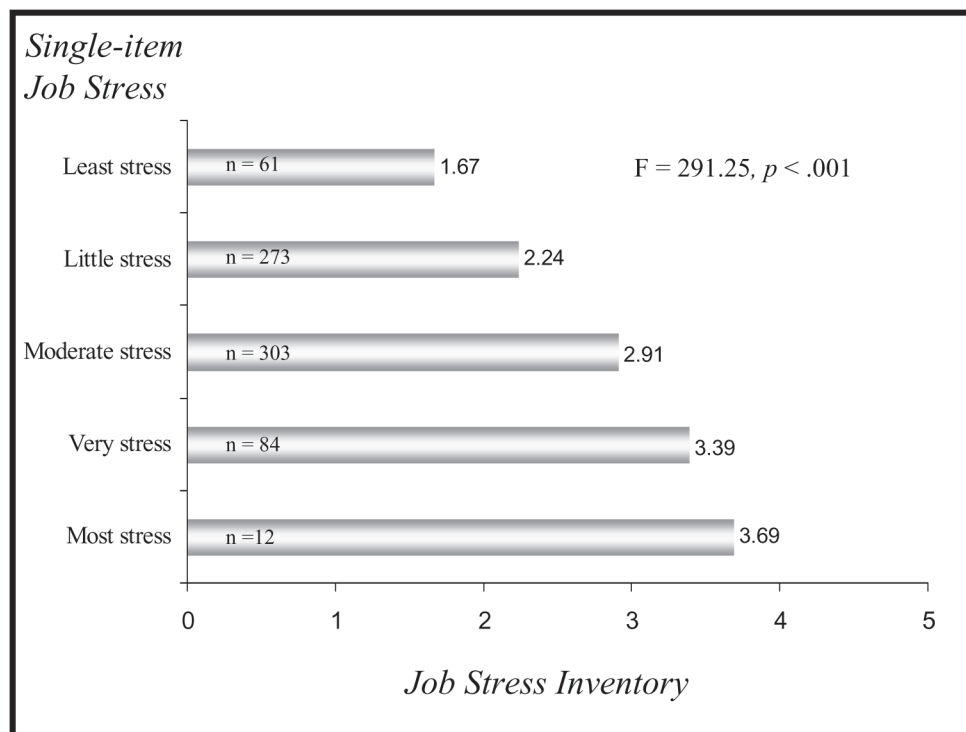


**Fig. 1** Mean scores of JSI, classified by groups with varying levels of self-rated job stress.

(Table 2), demonstrating a high degree of reliability of the inventory. Cronbach's alpha coefficients for subscales ranged from 0.77 to 0.90, all surpassed the 0.70 criterion for internal consistency. In addition, the SEM of the JSI was 0.9%, which was considered small.
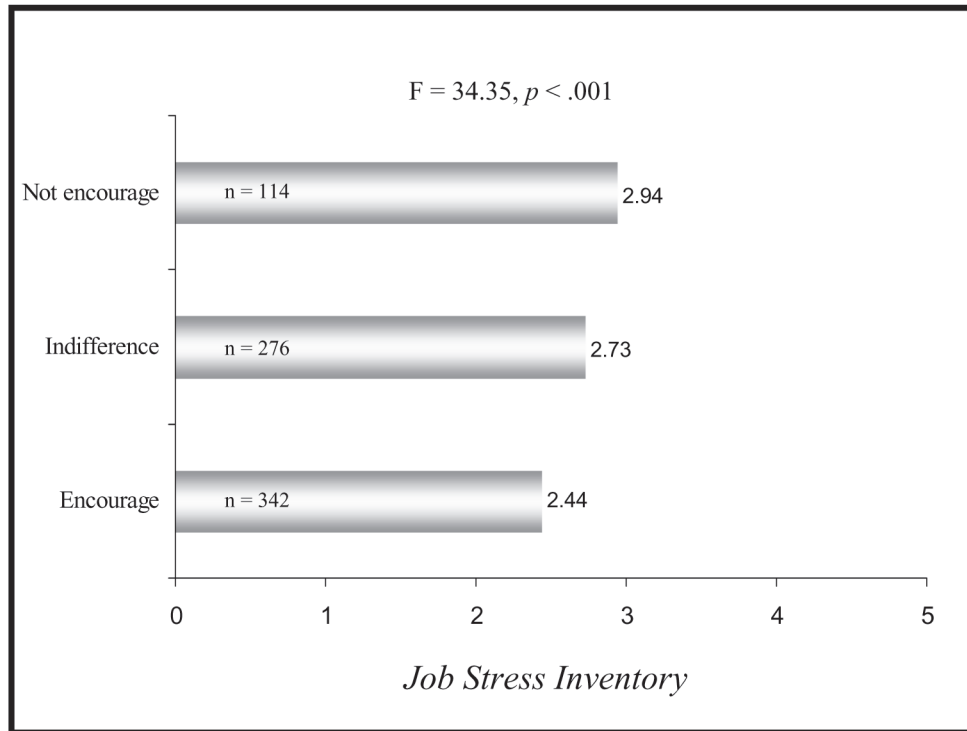


**Fig**. 2  Mean scores of JSI, classified by whether or not to encourage own child to pursue a dental career.

**Table 4** Intercorrelations* of the JSI and MBI scores

|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 1. JSI Overall | – | | | | | | | | |
| 2. JSI_F1 Patient-related | .83 | – | | | | | | | |
| 3. JSI_F2 Job condition | .77 | .46 | – | | | | | | |
| 4. JSI_F3 Health system reform | .78 | .46 | .60 | – | | | | | |
| 5. JSI_F4 Job characteristic | .79 | .59 | .52 | .58 | – | | | | |
| 6. JSI_F5 Time pressure | .86 | .61 | .62 | .60 | .62 | – | | | |
| 7. MBI_F1 Emotional exhaustion | .56 | .36 | .45 | .48 | .48 | .56 | – | | |
| 8. MBI_F2 Depersonalization | .38 | .28 | .28 | .30 | .37 | .32 | .51 | – | |
| 9. MBI_F3 Personal accomplishment | −.34 | −.28 | −.26 | −.30 | −.31 | −.25 | −.25 | −.35 | – |

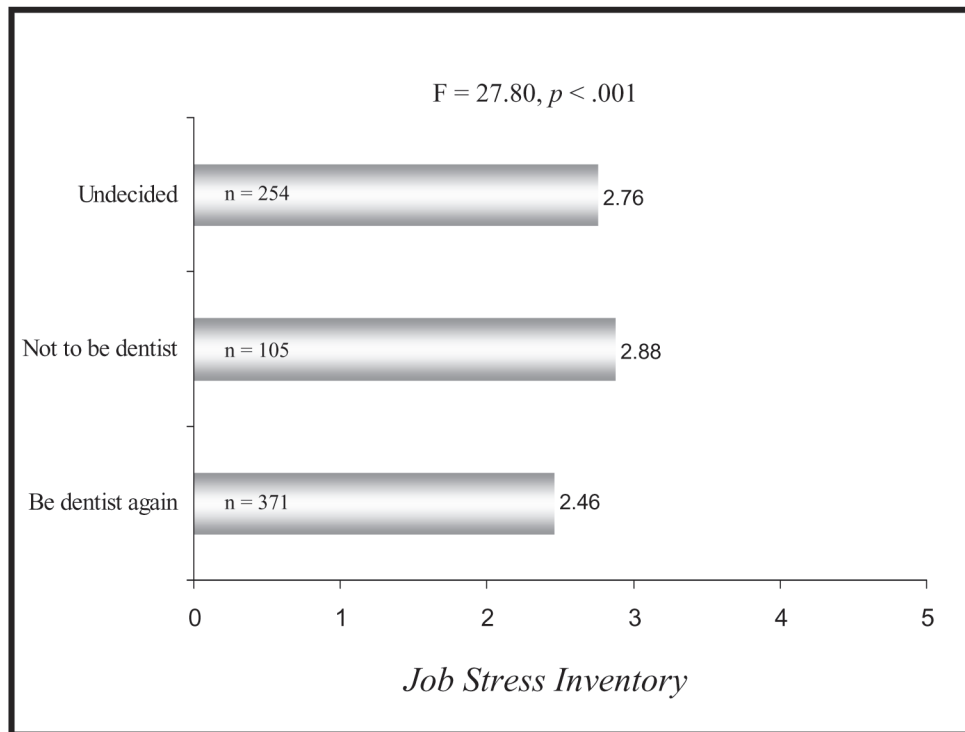* All correlations are significant at the .001 level.

**Fig**. 3 Mean scores of JSI, classified by decision making to choose dentistry over again.

## Discussion

The JSI was devised in order to assess the extent of occupational stress in heterogeneous dental care settings. The results of the present study provide evidence that the JSI has sufficient reliability and validity. A small SEM confirmed that the JSI was a reliable instrument. The internal consistency of the total scale was excellent, with Cronbach's alpha being 0.94. The subscales had somewhat lower internal consistencies with Cronbach's alphas ranging from 0.77 to 0.90. All of the JSI subscales, as well as the total scale score, met the reliability criterion recommended for group comparisons (i.e., $\geq$ 0.70). In addition, the total scale score met the minimum standard needed for comparing individual scores (i.e., 0.90). Scrutinizing the inter-item correlation matrix (results not shown), revealed that most items were moderately correlated with each other. One hundred and sixty-six (38.2%) inter-item pairwise correlations were below 0.30, 266 (61.1%) between 0.30-0.70, and 3 (0.7%) above 0.70.

The three highest inter-item correlations were 0.767 ($r_{item\ 27-item\ 29}$), 0.725 ($r_{item\ 1-item\ 4}$), and 0.711 ($r_{item\ 21-item\ 23}$). The Cronbach's alphas with either one of the three item pairs deleted ranged from 0.936-0.937 and the one with all three items deleted was 0.932. Thus, it is very unlikely that the high value of Cronbach's alpha obtained in this study resulted from redundancy among items. The JSI is hence concluded to have sufficient internal consistency reliability.

Construct validity of the JSI was explored by an exploratory factor analysis. Over the last decade, factor analysis has gained popularity as a method of examining construct validity, especially in research on occupational stress[9,23]. It determines which items load on which factors (i.e., constructs). The specificity of most item loadings was satisfactory except for 4 items: item 17 "Lack of proper supervision"; item 27 "Interference of work with private/family life"; item 28 "Too much work/patients"; and item 29 "Lack of time for maintaining social relations". Factor loadings

greater than 0.40 were considered as acceptable loadings on a component[24]. Factor loadings of the JSI were all above 0.4 except for item 14 "Interference of illness with care delivery". All items met the criterion for item convergent validity. The success rate for item discriminant validity testing was 100%. Thus, it appears that the five subscales of the JSI were psychometrically robust.

Examining item missing rates revealed that items 17 "Lack of proper supervision" (1.2% missing) and 10 "Lack of fairness from superior" (2.0% missing) had higher frequency of missing data for private dentists than government-employed dentists. The high frequency of missing data is likely due to a number of private dentists who considered these items irrelevant. All 15 individuals with missing data for item 10 were private dentists with ownership status. Options for dealing with this included: restricting the scale to items that would be relevant on all practice sectors, or, conversely, including all items even if inappropriate for some sectors. The latter was chosen since it is felt that the missing problem was minimal and the scale would have more power to distinguish between practice sectors. In addition, these items are still able to provide important information about private dentists with associated status for whom there is relevance. Findings from previous survey in the year 2000 indicated that a significant number of private dentists were associated (39.6%), while 51.7% were owners and 8.7% were partners[25]. Data from the present study showed an increasing trend of dentists with associated status (47.3%).

The JSI scores were able to distinguish between varying levels of self-reported job stress Highest JSI scores (indicating worst stress) were observed for the most stressful group and lowest JSI scores for the least stressful group, confirming the known-group validity of the JSI. Criterion validity was estimated based on the correlation of the scores on the JSI and the subscales of the MBI. Since the MBI used in this study has not been validated due to the scarcity in this field of research in Thailand, the findings related to it must be viewed with caution. Nevertheless, the pattern of correlations between the JSI and each subscale of the MBI were consistent with the hypotheses. This provides support for scale validation. They did not correlate completely, however, indicating that these two instruments are measuring concepts that are related but distinguishable and not redundant[26,27]. Further validation of the Thai version of the MBI is recommended.

Despite the grave consequences of job stress in the delivery of oral health services, dental researchers still struggle for a congruent concept of the phenomenon. As the definition of the construct, and the subsequent development of assessment measures, both depend on oral health system characteristics in which the dentist operates, a wide range of assessment scales exist, reflecting different aspects of dentists' job stress in various healthcare settings. The majority of existing job stress scales in the literature are heavily drawn upon job experiences in private healthcare markets, mostly in the U.S. and some nations in the European Communities. These include, for example, the DEWSS which covered the following 7 domains: work pressure, financial aspects, patient contacts, work contents, career aspects, team aspects, and professional and private life[8]. Given the distinction of work environments between private and public health care sectors, the author considered direct applications of these scales less appropriate than developing a new one. The current dental manpower crisis-an accelerated turnover of public rural dentists that may due to aggravated job stress-does not justify the approach of

repeated modifications and testings of existing scales. Such activities would require a lengthy timeframe with no guarantee of a usable outcome. Hence, the author took a step in developing the JSI which was designed from the ground up to account for the public-private mix of Thailand's oral health care system. In this study, a five-factor structure was proposed for the JSI. With the exception of the factor three 'health system reform', all subscales represent job stress found in daily aspects of dental practice. There are some similarities with other previously published domains, such as the 'patient-related'[7] or 'patient contacts'[8] domains are similar to the 'patient-related' domain in this study. The 'work pressure' domain in the DEWSS[8] contains items similar to the 'time pressure' subscale in the JSI. The JSI's 'health system reform' subscale, however, reflects job stress encountered in dynamic healthcare environments. As such, to the extent that dentists in public and private sectors are affected differently by changes in health system, this subscale may offer a better discriminating power for the JSI. Future research that applied the JSI on dentists in both settings will help clarify this issue.

A methodological limitation in most validation studies, including the present one, is that they have relied on psychometric data from the instrument-development sample. It is essential that the validity of a psychological instrument is also established on a different sample. Anastasi[28] recommended a process known as cross-validation -an independent determination of the validity of an instrument. Further study with different samples will also be needed to evaluate invariance of the five-factor structure of the JSI. In this way, the grounds for proclaiming the instrument as a valid measure would be much stronger than if only a single sample had been used. On the other hand, while most existing validation studies used small, homogeneous, convenient samples, the present study utilized a large, heterogeneous, nationally representative random sample. Hence, the present development of the JSI was extensively based on dentists' experiences from a wide variety of practice settings, including both public and private sectors. This makes the JSI a useful tool for future research to address the poor job retention and intention to leave among government-employed dentists in Thailand.

## Conclusion

At this time, the JSI is the only instrument available to measure Thai dentists' job stress in heterogeneous settings. Findings from this study are considered to be at the preliminary stages of instrument development. Refinement of the JSI should continue in future research with additional validation studies. New items should continue to be considered and tested to increase psychometric properties of the scale and to dynamically reflect changing healthcare environments. Based on the psychometric testing presented here, the JSI has potential as a reliable and valid instrument for assessing dentists' job stress.

## Acknowledgement

## Reference

1. Lazarus RS. Psychological stress and the coping process. New York: McGraw-Hill, 1966:27.

2. Karasek R, Theorell T. Healthy work: stress, productivity, and the reconstruction of working life. New York: Basic Books, 1990.

3. Siegrist J. Adverse health effects of high-effort/low-reward conditions. J Occup Health Psychol. 1996;1:27-41.

4. Firth-Cozens J, Greenhalgh J. Doctors' perceptions

of the links between stress and lowered clinical care. Soc Sci Med. 1997;44:1017-22.

5. Rada RE, Johnson-Leong C. Stress, burnout, anxiety and depression among dentists. J Am Dent Assoc. 2004;135:788-94.

6. Burman D, Locker D, Otchere D. Ontario dental assistants' job satisfaction: relationship to work stress and intention to change jobs. J Can Dent Assoc. 1990;56:617-20.

7. Wilson RF, Coward PY, Capewell J, Laidler TL, Rigby AC, Shaw TJ. Perceived sources of occupational stress in general dental practitioners. Br Dent J. 1998;184:499-502.

8. Gorter RC, Albrecht G, Hoogstraten J, Eijkman MA. Measuring work stress among Dutch dentists. Int Dent J. 1999;49:144-52.

9. Li J, Yang W, Cheng Y, Siegrist J, Cho SI. Effort-reward imbalance at work and job dissatisfaction in Chinese healthcare workers: a validation study. Int Arch Occup Environ Health. 2005;78:198-204.

10. Hatton C, Rivers M, Mason H, Mason L, Kiernan C, Emerson E, et al. Staff stressors and staff outcomes in services for adults with intellectual disabilities: the Staff Stressor Questionnaire. Res Develop Disabil. 1999;20:269-85.

11. Humphris GM, Peacock L. Occupational stress and job satisfaction in the community dental service of north Wales: A pilot study. Community Dent Health. 1992;10:73-82.

12. Tabachnick BG, Fidell LS. Using Multivariate Statistics. 4th Ed. New York: Harper and Row, 2001:607-75.

13. Roth SF, Heo G, Varnhagen C, Glover KE, Major PW. Occupational stress among Canadian orthodontists. Angle Orthod. 2003;73:43-50.

14. Maslach C, Jackson S. Maslach Burnout Inventory, 2nd ed. Palo Alto, California: Consulting Psychologist's Press, 1986.

15. Hastings RP, Horne S, Mitchell G. Burnout in direct care staff in intellectual disability services: a factor analytic study of the Maslach Burnout

Inventory. J Intellect Disabil Res. 2004;48:268-73.

16. Beckstead JW. Confirmatory factor analysis of the Maslach Burnout Inventory among Florida nurses. Int J Nurs Stud. 2002;39:785-92.

17. Hosanguan C. A study of job satisfaction among Thai dentists in the year 2004. J Dent Assoc Thai. 2005;55:257-71.

18. Zwick WR, Velicer WF. Comparison of five rules for determining the number of components to retain. Psychol Bull. 1986;99:432-42.

19. Faul AC, Hudson WW. The index of drug involvement: a partial validation. Social Work. 1997;42:565-72.

20. Campbell DT, Fiske JL. Convergent and discriminant validation by the multitrait multimethod matrix. Psychol Bull. 1959;56:81-105.

21. Cohen J. Statistical Power Analysis for the Behavioral Sciences, 2nd Ed. Hillsdale, NJ: Erlbaum, 1988:77-82.

22. Zeller R, Carmines E. Measurement in the Social Sciences. New York: Cambridge University Press, 1980:1-101.

23. Floyd FJ, Widaman KF. Factor analysis in the development and refinement of clinical assessment instruments. Psychol Assess. 1995;7:286-99.

24. Hair J, Anderson R, Tatham P, Grablowsky B. Multivariate data analysis. Tulsa: Petroleum Publishing Company, 1979:101-68.

25. Hosanguan C. Study of dental care delivery system in Thailand in the year 2000. 2002. (Unpublished manuscript).

26. Humphris G, Lilley J, Kaney S, Broomfield D. Burnout and stress-related factors among junior staff of three dental hospital specialties. Br Dent J. 1997;183:15-21.

27. Gorter RC, Albrecht G, Hoogstraten, Eijkman MAJ. Work place characteristics, work stress and burnout among Dutch dentists. Eur J Oral Sci. 1998;106:999-1005.

28. Anastasi A. Psychological testing, 6th Ed. New York: Macmillan, 1988:140-71.

# ความตรง ความเที่ยง และโครงสร้างปัจจัยของดัชนีความเครียดในหน้าที่การงานของทันตแพทย์ไทย

**ชาญชัย โห้สงวน**

ภาควิชาทันตกรรมชุมชน คณะทันตแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

**บทคัดย่อ**

***วัตถุประสงค์*** ในปัจจุบันยังไม่มีเครื่องมือสำหรับประเมินความเครียดในการทำงานสำหรับทันตแพทย์ไทย การศึกษานี้มีวัตถุประสงค์เพื่อพัฒนาดัชนีความเครียดในหน้าที่การงานที่ใช้ตอบด้วยตนเอง และเพื่อประเมินความเที่ยง ความตรง และโครงสร้างปัจจัยของดัชนีดังกล่าว

***วัสดุและวิธีการ*** ดำเนินการสำรวจกลุ่มตัวอย่างทันตแพทย์จำนวน 733 คน ซึ่งถูกคัดเลือกด้วยวิธีสุ่มตัวอย่างแบบเป็นระบบใช้แบบสอบถามทางไปรษณีย์เก็บรวบรวมข้อมูลเกี่ยวกับดัชนีความเครียดในหน้าที่การงานและข้อมูลอื่น ๆ ที่เกี่ยวข้อง ดัชนีนี้ประกอบด้วยข้อความ 30 รายการ มีตัวเลือกตอบแบบไลเคิร์ต 5 ระดับ ค่าคะแนนที่สูงแสดงถึงการมีความเครียดในหน้าที่การงานสูง ประเมินความเที่ยงประเภทความพ้องภายในของดัชนีด้วยค่าสัมประสิทธิ์ครอนบาห์อัลฟา ประเมินความตรงเชิงโครงสร้างด้วยการวิเคราะห์ปัจจัยเชิงสำรวจ ประเมินความตรงอิงเกณฑ์ด้วยค่าสหสัมพันธ์กับดัชนีภาวะหมดไฟของมาสลัค (Maslach Burnout Inventory)

***ผลการศึกษา*** การวิเคราะห์ปัจจัยเชิงสำรวจด้วยวิธีองค์ประกอบหลัก (principal components) พบว่าดัชนีความเครียดในหน้าที่การงานประกอบด้วย 5 มิติย่อย ซึ่งอธิบายความแปรปรวนของค่าคะแนนได้ร้อยละ 58.8 ค่าคะแนนดัชนีโดยรวมและคะแนนมิติย่อยทั้งหมดมีค่าครอนบาห์อัลฟาอยู่ระหว่าง 0.77–0.94 ซึ่งแสดงถึงความพ้องภายในระดับสูง ข้อความทุกรายการผ่านเกณฑ์ประเมินความตรงเชิงคอนเวอร์เจนท์ (convergent) และดิสคริมิแนนท์ (discriminant) พบค่าสหสัมพันธ์ระดับปานกลางระหว่างคะแนนดัชนีความเครียดในหน้าที่การงานกับดัชนีภาวะหมดไฟของมาสลัค ($r$ = −0.34–0.56)

***สรุป*** การศึกษานี้แสดงความเที่ยงและความตรงของดัชนีความเครียดในหน้าที่การงาน ซึ่งอาจสามารถนำดัชนีดังกล่าวมาประยุกต์ใช้ประเมินความเครียดที่เกิดจากการทำงานทันตกรรมในบริบทที่หลากหลายได้

(ว ทันต จุฬาฯ 2550;30:29–42)

***คำสำคัญ:*** *การวิเคราะห์ปัจจัย; ความเครียด; ความตรง; ความเที่ยง; ทันตแพทย์*