Brazilian Research in Pediatric Dentistry and Integrated Clinic 2016, 16(1):411-424
DOI: http://dx.doi.org/10.4034/PBOCI.2016.161.43
ISSN 1519-0501

Original Article

Dental Environment Stress: Findings among Lusophone Dental Students

Joao Paulo Menck Sangiorgio[1], Patricia Medeiros Araujo[2], Camila Hirata Navarro[2], Igor Renan Zen[1], Silvano Cesar da Costa[3], Patricia Helena Vivan Ribeiro[4], Antonio Ferelle[5], Cássia Cilene Dezan-Garbelini[5]

[1]Master in Dentistry, State University of Londrina, Londrina, PR, Brazil.
[2]Undergraduate Student, State University of Londrina, Londrina, PR, Brazil.
[3]Associate Professor, Department of Statistics, State University of Londrina, Londrina, PR, Brazil.
[4]Nurse, State University of Londrina, Londrina, PR, Brazil.
[5]Associate Professor, Department of Oral Medicine and Dentistry for Children, State University of Londrina, Londrina, PR, Brazil.

Author to whom correspondence should be addressed: Cássia Cilene Dezan-Garbelini, Rua Pernambuco, 540, Centro, Londrina, PR, Brazil. 86020-120. Phone: 55 43 3371-6752. E-mail: dgcassia@gmail.com.

Academic Editors: Alessandro Leite Cavalcanti and Wilton Wilney Nascimento Padilha

Received: 01 September 2016 / Accepted: 24 November 2016 / Published: 01 December 2016

Abstract

Objective: To perform cross-cultural adaptation of the Dental Environment Stress (DES), to test its construct validity and reliability, and to identify the sources of stress among Brazilian dental students. **Material and Methods:** The DES was transculturally adapted to Portuguese using translation/back-translation, review by an expert bilingual committee and consensus building. The first version was tested in a sample of 42 dental students to check the understanding level of the alternatives. The final version was applied to all the students enrolled in a Brazilian Public Dental School. Construct validity was assessed through factor analysis, performed by principal components analysis and Varimax rotation and reliability by internal Cronbach's alpha coefficient (95% CI). Wilcoxon rank sum was conducted to test for gender and Kruskall-Wallis for year comparison. Multivariate analysis relied on ordinal logistic regression modeling. **Results:** Factor analysis revealed five factors that possessed eigenvalues greater than 1.5 and together explained 46.88% of the total variance. Internal consistency of each factor was adequate, with Cronbach's alpha ranging from 0.65 to 0.84. 'Examinations and grades' (82.80%) was the highest scored item. Females presented higher rates, as well as second's and fifth's years students. The entering students were generally concerned with factors related to "Academic Performance", whereas clinical year students with "Insecurity Concerning their Professional Future". **Conclusion:** The Portuguese version of the DES presented good results, thus it could be a valid instrument to assess the factors of perceived stress in Lusophone countries, subsidizing the development of strategies to minimize the stress and optimize school performance.

Keywords: Dental Stress Analysis; Translating; Surveys and Questionnaires.

Introduction

Dentistry is a stressful occupation with up to 86% of professionals reporting very or fairly stressful lives [1] what makes it the reason of several studies [2]. Investigations into its concept and repercussions on health and life quality of individuals have shown the influence of professional practice in its constitution. The stressors associated with dental practice comprise time and scheduling pressures, managing uncooperative patients, and the highly technical and intensive nature of the work [3]. In chronic or extreme circumstances, these occupational factors could lead to psychological problems as depressive symptomatology, anxiety, anger, behavior disorders, substance abuse, absenteeism, diminished work efficiency, and burnout [4].

Analogously, several studies in different countries, as U.K., Australia, Greece, India, Spain and Germany reported the occupational stress in dental undergraduates and found that the factors affecting clinical students imitate those of qualified practitioners [5-7]. Besides this occupational stress, among dental students the educational process may be important to this development due to the contemporary curricula requirements, in which dental students are expected to acquire diverse proficiencies, for instance: acquisition of theoretical knowledge, clinical competencies and interpersonal skills; all within a short period of time to become a responsible dental professional [8].

Even though there are numerous publications about stress in dental students, there is no data on the Brazilian perspective. This may be related to the absence of a valid instrument available in Portuguese, which would allow its use in Lusophone countries. The instrument that seems to be most pertinent to this aim is the Dental Environmental Stress questionnaire (DES), specifically designed for use in dental students [9]. However, few studies have analyzed the psychometric properties of the instrument. Those who have accomplished this identified factors by means of factor analysis or internal reliability of the scale [6,10].

The huge impact of stress on dental students indicates the need for stress management programs in dental education that could be introduced in dental curricula [11]. The correct identification of stress and stressors in the dental practice, along with a better understanding of the more common situations capable of causing it, could permit the development of stress management interventions [8]. In doing so, it might be possible to minimize the adverse effects of stress on dental professionals and students [12].

Thus, this study aims to provide health professionals involved in the dental education with a practical and effective instrument for stressor identification in Lusophone dental students. In alignment with this, the objectives of this study were to perform cross-cultural adaptation of the DES, to test its construct validity and reliability, and to identify the main sources of stress among Brazilian dental students.

Material and Methods

Translation and Cross-cultural Adaptation

Initially, permission from the original author was obtained to carry out the translation. The DES was then translated and adapted according to previously published standard guidelines [13,14]. Two versions which were translated into Portuguese were created by two native Portuguese professional-speaking professional translators, one informed and the other uninformed about the aims of the study. A consensus-translated version was produced, which was translated back into English by two native English-speaking American bilingual translators. The back-translated English versions were compared with the original English version to determine semantic equivalence. The DES' original author took part in this step [9].

Once the social behavioral norms are expected to influence translation and requires communication and discussion with all stakeholders [15], a review committee evaluated the translations and determined the conceptual and item equivalence. The differences among cultures and languages from the different countries were taken into consideration in order to proceed with the DES adaptation. Thus, it was necessary to adjust some terms and cultural contexts to the Brazilian background, which sometimes entailed adjusting items to capture the same concept [15].

The committee developed a first version, which was validated on a convenience sample of 42 dental students, representative of the 5 years of the course. Along with the Brazilian DES, the students answered an evaluation instrument in which they could present their doubts and suggestions regarding the items. There were no substantial changes regarding difficulties in comprehension, and the final version was approved.

Construct Validity, Reliability and Stressors

Data collection was carried out at a Brazilian Public Dental School, in August of 2012, beginning of the 3rd semester. This particular school, since 2005, encompasses a five-year study program and follows a traditional lecture-based system, with some modifications based on the Brazilian curriculum guideline [16], which aims to graduate a generalist, humanist, critical and participative professional. To achieve this goal the curriculum is organized into modules, with active student participation in education, research and community based projects, approaching the student to the professional reality. There is also a significant hourly load dedicated to training courses in public health services.

The study objectives were explained to the students and all were invited to participate voluntarily (N = 289). Those who were absent on the day that the questionnaire was distributed (n = 39) or who refused (n = 25) were excluded. Thus the final sample comprised 225 students who anonymously completed the DES.

The instrument was divided into 2 sections. The first section verified socio demographic details, such as gender, age, year of undergraduate study, type of living accommodation, first course choice for admission and financial income. The second section comprised the Dental Environment Stress (DES), which assesses sources of stress associated with undergraduate course work and dental

students' training [9]. The students were asked to answer the DES items as "not pertinent" or 1 - "not stressful at all", 2 - "somewhat stressful", 3 - "quite stressful" and 4 - "very stressful".

Data Analysis

Data were double entered using EpiData 3.1 (EpiData Association, Odense, Denmark) and analyzed using the statistical software package R. All tests were two-tailed and conducted at a 5% level of significance.

To evaluate whether the dataset was suitable for factor analysis, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity were employed. The KMO tests whether the partial correlations among variables are robust enough to accommodate factor analysis. It allows comparison of the observed correlation coefficients with the partial correlation coefficients. A KMO value of 0.6 or higher is considered satisfactory to proceed with a factor analysis. Bartlett's Test of Sphericity tests the null hypothesis that the correlations among variables are equal to the identity matrix. A p-value of 0.05 or smaller, rejects the null hypothesis, indicating that the correlation matrix is not an identity matrix and therefore the implementation of factor analysis is possible [17]. The data were then submitted to principal components analysis in an attempt to reveal the number of significant components (eigenvalues greater than 1.0) produced by the 36 variables that comprise the DES. The eigenvalues show the proportion of the variance attributed to each value. When the factors were selected, a correlation matrix was generated, in which, the relationships between items and factors by means of factor loadings were observed. Also, Scree plots and root mean square residual values from this model were used as criteria [17].

To evaluate the construct validity, an exploratory factor analysis was performed by a principal components analysis and Varimax rotation, which were grouped into five factors, with the condition to exclude those with factor loadings less than or equal to 0.30. The reliability analysis was verified by internal consistency, assessed using Cronbach's alpha coefficient with 95% confidence intervals (95% CI). To verify the unidimensionality of the subscales of the Brazilian DES, the internal consistency was also evaluated for each subscale. Values equal to or above 0.7 and up to 0.9 indicate acceptable reliability for scales which are used as research tools to compare groups.

Univariate statistical analysis was conducted by Wilcoxon rank sum test for gender comparison and Kruskall-Wallis test for year comparison, and multivariate analysis relied on ordinal logistic regression modeling. In the models, study level and gender were included as possible predictors in order to evaluate at the same time the factors effect on students' responses [18]. Blank and "not pertinent" items were ignored in this analysis.

Ethical Aspects

This study received approval from the Committee of Ethics in Research Involving Human Beings/UEL, CEP 252/2011.

Results

Translation and Cross-cultural Adaptation

Regarding the assessment of conceptual and item equivalence, the literature review on the subject, and discussions with expert professionals indicated that the original instrument was relevant to Brazilian culture. However, some items included in the DES were considered not pertinent to the Brazilian population and because of this were removed or modified. Thus, the terms '*Forced postponement of marriage or engagement*' was replaced by '*Difficulty in undertaking conjugal commitments*'; '*Problems adapting to marriage'* was replaced by *'Reconciling personal life issues with dental school routines*'; and '*Conflict with the partner in relation to career development*' by '*Conflict with the family throughout your career development*'. Additionally, the item '*Having children at home*' was removed.

Considering the changes in sexual behaviors that occurred in the last decades in Brazil, it was decided to keep the item '*Attitudes of the school toward female dental students*' and to add '*Attitudes of the school toward homosexual dental students*'. Thus, the Brazilian version of DES (Br-DES) is now composed of 36 items.

Face validity, performed by the sample composed of 42 students, indicated ninety five per cent understanding in all items. The suggestions given were in reference to the vocabulary, which, after analysis, allowed for further elaboration in the final format of the instrument.

Construct Validity and Reliability

Initial analysis revealed that the data obtained attended to the assumptions to proceed with factor analysis standard guidelines [13]. The sample contained 225 participants averaging 6.25 people per item. The KMO was high (0.82) and Bartlett's test was significant ($\chi 2$ = 3091.50, df = 630, p <0.01). The initial communalities were equal to 1 and after extraction ranged between 0.43 and 0.82. This indicated that all items could be included in the analysis once, after extraction, only variables with values less than 0.30 would be withdrawn. The principal components performed in order to explore the data structure, pointed to the existence of nine components with eigenvalues greater than 1.0 and the ability to explain 60.38% of the total variance. Among these, five factors possessed eigenvalues greater than 1.5 and together explained 46.88% of the total variance. The scree plot revealed that after the fifth component, the decline became constant, indicating the possibility that, from this point on, a single variance dominates the structure of the common variance [14]. Thus, by the eigenvalue criterion as shown in the scree plot, the 36 items of the Brazilian DES appeared to be organized into five components.

To proceed with the construct validity of the DES, a factor analysis was performed using the method of principal components with Varimax rotation. Although preliminary analysis signaled the possible existence of nine factors, the extraction of five factors consonant with other studies on the structure of the DES was requested [6]. Based on these analyses, three items have not reached the factor loading of 0.35. However, they were reclassified based on the factor load of greater value as well as by theoretical construct. The five rotated factors were divided as follows: *Construct 1*:

comprised 10 items about "*Academic Performance*", which accounted for 13.34% of the common variance; *Construct 2*: comprised 6 items about "*Difficulties and Insecurities Regarding the Individual's Professional Future*", which accounted for 9.53% of the common variance; *Construct 3*: comprised four items about "*Responsibilities with Patients*", which accounted for 8.76% of the common variance; *Construct 4*: comprised 8 items on "*Individual and Institutional Factors*", which accounted for 8.21% of the common variance; *Construct 5*: comprised 8 items on "*Interpersonal Relationships*", which accounted for 7.03% of the common variance (Table 1).

Table 1. Factorial loadings (load), Communalities (h^2) and Cronbach's alpha (α) for the 36 Br-DES items.

Items	load	h^2	α
Academic performance			
21 – Reconcile personal life issues with dental school routines	0.68	0.68	0.83
27 - Lack of time to do assigned school work	0.67	0.56	
1 - Amount of assigned classwork	0.66	0.63	
15 - Lack of time for relaxation and recreation	0.65	0.57	
7 - Examinations and grades	0.62	0.54	
3 - Difficulty of classwork	0.61	0.61	
20 - Completing graduation requirements	0.58	0.53	
11 - Receiving criticism about work	0.48	0.55	
9 – Atmosphere created by faculty	0.47	0.55	
24 - Fear of failing course or year	0.44	0.63	
Difficulties and insecurities about their professional future			
13 - Lack of confidence in self to be a successful dental-student	0.86	0.82	0.83
14 - Lack of confidence in self to be a successful dentist	0.84	0.80	
25 - Insecurity concerning professional future	0.66	0.69	
12 - Difficulty in learning precision manual skills required in pre-clinical and laboratory work	0.62	0.69	
8 - Difficulty in learning clinical procedures	0.59	0.66	
35 - Fear of being unable to catch up if i get behind	0.43	0.66	
Responsibilities with patients			
6 - Patients being late or not showing for their appointments	0.86	0.79	0.84
2 - Lack of cooperation by patient in their home care	0.82	0.75	
4 - Responsibilities for comprehensive patient care	0.74	0.62	
18 - Working on patients with dirty mouths	0.71	0.64	
Individual and institutional factors			
28 - Considering entering some other field of work	0.63	0.54	0.75
29 - Difficulty in undertake conjugal commitments	0.59	0.44	
22 - Expectations of dental school and what in reality it's like	0.54	0.56	
30 - Personal physical health	0.49	0.60	
26 - Financial responsibilities	0.47	0.47	
23 - Lack of participation in the school's decision-making	0.40	0.54	
17 - Rules and regulations of the school	0.38	0.56	
34 – Inconsistency of feedback on you work between different instructors	0.32	0.50	
Interpersonal relationships			
33 – Discrimation due to race, class status or ethnic group	0.75	0.63	0.65
31 - Attitudes of school toward women dental students	0.63	0.56	
36 - Attitudes of school toward homosexual dental students	0.59	0.63	
16 – Amount of cheating in dental school	0.58	0.55	
5 – Competition for grades	0.42	0.54	
32 – Conflict with the family throughout your career development	0.36	0.58	
19 - Lack of family atmosphere in the dormitories during school	0.28	0.43	
10 – Relations with member of the opposite sex	0.21	0.66	
Total			**0.88**

Stressors

The mean age of the sample was 21.87 ± 2.99 years ranging from 17.41 to 42.92 years. Most (n = 174; 77.33%) choose dentistry as first choice of admission. Among the students that have another course as the first option (n = 51; 22.67%), 62.55% had chosen medicine as first option (n = 32). Majority of students (n = 202; 89.78%) were single and lived alone or with other students (n = 144; 64.00%). The sample description is presented in Table 2.

Table 2. Sample description by year of study and gender.

Year of study	n	Response rate (%)	Gender			
			Female		Male	
			n	%	n	%
1st	32	50.79	22	9.78	10	4.44
2nd	57	87.69	40	17.78	17	7.56
3rd	49	85.96	41	18.22	8	3.56
4th	44	80.00	30	13.33	14	6.22
5th	43	87.76	31	13.78	12	5.33
Total	225	77.85	164	72.89	61	27.11

The items most perceived as "quite stressful" or "very stressful" were '*Examinations and grades*' (82.8%), '*Fear of failing course or year*' (73.99%), '*Patients being late or not showing for their appointments*' (66.21%), '*Lack of time for relaxation*' (64.09%), '*Insecurity concerning professional future*' (62.22%), and '*Inconsistency of feedback on you work between different instructors*' (55.25%).

Univariate analysis indicated significant differences by year of study and gender. It is notable that female students had higher scores than the male ones in thirty-one items, and the difference was significant in seventeen items. Also, in twenty-four DES items, the Kruskall-Wallis test indicated a significant difference by year of study (Table 3). Ordinal logistic regression modeling revealed that a 19 of stressors remained significantly different between years of study and 18 gender (Table 4).

Table 3. Descriptive data and univariate analysis results of the 36 Br-DES items.

Stress items	Distribution of Replies (%)					p-value	
	n	1	2	3	4	Gender+	Year++
Academic performance							
Examinations and grades	221	3.17	14.03	27.60	55.20	0.00*	0.00*
Fear of failing course or year	223	12.56	13.45	17.49	56.50	0.02*	0.00*
Lack of time for relaxation	220	12.73	23.18	26.36	37.73	0.01*	0.00*
Lack of time to do assigned school work	222	8.56	34.23	28.83	28.38	0.00*	0.00*
Completing graduation requirements	218	12.39	32.11	27.98	27.52	0.00*	0.02*
Reconcile personal life issues with dental school routines	223	19.73	30.94	23.32	26.01	0.00*	0.00*
Atmosphere created by clinical faculty	221	17.65	33.48	27.60	21.27	0.01*	0.00*
Amount of assigned classwork	224	18.30	39.29	29.91	12.50	0.00*	0.00*
Difficulty of classwork	223	19.73	39.01	26.46	14.80	0.00*	0.00*
Receiving criticism about work	219	21.00	38.81	26.03	14.16	0.00*	0.52
Difficulties and insecurities about their professional future							
Insecurity concerning professional future	225	11.56	26.22	30.22	32.00	0.00*	0.02*
Fear of being unable to catch up if I get behind	219	20.09	24.66	20.55	34.70	0.01*	0.00*
Lack of confidence in self to be a successful dentist	217	21.66	27.19	27.19	23.96	0.00*	0.01*
Lack of confidence in self to be a successful dental-student	215	20.93	29.30	26.05	23.72	0.00*	0.02*
Difficulty in learning clinical procedures	219	15.07	39.73	26.94	18.26	0.00*	0.06
Difficulty in learning precision manual skills required in pre-clinical and laboratory work	220	18.18	39.09	24.09	18.64	0.01*	0.45

Responsibilities with patients							
Patients being late or not showing for their appointments	148	12.16	21.62	27.70	38.51	0.50	0.00*
Responsibilities for comprehensive patient care	152	19.74	32.24	32.24	15.79	0.23	0.00*
Working on patients with dirty mouths	158	25.32	27.22	25.95	21.52	0.09	0.00*
Lack of cooperation by patient in their home care	150	16.67	42.67	28.67	12.00	0.29	0.00*
Individual and institutional factors							
Inconsistency of feedback on you work between different instructors	218	15.60	27.06	27.52	29.82	0.11	0.00*
Financial responsibilities	218	16.51	27.52	32.11	23.85	0.20	0.00*
Expectations of dental school and what in reality it's like	219	12.79	36.53	28.77	21.92	0.16	0.00*
Lack of input into decision-making processes of school	217	31.34	34.56	24.42	9.68	0.60	0.08
Personal physical health	215	33.95	32.56	15.35	18.14	0.06	0.04*
Rules and regulations of the school	220	32.73	41.36	20.00	5.91	0.26	0.29
Difficulty in undertake conjugal commitments	159	54.09	23.27	11.95	10.69	0.11	0.00*
Considering entering some other field of work	166	50.00	27.71	11.45	10.84	0.63	0.50
Interpersonal relationships							
Amount of cheating in dental school	203	33.50	30.54	19.21	16.75	0.28	0.10
Lack of home atmosphere in living quarters	176	51.14	15.34	17.05	16.48	0.81	0.82
Competition for grades	210	45.71	21.90	15.71	16.67	0.02*	0.05*
Conflict with the family throughout your career development	186	61.29	20.43	9.68	8.60	0.75	0.65
Discrimation due to race, class status or ethnic group	163	69.33	12.88	9.82	7.98	0.29	0.40
Attitudes of school toward women dental students	163	70.55	13.50	7.98	7.98	0.08	0.00*
Attitudes of school toward homosexual dental students	152	76.32	9.87	9.21	4.61	0.55	0.56
Relations with member of the opposite sex	205	77.56	15.12	4.88	2.44	0.39	0.25

1: Not stressful at all, 2: Somewhat stressful, 3: Quite stressful, 4: Very stressful | +: Wilcoxon rank sum test, ++: Kruskall-Wallis test, *: $p < 0.05$.

Table 4. Multivariate significant models for stress items based on ordinal logistic regression.

Dependent Variable	Independent Variables†	OR	95% CI
Academic Performance			
Examinations and grades	Males	0.24	0.13 - 0.44
	2nd year	3.38	1.32 - 8.83
	5th year	0.29	0.12 - 0.71
Fear of failing course or year	Males	0.53	0.29 - 0.97
	2nd year	4.09	1.53 - 11.40
	5th year	0.24	0.10 - 0.59
Lack of time for relaxation	Males	0.39	0.22 - 0.69
	2nd year	5.76	2.38 - 14.37
	4th year	0.37	0.16 - 0.87
Lack of time to do assigned school work	Males	0.35	0.20 - 0.64
	2nd year	11.99	5.11 - 28.96
	3rd year	3.11	1.35 - 7.30
Completing graduation requirements	Males	0.43	0.25 - 0.75
	2nd year	2.68	1.19 - 6.09
Reconcile personal life issues with dental school routines	Males	0.42	0.24 - 0.73
	2nd year	4.04	1.82 - 9.13
Atmosphere created by clinical faculty	Males	0.44	0.25 - 0.76
	2nd year	12.08	5.12 - 29.46
	3rd year	5.42	2.29 - 13.20
	4th year	4.02	1.68 - 9.86
	5th year	7.69	3.22 - 18.92
Amount of assigned classwork	Males	0.42	0.24 - 0.74
	2nd year	8.09	3.57 - 18.76
Difficulty of classwork	Males	0.39	0.22 - 0.69
	2nd year	4.83	2.18 - 10.70
Receiving criticism about work	Males	0.33	0.19 - 0.58
Difficulties and Insecurities about their Professional Future			
Insecurity concerning professional future	Males	0.39	0.22 - 0.68
	2nd year	2.94	1.30 - 6.71
	4th year	2.33	1.00 - 5.46
	5th year	4.06	1.73 - 9.71
Fear of being unable to catch up if I get behind	Males	0.44	0.25 - 0.77
	2nd year	2.48	1.09 - 5.71
Lack of confidence in self to be a successful dentist	Males	0.31	0.17 - 0.54

	5th year	3.58	1.52 - 8.55
Lack of confidence in self to be a successful dental-student	Males	0.31	0.17 - 0.54
	5th year	3.52	1.50 - 8.41
Difficulty in learning clinical procedures	Males	0.30	0.17 - 0.53
Difficulty in learning precision manual skills required in pre-clinical and laboratory work	Males	0.45	0.26 - 0.78
Responsibilities with Patients			
Working on patients with dirty mouths	Males	0.35	0.18 - 0.67
Patients being late or not showing for their appointments	4th year+	3.03	1.41 - 6.66
	5th year+	3.16	1.48 - 6.90
Responsibilities for comprehensive patient care	5th year+	2.72	1.25 - 6.01
Individual and Institutional Factors			
Inconsistency of feedback on you work between different instructors	2nd year	4.52	2.04 - 10.15
Financial responsibilities	2nd year	1.79	0.81 - 3.97
	4th year	2.72	1.20 - 6.22
	5th year	3.46	1.49 - 8.18
Expectations of dental school and what in reality it's like	2nd year	3.76	1.66 - 8.65
	3rd year	2.49	1.06 - 5.90
	4th year	4.35	1.85 - 10.40
	5th year	5.39	2.26 - 13.09
Interpersonal Relationships			
Competition for grades	Males	0.44	0.24 - 0.79
	4th year	0.26	0.11 - 0.62

†Reference categories: females and first year | + Reference category: third year | $p<0.05$.

Differences between sexes, but not for year, were detected in four items belonging to 3 different constructs – "*Academic Performance*", "*Difficulties and Insecurities about their professional Future*" and "*Responsabilities with Patients*". The females perceived '*Receiving criticism about work*', '*Difficulty in learning clinical procedures*', '*Difficulty in learning precision manual skills required in pre-clinical and laboratory work*' and '*Working on patients with dirty mouths*', respectively 2.30, 1.22, 1.86 and 2.33 times more stressful than males. Differences among years, but not between genders, were identified in 5 items that belonged to 2 constructs – "*Responsibilities with Patients*" and "*Individual and Institucional Factors*". They were '*Responsibilities for comprehensive patient care*', '*Patients being late or not showing for their appointments*', '*Expectations of dental school and what in reality it's like*', '*Financial responsibilities*', and '*Inconsistency of feedback on you works between different instructors*'.

The results of the multivariate analysis indicated that entering students considered '*Competition for grades*' 2.85 times more stressful than fourth grade students. Second-year students seemed to be the most concerned about most every item, especially with the items of "*Academic Performance*" construct. Fourth and fifth grade students appeared the least stressed, apart from '*Lack of confidence in self to be a successful dental-student and a dentist*' and '*Insecurity concerning professional future*' – from the construct "*Difficulties and Insecurities about their Professional Future*"; '*Expectations of dental school and what in reality it's like*' and '*Financial responsibilities*'- from "*Individual and Institutional Factors*".

Discussion

Despite the fact that there are many cross-cultural adaptation and psychometric indices of scales in dentistry, specific tools for gauging stress, such as the DES, are not found in Portuguese. Additionally, although DES has been used in many countries, among different cultures, few studies have demonstrated its properties or methods of cultural adaptation prior to describe the perceived

stressors [6,7,10,11,19]. Satisfactory results of this study, both in regard to semantic equivalence and actual measurements, suggest that the cultural adaptation process of the Brazilian/Portuguese version of DES was adequate.

The results showed semantic equivalence between the English and Portuguese versions of DES. Pre-test is essential to accomplish it because it detects potential difficulties with the instrument, such as misinterpretations about the intended meaning of the items [14]. The instrument's content validity is its ability to verify if the items represent all aspects of the instrument's content based on judgment, so an expert committee should consider the appropriateness of the items [20].

Along with Cronbach's alpha, factorial analysis is an important tool to ascertain psychometric indicators because it allows identifying how the items are organized according to the samples' constructs instead of being theoretically divided. Previous studies recognized by factor analysis, whether a smaller number of factors could account for the pattern of correlations among a larger number of variables [6]. DES was subdivided into seven scales, of which the internal consistency was verified by Cronbach's alpha. The identified factors were "*self-efficacy beliefs*", "*faculty and administration*", "*workload*", "*patient treatment*", "*difficulties in adapting to the specific demands during the period of preclinical and clinical training*", "*performance pressure*", and "*individual items*". Among Chilean and Argentinean dental students four-factor solution emerged and included "*academic workload*", "*clinical training*", "*time constraints*" and "*self-efficacy beliefs*" [21]. This study identified 5 distinct factors: "*Academic Performance*", "*Difficulties and Insecurities Regarding the Individual's Professional Future*", "*Responsibilities with Patients*", "*Individual and Institutional Factors*" and "*Interpersonal Relationships*". It is possible that the structure factor and reliability results may differ when applying this version among other population groups in Brazil. This expansion could generate valuable information that will contribute to the ratification of the validity and reliability of the instrument in general, as well as consolidate its cultural adaptation. It is important to point out that the country probably has one of the highest numbers of dental students in the world; every year about 9,000 undergraduate students complete their courses [22].

Concerning the validation of Br-DES, the instrument can be considered a reliable and valid measure because its 36 items have significant factor loadings (greater than 0.40 and the great majority close to 0.70) in one factor. The items formed three precise factors (Cronbach's alpha greater than 0.80), and two factors with less precision (alpha greater than 0.65), which are theoretically consistent. For this, the psychometric properties of the DES were satisfactory and provided good support for its reliability and validity. In a previous study, DES was divided theoretically into five domains with a general alpha of 0.95 [23]. Br-DES general alpha was consistent to previous reports [7,11,19]; alpha values from 0.70 to 0.95 are considered acceptable but a very high value may indicate redundancy between items [24]. But, the study did not test discriminant validity and its cross-sectional design did not allow for testing the stability and responsiveness of the instrument, i.e., its ability to reproduce the same results in successive

applications, and to detect changes over time. Only the use of this instrument in prospective studies will enable to analysis of these properties. Also, longitudinal studies are needed to follow students throughout their curriculum [8].

The stress theory has been widely recognized as being composed of three factors: i) the stressor, responsible for triggering the stress response; ii) the stress response, which can be physical, psychological or social; iii) the stress process, the result of the individual's interaction with the stressor [25]. It is important to evaluate all these aspects when studying academic stress. However, DES allows access only to stressors. Thus, the use of other instruments combined with DES could expand the present studies on stress among dental students. Furthermore, its predictive ability, although already considered in the body of literature, should be checked in additional studies.

Multivariate analysis demonstrated that perceived stressors were different among years of study and between gender, with higher rates for the second and fifth years, and also for females. It's important to highlight that DES only allows identifying and quantifying the stressors reported by study population. To evaluate stress another methodologies can be used [7,26].

'*Examinations and grades*' was the highest scored item (82.80%) among all the students, as previously described. There is evidence that the type of examination can produce different changes in emotional, behavioral and cognitive assessments, which appeared to initiate different physical, emotional, and social reactions. Oral presentation is perceived as the most difficult by students, the pencil and paper examination is evaluated as the easiest while objective structured clinical examination (OSCE) as intermediate [27]. Due to the curriculum characteristics, the studied population is subjected to different types of examination that can influence the student's perception of stress related to the matter.

The second year presented the greatest perceived sources of stress in most items concerning "*Academic Performance*". Second and third years are prone to be more stressful because of the intense laboratorial/pre-clinical loads, consistent with intense schedule of biomedical and introductory dental coursework, laboratory work and initial clinical training work [6,8]. At this school, the second year consists in a very challenging and demanding year. With the introduction to clinical disciplines as restorative dentistry and diagnosis, the students must acquire a great amount of knowledge in radiology, semiology, pathology and stomatology, besides the acquisition of manual skills in laboratory and preclinical work. In advance, the results of this study have subsidized the curricular changes that are in course, at the school.

In contrast to other studies [21,26], the results indicate a decrease in overall student stressors levels as the student progresses in the program. Fifth year stressors consisted mainly in '*Difficulties and insecurities about professional future*'. As described in the literature, these findings reveals that fifth-year students face anxieties about the future and may be uncertain about some features of their dental education, which are common to developed, undeveloped and sub developed countries [6]. For the fourth and fifth year, the diminished stressors rates regarding academic and clinical evaluation may be due to the clinical training evaluation process. At this school it is not

based on unit (quotas) requirements, which has already been described as a significant source of stress [28]. On the other hand, it's noted a great concern on '*Atmosphere created by clinical faculty*' in the fifth year. This may due to the curriculum guidelines, which encourage critical thinking and the ability to self-evaluate the clinical performance. However, the students still require professor's approval to work, and the autonomy is suspended, this tension between autonomy and submission is reported to be relevant in clinical dentistry stress [29]. Sometimes the professor assumes that trainees are asking for feedback but actually they are soliciting reassurance [30] and this can be a source of conflict.

Clinical year students had constant rates for patient and clinic responsibilities items, with a slight increase on '*Responsibilities for comprehensive patients care*'. This is congruent with previous studies [31] in which items linked to clinical training tended to induce less stress in final-year students. Furthermore, this item specifically demonstrated a more generalist and humanist side of the dental student formation, compatible with Brazilian curriculum guideline [16].

The rates of "*Individual and Institutional Factors*" varied considerably through the years of study. The item '*Expectations of dental school and what in realty it is like*' and '*Financial responsibilities*' stood out in the fifth year, while '*Personal physical health*' and '*Inconsistency of feedback on your work between different instructors*' have greater rates in second year. These factors relate to uncontrollable features of the students' life, such as the lack of financial autonomy, occupational hazards of dentistry and faculty relations. As regard to inconsistency of feedback, although it is foundational to professional development, feedback can result in inconsistent and unanticipated outcomes [30]. Multiple influences appear to impact upon the interpretation and uptake of feedback. These include confidence, experience, and fear of not appearing knowledgeable. Importantly, however, each could have a paradoxical effect of both increasing and decreasing receptivity [32]. Unfortunately, the self-monitoring of confidence and the provision of feedback on appropriate levels of confidence are seldom considered in education programs [30]. Besides this, the different training formation experienced by the professors may on the one hand to enrich the students' development but the other can result in feedback inconsistencies as reported in a Canadian study [10]. This investigation revealed the introduction of a Faculty Development/Calibration Educational Series in recognition of this problem, however the reports on conflicting teaching, didn't decreased this item levels.

As encountered in other countries, regarding the association of gender and perceived sources of stress, females reported higher rates in almost every significant item of the DES [2,8]. The fact that female students report higher stressor rates can be attributed to their different patterns of response to stressful events. Some investigations suggested that gender differences could be explained by different patterns of psychological morbidity and because males are simply less expressive of their concerns [33]. Also, it is important to recognize that the higher stress level for females is not related to higher levels of psychological disturbance [23]. The adverse effects of student stress on psychological health were not explored in this study. As already accomplished by

other authors [8,23], further research should incorporate measures of psychological disturbance for a more detailed assessment of mental health and its relation to dental school stress.

Conclusion

The results indicate several findings consistent with the international literature, but further research may enhance the understanding of dental student stress. In summary this investigation demonstrated that entering students are mostly concerned with factors closely related to academic performance, whereas clinical year students are more concerned about insecurity in their professional future. For the benefit of using the Brazilian version of the DES, we highlight the achievements of construct validity, indicating its ability to discriminate various attributes related to stress in dental school. It is believed that further research may help to better understand the internal organization of the scale factors, enabling also the refinement of the instrument and possible reduction in the number of items.

References

1. Kay EJ, Lowe JC. A survey of stress levels, self-perceived health and health-related behaviours of UK dental practitioners in 2005. Br Dent J 2008; 204(11):E19; discussion 622-3.
2. Alzahem AM, Van der Molen HT, Alaujan AH, De Boer BJ. Stress management in dental students: a systematic review. Adv Med Educ Pract 2014; 5:167-76.
3. Alzahem AM, Van Der Molen HT, Alaujan AH, Schmidt HG, Zamakhshary MH. Stress amongst dental students: A systematic review. Eur J Dent Educ 2011; 15(1):8-18.
4. Iacovides A, Fountoulakis KN, Kaprinis S, Kaprinis G. The relationship between job stress, burnout and clinical depression. J Affect Disord 2003; 75(3):209-21.
5. Polychronopoulou A, Divaris K. A longitudinal study of Greek dental students' perceived sources of stress. J Dent Educ 2010; 74(5):524-30.
6. Kumar S, Dagli RJ, Mathur A, Jain M, Prabu D, Kulkarni S. Perceived sources of stress amongst Indian dental students. Eur J Dent Educ 2009; 13(1):39-45.
7. Humphris G, Blinkhorn A, Freeman R, Gorter R, Hoad-Reddick G, Murtomaa H, et al. Psychological stress in undergraduate dental students: baseline results from seven European dental schools. Eur J Dent Educ 2002; 6(1):22-9.
8. Elani HW, Allison PJ, Kumar RA, Mancini L, Lambrou A, Bedos C. A systematic review of stress in dental students. J Dent Educ 2014; 78(2):226-42.
9. Garbee WH, Zucker SB, Selby GR. Perceived sources of stress among dental students. J Am Dent Assoc 1980; 100(6):853-7.
10. Muirhead V, Locker D. Canadian dental students' perceptions of stress and social support. Eur J Dent Educ 2008; 12(3):144-8.
11. Silverstein ST, Kritz-Silverstein D. A longitudinal study of stress in first-year dental students. J Dent Educ 2010; 74(8):836-48.
12. Pozos Radillo BE, Tórrez López TM, Aguilera Velasco MDLA, Acosta Fernández M, González Perez GJ. Stress-associated factors in Mexican dentists. Braz Oral Res 2008; 22(3):223-8.
13. Guillemin F. Cross-cultural adaptation and validation of health status measures. Scand J Rheumatol. 1995; 24(2):61-3.
14. Guillemin F, Bombardier C, Beaton D. Cross-cultural adaptation of health-related quality of life measures: Literature review and proposed guidelines. J Clin Epidemiol 1993; 46(12):1417-32.
15. Sussman S, Palinkas LA. Reflections on international translation of evidence-based health behavior programs. Eval Health Prof 2008; 31(3):323-30.

16. Brasil. Ministério da Saúde. Conselho Nacional de Educação. Câmara de Educação Superior. Resolução CNE/CES 1.300/2001 de 06 de novembro de 2001. Diretrizes curriculares nacionais dos cursos de gradução em farmácia e odontologia. Superior CN de EC de E, ed. 2001;1:25.
17. Conway JM, Huffcutt AI. A review and evaluation of exploratory factor analysis practices in organizational research. Organ Res Methods 2003; 6(2):147-68.
18. Agresti A. An introduction to categorical data analysis. 2.nd. ed. Hoboken, NJ: Wiley-Interscience; 2007.
19. Sugiura G, Shinada K, Kawaguchi Y. Psychological well-being and perceptions of stress amongst Japanese dental students. Eur J Dent Educ 2005; 9(1):17-25.
20. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine 2000; 25(24):3186-91.
21. Fonseca J, Divaris K, Villalba S, Pizarro S, Fernandez M, Codjambassis A, et al. Perceived sources of stress amongst Chilean and Argentinean dental students. Eur J Dent Educ 2013; 17(1):30-8.
22. Morita MC, Haddad AE, Araújo ME. Perfil atual e tendências do cirurgião-dentista Brasileiro. Maringá: Dental Press; 2010.
23. Naidu RS, Adams JS, Simeon D, Persad S. Sources of stress and psychological disturbance among dental students in the West Indies. J Dent Educ 2002; 66(9):1021-30.
24. Terwee CB, Bot SDM, de Boer MR, van der Windt DA, Knol DL, Dekker J, et al. Quality criteria were proposed for measurement properties of health status questionnaires. J Clin Epidemiol 2007; 60(1):34-42.
25. Coles C. Medicine and stress. Med Educ 1994; 28(1):3-4.
26. Rubenstein LK, May TM, Sonn MB, Batts VA. Physical health and stress in entering dental students. J Dent Educ 1989; 53(9):545-7.
27. Sarid O, Anson O, Bentov Y. Students' reactions to three typical examinations in health sciences. Adv Heal Sci Educ 2005; 10(4):291-302.
28. Dodge WW, Dale RA, Hendricson WD. A preliminary study of the effect of eliminating requirements on clinical performance. J Dent Educ 1993; 57(9):667-72.
29. Wetherell J, Mullins G, Hirsch R. Self-assessment in a problem-based learning curriculum in dentistry. Eur J Dent Educ 1999; 3(3):97-105.
30. Curtis DA, O'Sullivan P. Does trainee confidence influence acceptance of feedback? Med Educ 2014; 48(10):943-5.
31. Sanders A, Lushington K. Effect of perceived stress on student performance in dental school. J Dent Educ 2002; 66:75-81.
32. Eva KW, Armson H, Holmboe E, Lockyer J, Loney E, Mann K, et al. Factors influencing responsiveness to feedback: On the interplay between fear, confidence, and reasoning processes. Adv Heal Sci Educ 2012; 17(1):15-26.
33. Sanders AE, Lushington K. Sources of stress for Australian dental students. J Dent Educ 1999; 63(9):688.