Work Stress Inventory for Dental Assistants: Development and Psychometric Evaluation

Yousef S. Khader, ScD; Dana M. Airan, MSc; Ibrahim Al-Faouri, PhD

Abstract

Objectives: *The purposes of this study were to develop a work stress inventory for dental assistants (WSI-DA) in Jordan and examine its psychometric properties and to describe potentially stressful work-related conditions related to the profession of dental assistance in Jordan.* ***Methods:*** *A total of 542 dental assistants working in private dental clinics in Jordan participated in this study. The stages of instrument development included selecting an initial item pool, choosing the best items, deciding on the questionnaire format, pretesting the instrument, and determining its reliability and validity. An initial set of 55 items was selected and categorized into nine hypothetical categories. Further testing and using factor analysis ended with a 35-item, nine-scale instrument. The raw score for each scale was calculated by adding the responses for individual items and then transformed to 0-100 scales. The item-level validity, item internal consistency, item discriminant validity, and Cronbach's alpha were assessed.* ***Results:*** *Nine factors had eigenvalues greater than one. The nine factors accounted for 78.7 percent of the total variability in the 35-item questionnaire. All item–scale correlations were greater than the recommended correlation of 0.40. Except patient's suffer scale (Cronbach's alpha = 0.56), all other scales demonstrated acceptable internal consistency with Cronbach's alpha exceeding the minimum standard of 0.7 and ranging from 0.71 to 0.87. Test–retest reliability showed acceptable reliability in all nine scales and ranged from 0.61 to 0.92.* ***Conclusions:*** *The 35-item, nine-scale WSI-DA demonstrated acceptable validity and reliability when used among dental assistants in Jordan.*

Key Words: stress, dental assistants, factor analysis, validity, reliability

Introduction

Occupational stress is a condition where job-related factors interact with the worker to change his or her psychological or physiological conditions (1). Interest in occupational stress is gaining prominence among researchers, employers, and policy makers throughout the world. In Jordan, the problem of job stress began to emerge notably in the last few years among health professionals because of the social, economical, and political problems in the entire region. Dental practice has been considered the most stressful of the health care professions (2) primarily because of the nature and working conditions of dental surgery (3-5). Occupational stress among dental professionals is an important public health problem because it may not only affect mental and physical health of dental professionals, but it may manifest in the form of job dissatisfaction, poor job performance, high rate of absenteeism and turnover, heart diseases, accident occurrence, alcohol abuse, and social/family problems (6-9).

An earlier study carried out in the UK by Cooper et al. (4) identified the pattern of work stressors suffered by general dental practitioners. The potential stressors in dental practice include those intrinsic to the job, relationships at work, and lack of career development (4). Time-related pressures, fearful patients, work loads, financial worries, problems with staff, equipment breakdowns, lack of materials, poor working conditions, and the routine and boring nature of the job are the main causes of stress (5).

Dental assistants are important members of the dental health care team who enhance the efficiency of the dentist in the delivery of dental care for patients. Research on stress in health professions has mainly focused on doctors and nursing staff, with only a few studies focused on dentists and dental assistants. This study was conducted to develop a work stress inventory for dental assistants (WSI-DA) in Jordan, examine its psychometric properties, and describe potentially stressful work-related conditions related to the profession of dental assistance.

Methods

Study Population. To obtain a representative sample of dental assistants in Jordan, the three most populated and main cities in Jordan were identified, namely Amman, Irbid, and Al-Zarqa. Areas in each city where dental clinics cluster were predetermined and all dental clinics in these areas were visited. The researcher and her assistant met a total of 704 dental assistants in these clinics over a period of 10 months and invited them to participate in the study. Only 542 (77.0 percent) persons agreed to participate and completed the questionnaire.

Send correspondence and reprint requests to Dr. Yousef S. Khader, Department of Community Medicine, Public Health and Family Medicine, Faculty of Medicine, Jordan University of Science & Technology, Irbid 22110, Jordan. Tel.: 962-2-795435025; Fax: 962-2-7201064; e-mail: yousef.k@excite.com. Yousef S. Khader is with the Department of Community Medicine, Public Health and Family Medicine, Faculty of Medicine, Jordan University of Science & Technology, Irbid, Jordan. Dana M. Airan is in the private sector, United Arab Emirates. Ibrahim Al-Faouri is with the King Abdullah University Hospital, Irbid, Jordan. Manuscript received: 9/6/07; accepted for publication: 4/21/08.

DOI: 10.1111/j.1752-7325.2008.00094.x

Instrument Development. The inventory development started with selecting an initial item (potential stressors) pool followed by choosing the most relevant items, deciding on the questionnaire format, pretesting the instrument, and determining its reliability and validity. The items were selected to be relevant to stress, easy to understand, and easy to use. Items were selected based on the review of published literature on job stress and stressful conditions in the workplace and on the interview with a group of dentists and another group of dental assistants. An initial set of 55 items was selected and categorized into nine hypothetical categories: work load (five items), work hazard (eight items), relationship with the dentist (nine items), relationship with the patients (six items), working hours (five items), income (four items), working place (seven items), patient management (six items), and nonmedical tasks (five items). A list of potential stressors that commonly occur in the work setting was presented to respondents. They were asked to indicate how stressful they find each potential stressor when it occurs, using a 4-point scale (not stressful "1," slightly stressful "2," moderately stressful "3," and extremely stressful "4"), with a higher score indicating higher intensity of stress. Furthermore, the questionnaire sought information about sociodemographic characteristics, self-reported overall occupational stress, and job satisfaction.

In pilot testing of the questionnaire, 50 participants were asked to complete the questionnaire and give feedback about the clarity and meaningfulness of all items. The pilot testing showed that seven items reflected conditions that are not stressors as thought, thus they were eliminated. Eight items were eliminated because of high rate of missing values, and two items were eliminated because they were identified as personal rather than occupational stressors. It was found that all items were appropriately and similarly understood by respondents. However, two items in "dentist–assistant relationships" were identified as "ambiguous," thus they were modified to be clearer.

Factor Analysis. Factor analysis with principal component method of factor extraction and varimax method of factor rotation was conducted to identify underlying factors that explain the pattern of correlations within the set of observed stressors. The number of factors to be retained for interpretation was not requested from the statistical software. It was determined using the eigenvalue-one criterion (Kaiser criterion) (10) and the interpretability criterion. With this approach, any factor with an eigenvalue greater than 1.0 and its interpretation make sense in terms of what is known about the construct was retained.

Scoring. The raw score for each scale was calculated by adding the responses for individual items. To facilitate comparison of the scale scores, all scales were transformed to 0-100 scales. A single algorithm that was used in transformation of SF-36 scales was adopted (11): transformed scale score = [(raw scale score − lowest possible scale score)/possible scale score range] × 100.

Assessment of Validity. The item-level validity of the scale was examined by checking the following scoring assumptions: a) items belonging to the same scale and measuring the same construct should show approximately the same means and standard deviations; b) each item in the scale should have approximately the same correlation with the scale; c) for item internal consistency, the correlation between items and hypothesized scale should exceed 0.40; and d) for item discriminant validity, the correlation between each item and its hypothesized scale should be higher than the correlation between that item and other scales (12). The correlation between an item and its hypothesized scale was estimated as if the item in question was not in the total scale score to avoid inflating the item–scale correlation coefficient. If these conditions are met, it is appropriate to combine items as hypothesized into simple summated rating scales (13).

Assessment of Reliability. Cronbach's alpha was calculated to assess the degree of internal consistency and homogeneity between the items. The minimum score of 0.70 is required to support claims of internal consistency (12). Another aspect of reliability was assessed by repeating the administration of the 35-item stress scale. One week after the time of first administration, the same questionnaire was readministered to a total of 30 subjects. The sample size that is required to examine the test–retest reliability was determined based on the recommendations of Fleiss (14), and the test–retest reliability was determined quantitatively using Pearson's correlation coefficient.

Statistical Analysis. The Statistical Package for Social Sciences software (SPSS, version 11.5, Chicago, IL) was used for data processing and data analysis. Characteristics of subjects' variables were described using frequency distribution.

Results

Participants' Characteristics. This study included a total of 542 female dental assistants with a mean (standard deviation) age of 27.4 (5.4) years old (range: 20-50). Their sociodemographic and work-related characteristics are shown in Table 1.

Self-Reported Stress and Job Satisfaction. About 61 percent of dental assistants reported that they have stress. Only 17.7 percent of the respondents were told by a physician that they have stress. About half (44.7 percent) of participants reported that they did not find real enjoyment in their job, and only 6.6 percent reported that they are often bored with their job. More than half of the participants (53.5 percent) were fairly well-satisfied with their job, and 76.9 percent reported that they like it. Only 12.8 percent were enthusiastic about their jobs.

Factor Analysis. In the initial factor analysis, nine factors had an eigenvalue greater than 1. Three

Table 1
Sociodemographic and Important Characteristics of Dental Assistants

Variable	*n* (%)
Age (year), mean (SD) = 27.7 (5.4)	
20-25	188 (34.9)
26-30	194 (36.1)
>30	156 (29.0)
Marital status	
Not married	372 (68.6)
Married	170 (31.4)
Years of experience, mean (SD) = 4.6 (3.9)	
≤3	264 (52.0)
>3	244 (48.0)
Academic degree	
High school or less	250 (46.9)
Diploma	190 (35.6)
Bachelor	93 (17.4)
Monthly income (JD)*	
≤200	368 (78.3)
>200	102 (21.7)
Working hours per day, mean (SD) = 8.7 (1.3)	
≤8	256 (51.0)
>8	246 (49.0)

* US $1 = 0.71 JD.
SD, standard deviation.

items were found to be poorly correlated with the extracted factors, thus they were eliminated. When the factor analysis is repeated with the three items deleted, the procedure resulted in a 35-item, nine-scale instrument: work load (three items), work hazard (three items), dentist–assistant relationship (six items), type of patients (four items), working hours (three items), income (two items), working environment (six items), patient's suffer (three items), and nonmedical tasks (five items). The distribution of the 35 items is shown in Table 2. The nine factors accounted for 78.7 percent of the total variability in the 35-item questionnaire. In order to test the stability of the factor structure, the total sample of 542 subjects was randomly split into two halves: initial sample and validation sample. Factor analysis and psychometric evaluation were conducted separately in each sample. Results of factor analysis, multi-item scaling, and internal consistency analysis in the two samples were principally equivalent. The number of factors, the factor structure, and factor loadings were for the greater part comparable between the two samples. Differences were found for one item within the "type of patients" scale. The item "managing patients with dental phobia" had higher loading on the "patient's suffer" scale in the initial sample. Because no important differences were found between the initial sample and validation sample, the results of the factor analysis for the data set of 542 subjects are presented.

Scaling Assumptions and Reliability. Table 3 shows that the range of item–scale correlations within each scale was moderate to strong. Indeed, all item–scale correlations were greater than the recommended correlation of 0.40. Nonetheless, the item–scale correlations were reasonably similar within each scale. At the level of individual items, it was apparent that all items were more strongly correlated with their own scale than with other scales. Except patient's suffer scale (Cronbach's alpha = 0.56), all other scales demonstrated acceptable internal consistency with Cronbach's alpha, exceeding the minimum standard of 0.7 and ranging from 0.71 to 0.87. Test–retest reliability showed acceptable reliability in all nine scales and ranged from 0.61 to 0.92.

Discussion

Dental assistants are an invaluable part of the dental care team, enhancing the efficiency of the dentist in the delivery of oral health care and increasingly influencing the productivity of the dental office through interpersonal, business, and technical skills. In Jordan, as well as in other Eastern Mediterranean countries, dental assistants work full-time and play many roles in dental practice: receptionist, office manager, chairside assistant, X-ray technician, or dental educator. In the United States and in European countries, dental assistants may have the so-called "expanded duties," permitting them to do many additional tasks related to patient care.

There are different measures that can be used to assess the diverse aspects of occupational stress. The Job Diagnostic Survey (JDS) (15) provides useful information relating to workers' feelings about their jobs. Occupational Stress Inventory (OSIv) (16) provides information about the general and specific sources of job stress. However, the JDS and OSIv do not evaluate the perceived severity of job stressors. The Work Environment Scale (17) was developed to assess the psychological states and emotional reactions of workers assigned to a particular job, but it is limited by its true–false format. Despite the availability of different measures, their application to a particular workplace is not always straightforward. This study attempted to develop a WSI-DA in Jordan and examine its psychometric properties. Such an instrument allows us to look for correlations between stress and a variety of diseases and assess the impact of interventions that attempt to moderate, minimize, or eliminate some of these stressors.

Table 2
Frequency Distribution of Dental Assistants According to Their Responses to the 35-Item Work Stress Inventory for Dental Assistants

Items and scales	Potential stressor	Not stressful *n* (%)	Slightly stressful *n* (%)	Moderately stressful *n* (%)	Extremely stressful *n* (%)
Work load					
I-1	Extra load and diversity of tasks	114 (21.0)	292 (53.9)	113 (20.8)	23 (4.2)
I-2	Not enough time to prepare clinic between patients	136 (25.1)	261 (48.1)	125 (23.1)	20 (3.7)
I-3	Dealing with highly demanding patients	252 (46.5)	248 (45.8)	26 (4.8)	16 (3.0)
Work hazard					
I-4	Responsibility for infection control	356 (65.7)	106 (19.6)	33 (6.1)	47 (8.7)
I-5	Exposure to health and safety hazards	324 (59.8)	134 (24.7)	30 (5.5)	54 (10.0)
I-6	Responsibility for instrument sterilization	246 (45.4)	132 (24.4)	55 (10.1)	109 (20.1)
Dentist–assistant relationship					
I-7	Criticism by the dentist	253 (46.7)	250 (46.1)	12 (2.2)	27 (0.5)
I-8	Conflict with the dentist	300 (55.4)	204 (37.6)	24 (4.4)	14 (2.6)
I-9	Verbal abuse by the dentist	461 (37.6)	52 (52.4)	6 (6.5)	23 (3.5)
I-10	Blame from the dentist for anything that goes wrong in the clinic	204 (85.1)	284 (9.6)	35 (1.1)	19 (4.2)
I-11	Difficulty in knowing what the dentist needs through dental procedures	337 (62.2)	184 (34.0)	15 (2.8)	6 (1.1)
I-12	Poor verbal communication with the dentist	384 (70.8)	142 (26.2)	10 (1.8)	6 (1.1)
Type of patients					
I-13	Managing patients with dental phobia	185 (34.1)	201 (37.1)	109 (20.1)	47 (8.7)
I-14	Dealing with handicapped patients	336 (62.0)	154 (28.4)	21 (3.9)	31 (5.7)
I-15	Dealing with children	278 (51.3)	228 (42.1)	15 (2.8)	21 (3.9)
I-16	Dealing with elderly patients	259 (47.8)	222 (41.0)	40 (7.4)	21 (3.9)
Working hours					
I-17	Having to work through breaks	151 (27.9)	293 (54.1)	85 (15.7)	13 (2.4)
I-18	Very long working hours	135 (24.9)	256 (47.2)	99 (18.3)	52 (9.6)
I-19	Very short or no lunch break	149 (27.9)	283 (52.2)	89 (16.4)	21 (3.9)
Income					
I-20	Income is not enough to cover living expenses	46 (8.5)	170 (31.4)	242 (44.6)	84 (15.5)
I-21	Salary is low when compared to efforts	58 (10.7)	143 (26.4)	220 (40.6)	121 (22.3)
Working environment					
I-22	Working in crowded clinic	326 (60.1)	124 (22.9)	70 (12.9)	22 (4.1)
I-23	Inadequate lighting	329 (60.7)	162 (29.9)	30 (5.5)	21 (3.9)
I-24	Poor ventilation in the clinic	38 (56.8)	169 (31.2)	7.9 (43)	22 (4.1)
I-25	Difficulty in getting rid of disposal materials	403 (74.3)	102 (18.8)	16 (3.0)	21 (3.9)
I-26	Shortage of water	437 (80.6)	62 (11.4)	27 (5.0)	16 (3.0)
I-27	Presence of clinic in a noisy area	359 (66.2)	108 (19.9)	64 (11.8)	11 (2.0)
Patient's suffer					
I-28	Performing procedures that patient experience as painful	167 (30.8)	256 (47.2)	105 (19.4)	14 (2.6)
I-29	Ignorance of the patients' complain by the dentist	294 (54.2)	210 (38.7)	28 (5.2)	10 (1.8)
I-30	Watching patients while complaining	133 (24.5)	179 (33.0)	131 (24.2)	99 (18.3)
Nonmedical tasks					
I-31	Responsibility for arranging patients' appointments	361 (66.6)	82 (15.1)	37 (6.8)	62 (11.4)
I-32	Answering telephone calls	347 (64.0)	85 (15.7)	35 (6.5)	75 (13.8)
I-33	Billing and ordering supplies	316 (58.3)	81 (15.0)	59 (10.9)	86 (15.9)
I-34	Developing X-rays	250 (46.1)	162 (29.9)	80 (14.8)	50 (9.2)
I-35	Responsibility for financial management	308 (56.8)	87 (16.1)	75 (13.8)	72 (13.3)

Table 3
Descriptive Statistics, Cronbach's alpha, and Summary Results of Item Convergent and Discriminant Validity

Component	Number of items	Mean ± SD	Cronbach's alpha	Range of correlations: Item internal consistency*	Range of correlations: Item discriminant validity†	Test–retest validity
Work load	3	31.2 ± 19.7	0.71	(0.705, 0.857)	(0.008, 0.650)	0.73
Work hazard	3	25.5 ± 27.7	0.74	(0.800, 0.828)	(0.005, 0.406)	0.86
Dentist–assistant relationship	6	16.6 ± 16.0	0.80	(0.704, 0.779)	(0.077, 0.648)	0.61
Type of patient	4	23.8 ± 21.0	0.77	(0.706, 0.827)	(0.001, 0.444)	0.85
Working hours	3	33.7 ± 22.3	0.78	(0.821, 0.847)	(0.045, 0.431)	0.71
Income	2	57.4 ± 25.9	0.78	(0.864, 0.892)	(0.150, 0.337)	0.86
Working environment	6	16.3 ± 20.0	0.87	(0.672, 0.894)	(0.105, 0.412)	0.91
Patients' suffer	3	32.0 ± 20.5	0.56	(0.596, 0.820)	(0.110, 0.412)	0.71
Nonmedical tasks	5	26.3 ± 27.6	0.84	(0.673, 0.860)	(0.084, 0.407)	0.92
Total	35	25.9 ± 11.7	0.86			0.79

* Correlations between items and hypothesized scale.
† Correlations between items and other scales.
SD, standard deviation.

This study included a total of 542 dental assistants working in private dental clinics. The product of this study was a 35-item WSI-DA composed of nine categories (scales) where each category consists of a number of items that evaluate a distinct dimension of stressors. These nine categories (work load, work hazard, dentist–assistant relationship, type of patients, working hours, income, working environment, patient suffer, and nonmedical tasks) are considered the main sources of stress for dental assistants working in private dental clinics in Jordan. The developed instrument was a self-administered questionnaire that took an average of 12 minutes to be completed. This 35-item instrument is suitable for use among dental assistants of different academic degrees because they work in the same environment and experience similar conditions. Although the 35 stressors are commonly encountered in dental practice, one cannot know if each respondent had experienced each stressor. It is possible that respondents identified the stressor as not stressful when it is not experienced. This error can be easily fixed by adding "not applicable" as a new response category to be chosen by persons when the stressor is not experienced.

Subsequent psychometric evaluation demonstrated that this instrument is an acceptable, reliable, and valid measure of job stressors among dental assistants. The internal consistency of the scales was assessed using Cronbach's alpha. Cronbach's alpha of the nine scales ranged from 0.71 to 0.87, and the item–scale correlation varied from 0.59 to 0.89. Besides, it had good test–retest reliability with a correlation coefficient of range from 0.61 to 0.92 for the nine scales. The nine scales explained 78.7 percent of the total variability which is higher than the value of 60 percent to be considered acceptable (7).

In regard to the number of item per factor, we know that the recommendation of three items per scale should be viewed as a minimum and certainly not as an optimal number of items per scale as the reliability increases with increasing the number of items. Only one factor (income) did not meet the minimum number of items per factor. We started with four items and we ended with only two items, probably because the measure of income is more objective than subjective.

Although preliminary results were encouraging, the validation of an instrument is an ongoing process. The greater the number of situations when the measure is shown to correlate with the hypothesis, the stronger the evidence for validity. For this instrument to be used, it is important that it should be culturally relevant and valid for the local population while demonstrating acceptable psychometric properties (7).

One of the possible limitations of this study is that nothing is known about the nonrespondents. Other limitations include inability to compare this instrument with other stress scales because of limited availability of such instruments validated for use among dental assistants. It would be wrong to view the 35-item instrument as an instrument that captures everything of interests to all concerned. Rather, the instrument has been designed as a foundation for research on job stress among dental assistants. Indeed, one of the problems when using factor analysis in the development of a scale is the likelihood of omitting single, simple, tangible items that may be important to specific respondents or researchers.

In conclusion, the 35-item, nine-scale WSI-DA demonstrated acceptable validity and reliability when used among dental assistants in Jordan.

References

1. Beehr TA, Newman JE. Job stress, employee health, and organizational effectiveness: a facet analysis, model, and

literature review. Pers Psychol. 1978;31: 665-9.
2. Freeman R, Main JR, Burke FJ. Occupational stress and dentistry: theory and practice. Part I. Recognition. Br Dent J. 1995;178:214-7.
3. Bourassa M, Baylard JF. Stress situations in dental practice. J Can Dent Assoc. 1994;60:65-71.
4. Cooper CL, Watts J, Kelly M. Job satisfaction, mental health, and job stressors among general dental practitioners in the UK. Br Dent J. 1987;162:77-81.
5. Moore R, Brodsgaard I. Dentists' perceived stress and its relation to perceptions about anxious patients. Community Dent Oral Epidemiol. 2001;29:73-80.
6. Kent G. Stress amongst dentists. In: Payne R, Firth-Cozens S, editors. Stress and health professionals. 1st ed. London: Wiley; 1987. p. 127-49.
7. Stack S. Occupation and suicide. Soc Sci Q. 2001;82:384-96.
8. Leong CS, Furnham A, Cary L, Cooper CL. The moderating effect of organizational commitment on the occupational stress outcome relationship. Hum Relat. 1996;49:1345-63.
9. Wall TP, Ayer WA. Work loss among practicing dentists. J Am Dent Assoc. 1984;108:81-3.
10. Kaiser HF. The application of electronic computers to factor analysis. Educ Psychol Meas. 1960;20:141-51.
11. Ware JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Med Care. 1992;30:473-83.
12. Cronbach LJ. Coefficient alpha and the internal structure of tests. Psychometrika. 1951;16:297-333.
13. Ware JE, Johnston SA, Davies A, Brook RH. Conceptualization and measurement of health for adults in the health insurance study: Vol. III, mental health. Santa Monica: RAND; 1979.
14. Fleiss JL. Reliability of measurements. The design and analysis of clinical experiments. New York: John Wiley & Sons; 1986. p. 2-31.
15. Hackman JR, Oldham GR. Development of the Job Diagnostic Survey. J Appl Psychol. 1975;60:159-70.
16. Osipow SJ, Spokane AR. Occupational stress inventory manual: research version. Odessa: Psychological Assessment Resources; 1981.
17. Insel PM, Moose RH. Work Environment Scale, form R. Palo Alto: Consulting Psychologists Press; 1974.