Reuna

VALIDATION OF A SCALE OF PERCEIVED STRESS IN HIGHER EDUCATION PROFESSORS

VALIDAÇÃO DE UMA ESCALA DE ESTRESSE PERCEBIDO EM DOCENTES DO ENSINO SUPERIOR

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ABSTRACT

The present study aimed to investigate the dimensionality of the Perceived Stress Scale (PSS), in its version of 14 and 10 items (PSS-14 and PSS-10), in a sample of professors from the Federal University of Viçosa (N = 222). An exploratory factorial analysis using the principal components method, with varimax rotation, indicated the solution with two factors as the most adjusted to the data, confirming previous studies. In relation to PSS-14, the items had adequate factor loads and the retained factor explained 58% of the common variance of the scores, presenting internal consistency (α = 0.89). In relation to PSS-10, the items had adequate factor loads and the retained factor explained 54% of the common variance of the scores, presenting internal consistency (α = 0.87). In the end, it was found that there were satisfactory adjustments for the two versions of the PSS in its two-factor model, with the 14-item scale being the harmonic solution, considering the relationship between parsimony in the quantity of items and the statistical robustness of this instrument. The results showed that the teaching career is one of the most stressful activities among the professions studied, demanding public policies that balance the teaching career, combating the incidence of stress and other emerging diseases in this professional category.

Keywords: Quality of Life; PSS-14, Higher Education Certificate.

RESUMO

O presente estudo teve por objetivo investigar a dimensionalidade da Escala de Estresse Percebido (PSS), em sua versão de 14 e de 10 itens (PSS-14 e PSS-10), em uma amostra de docentes da Universidade Federal de Viçosa (N = 222). Uma análise fatorial exploratória pelo método dos componentes principais, com rotação varimax, indicou a solução com dois fatores como a mais ajustada aos dados, confirmando estudos anteriores. Em relação a PSS-14, os itens possuíram cargas fatoriais adequadas e o fator retido explicou 58% da variância comum dos escores, apresentando consistência interna (α = 0,89). Em relação a PSS-10, os itens possuíram cargas fatoriais adequadas e o fator retido explicou 54% da variância comum dos escores, apresentando consistência interna (α = 0,87). Ao final, constatou-se que houve ajustes satisfatórios para as duas versões da PSS em seu modelo bifatorial, sendo a escala com 14 itens a solução harmônica, considerando-se a relação entre a parcimônia na quantidade de itens e a robustez estatística deste instrumento. Os resultados demonstraram que a carreira docente é uma das atividades mais estressantes entre as profissões estudadas, demandando politicas públicas que equilibrem a carreira docente, combatendo com a incidência de estresse e outras doenças emergentes nessa categoria profissional.

Palavras-chave: Qualidade de Vida; PSS-14, Professores do Magistério Superior.

1. Introduction

The stress is in any situation in which the body homeostatic balance is disturbed, promoting organic adaptations as the release of a large amount of hormones in the bloodstream, preparing the individual for some kind of reaction (NAHAS, 2001; MARGIS et al., 2003).

The stress occurs when environmental conditions exceed the adaptation capacity of physiological or psychological processes, whether in the fields cognitive, emotional or behavioral, placing individuals at risk and susceptible to the diseases development (MACHADO, 2014). The stress response depends not only on the magnitude and frequency of the stressor agent, but, above all, the life style and how the individual perceives the situation. Therefore, people can react differently to similar situations(LIPP, 1996; MARGIS et al., 2003).

It has been observed, in recent decades, a growing interest on the part of researchers regarding the psychological stress as a function of its significant impact on the individuals' health. Regardless of stressor the source , different studies have demonstrated that stress impacts negatively on physical and psychological health (THOITS, 2010). Such studies provide evidence that the stress evaluation by means of valid and reliable tools is essential for programs of prevention, diagnosis and intervention in relation to this issue.

Among the different ways to assess tress, one of them is to observe the degree to which the individual perceives how stressful the different situations that have occurred throughout his or her life (LAZARUS; FOLKMAN, 1984).

Thus, to ensure that an event is perceived as a stressor, it is necessary the occurrence of two processes mediators between the individual and the environment: the cognitive assessment, which determines the extent to which the life event is perceived as relevant/threatening, and coping strategies, through which the individual manages the internal and external demands before the event, perceived as a stressor. The stress occurs, therefore, when the individual assesses that the internal or external demands exceed his or her ability to deal with them (LAZARUS, 1995).

The Perceived Stress Scale - PSS (Cohen et al., 1983) is one of the most often cited instruments in the literature to estimate stress (MACHADO, 2014). According to Cohen and Williamson (1988), the advantage of using the PSS compared to other instruments is based on the fact that the items of this scale estimate the degree to which individuals believe that their life was unpredictable, uncontrollable and overloaded during the month prior to the evaluation" (COHEN et al., 1983).

This means that the PSS evaluates the stress under three aspects: presence of specific agents that cause stress, physical and psychological symptoms of stress and general perception of stress, regardless of its causal agent (for example, in item 3: "Last month, how many times did you feel nervous or stressed?". According to the authors, the other instruments available in the literature propose to estimate the specific impact of some stressful factors, which limits their results, given that events related to the stress, and may vary among individuals.

Thus, the estimate of the perceived stress may be important to help in the identification of the factors likely to generate stressful situations, increasing the individual's ability to deal with the same (BARRINGTON et al., 2012).

Considering the aspects mentioned above, the present study aimed to investigate the scales dimensionality of perceived stress (PSS 14 and PSS-10), with the purpose of providing new evidence of validity in the Brazilian context.

Thus, this research arises from the following research question: Are the dimensionalities scale of perceived stress appropriate to measure stress levels of higher education professors?

This research was justified by the fact that the teaching in Brazil is considered as one of the most stressful professional activities, among all professional categories (KYRIACOU, 2003). According to a national survey conducted by Beaver Creek (1999), 26% of Professors in Brazil had a level of emotional exhaustion considered dangerous to mental health of the same, although this is not a reality only in Brazil. Several international studies have, in the same way, demonstrated that the adverse teaching conditions are multiple, and contribute to high occupational stress levels (DOMÉNECH and ARTIGA, 2010; KERR et al., 2011; KOKKINOS, 2007; MONTGOMERY and RUPP, 2005; YONG and YUE, 2007).

It should be noted that these, to be used, must submit adequate reliability and validity for the study sample. These properties are essential to ensure that the data obtained may be considered of quality (DERENNE et al., 2010). In addition, previous studies have been conducted with elementary and high school teachers or private institutions of higher education, which demonstrates a need to assess the stress levels of higher education professors of federal institutions, which are responsible for a large part of graduate programs and research projects funded by public institutions, activities with great potential for stress generation.

2. Theoretical frame

2.1 Stress

The word stress means a set of the organism reactions to the aggressions of various origins, capable of disrupting its internal balance (FERREIRA, 1993). It is also a term derived from the latin word with connotations of adversity and affliction, force, pressure or effort (FRANÇA, 2008; CAMELO and ANGERAMI, 2004)

The stress concept is not new, but it was only in the beginning of the 20th century that scholars of the biological and social sciences began to investigate their effects on the people's physical and mental health, as a condition of the body after the effort of adaptation that can produce inability to answer the mental and emotional behavior, physical condition and the relationship with the people.

The physiology of stress includes hormonal mechanisms that start in the brain with the encouragement of the pituitaries and trigger a series of events that encompass the adrenal glands, which act on the stomach, the heart, the lymphatic system, reaching even the immune system. This fact leaves the body with the defenses also affected; lowering the levels of endorphins and serotonin, which are substances which increase the human being's self-esteem. Therefore, a person who experiences the stress tends to have low self-esteem, decreasing the yield in the professional, intellectual and other fields (GUYTON and HALL, 2006).

It is believed that 90% of the world population is affected by stress (BATISTA and BIANCHI, 2006; MENDES et al., 2011). This percentage is associated with the development of several diseases (BARBOSA and CERBASI, 2009). According to Camel and Angerami (2004), Malagris and Fiorito (2006) and Seaweard (2009) about 70% to 80% of heart diseases, some kinds of cancer, infertility, ulcers, insomnia and hypertension, are related to stress development.

In addition to the aspects mentioned, there are studies that classify the stress in two types, good or bad, that may have a positive or negative effect. As positive effect, it is possible to mention the state of alertness, concentration, making our actions better and more effective. The reflections become faster, we think faster and, depending on the environment conditions, we can be more creative and productive (LIPP, 2002). The negative effect, in turn, occurs when the body reacts by a prolonged time to stressor agent, feeling, when exhausted, the ability of attention and concentration decreased, there is a greater effort to maintain productivity. If the stressor agent continues acting and the situation is not resolved, the body, even though tired, keeps on reacting and consuming energy, causing the diseases (CHRISTOPHORO and WAIDMAN, 2008).

The presence of the stress negative effects can be increased by environmental conditions in which individuals develop. This also includes the work environment, causing occupational stress.

2.2 Perceived Stress

According to Cohen and Williamson (1988), there are three ways to measure stress. The first is directed to the presence of specific stressor agents; the second, to physical and psychological symptoms of stress and the third aims to measure the perception of individual stress in a global way, regardless of the stressor agents. There

are also scales that measure the level of stress by means of other scales that quantify the impact of stressful events (life-events impact). However, these instruments have limitations, since the events related to stress can vary a lot among individuals.

According to Faro (2015), in view of their relevance in the study of health and their areas of interface, valid and reliable research instruments are required in the stress research. Therefore, Cohen et al. (1983) proposed a scale that measures the perceived stress, i.e. measures the degree to which individuals perceive situations as stressful. According to Lee (2012) this is possibly, the most widely used scale to measure cognitive stress until today. PSS is originally composed by 14 items (among scholars, known as PSS-14), but there are also reduced versions with 10 and 4 items (PSS-10 and PSS-4), all being used when the goal is to detect in what degree the individuals evaluate situations and/or stimuli of their experiential context as stressors (COHEN et al., 1983).

PSS evaluates the individual's perception about how unpredictable and uncontrollable seem to him or her life events experienced in the previous month, which may be used in the general population with at least an equivalent level of schooling to complete basic education (COHEN and WILLIAMSON, 1988). In addition to providing a stress subjective evaluation, the brevity of the instrument is highlighted, which contributes to its application in conjunction with other measures.

PSS was initially developed with 14 items (PSS-14, COEHN et al., 1983), being seven positive and seven negative. A principal component analysis with varimax rotation, demonstrated the existence of two components with eigenvalues > 1 (3.6 and 2.2, respectively), reflecting the positive and negative groups of items (COHEN and WILLIAMSON, 1988). Reduced versions of the instrument were subsequently produced, containing ten (PSS-10, six positive and four negative) and four items (PSS-4, two positive and two negative), the latter being used only as a screening instrument, in large surveys s (COHEN and LICHTENSTEINS, 1990; COHEN and WILLIAMSON, 1988).

As to its validity, PSS was subjected to Confirmatory Factor Analysis (CFA) in different countries, such as Spain (PSS-14, REMOR, 2006), Japan (PSS-14, MIMURA and GRIFFITHS, 2008), Mexico (PSS-14,RAMÍREZ and HERNÁNDEZ, 2007), Jordan (PSS-14, ALMADI et al., 2012), China (all three versions of PSS, LEUNG et al., 2010), Portugal (all three versions of PSS, RIBEIRO and MARQUES, 2009), among others.

In Brazil, Luft et al. (2007) conducted the first translation and validation for the Brazilian context, however, the exploratory factorial analysis was the version with 14 items with the elderly. Whereas Reis et al. (2010) performed the AFC of PSS-10 with a group of university professors, reaching a satisfactory solution, and Faro (2013) researched the stress in graduate students, corroborating the factorial structure found by Luft et al. (2007).

3. Methodology

3.1 Characterization of the research

This research had as a focus of study the stress levels evaluation of UFV's professors, representing a case study. According to Yin (2005), through the case study it is possible to obtain more detailed analyzes on the unit under study and reach conclusions with a greater level of depth.

In relation to its goals, this research can be characterized as descriptive, because it intended to describe the stress in professors, according to their characteristics. According to Gil (2002), the descriptive research has as objective the description of the characteristics of a given phenomenon or establishment of relationships between the variables and the nature of this relationship.

Regarding the problem approach, the research may be considered quantitative, allowing to evaluate the professors' stress levels of UFV, correlating them with the socioeconomic characteristics of the same.

3.2 Study site

The study was performed in the city of Viçosa, MG, taking as a research unit of the Federal University of Viçosa, Campus Viçosa.

UFV originated from the Higher School of Agriculture and Veterinary Science (ESAV), founded on March 30th in 1922. Today, after 93 years of existence, the institution has 45 undergraduate courses, which are organized in four centers of science, they are the Sciences (CCA), Biological and Health Sciences (CCB), Exact and Technological Sciences (CCE) and Human Sciences, Arts and Languages (CCH), and a total of 44 graduate courses Strictu Sensu in campus Viçosa. The relevance of this site for the proposed study consists of the fact of being the UFV national and international reference in teaching and research, besides being considered one of the Brazilian institutions with higher rates of qualification of teaching staff in level of master and doctorate (UFV, 2015).

3.3 Definition of the sample

For the achievement of quantitative research, it was opted for the use of a simple random sample, since it was intended to evaluate the characteristics of the population as a whole. For Hair (2009) one of the advantages of random sampling is the possibility of estimating the margins of error of the results related to the sampling.

In relation to the number of professors, the campus of Viçosa currently has 966 professors, being 221 professors at CCA, 247 professors at CCB, 279 professors at CCE and 219 professors at CCH.

For the choice of the sample size, and guarantee of statistical significance, the Equation 1 was used, suggested by Triola (2005):

$$\eta = \frac{\sigma^2.p.q.N}{e^2.(N-1)+\sigma^2.p.q}$$

[1]

Where,

η = Sample size

σ = confidence level chosen, expressed in numbers of standard deviations;

p = probability of choosing any teacher at random;

$q = (1-p)$, i.e., probability of non-observation of the phenomenon;

N = total size of population; and e = maximum error allowed.

Considering that the study population is 966 professors, which p e q = 0.5 (once the probability of choosing each professors must be the same) N = 966, σ = 1.96 (for a confidence of 95%), to assume a maximum error associated to 5.3%, 222 professors were interviewed.

3.4 Instruments and Data Analysis

PSS was used, translated and validated to Brazil by Luft, et al. (2007). The PSS has 14 items with Likert scale responses of five points and final score between 0 and 56 points. The items are divided into seven negative factors (Factor 1: 1, 2, 3, 8, 11, 12 and 14) and seven positive factors (Factor 2: 4, 5, 6, 7, 9, 10 and 13). The positive points are subjected to recode procedure for the calculation of the final score.

For the present study, the exploratory factorial analysis of PSS was performed, which identified the common components in a large number of variables. This evaluation allowed to determine how the scale is related to the theoretical concepts that are based on.

For the interpretation of the matrix, the method of orthogonal varimax rotation was applied, which maximizes the high correlations and minimizes the low, thereby facilitating the analysis. Based on these results, it was chosen to analyze the internal consistency (Cronbach's alpha coefficient) and the loadings of the scale with 14 and with 10 questions.

Statistical analyzes were performed using the software Statistical Package for the Social Sciences - SPSS version 20.0, licensed.

3.5 Procedures and Ethical Considerations

Throughout the research process the ethical principles were met set out in Resolution no. 466/2012 of the National Health Council, having this study been approved by the Human Research Ethics Committee at the Federal University of Viçosa through CAAE: 45243915.1.0000.5153 and opinion number 1.116.358.

Before initiating the data collection, the authorization of Dean's Office of People Management of the UFV was obtained. All participants responded to the free and informed consent form (ICF). After these procedures, the questionnaire was applied to professors in accordance with the objectives of the study.

4. Results

For organization of results and discussion, this topic was divided into two parts: characterization of the sample and validation and analysis of constructs and factors.

4.1 Characteristics of the research professors

For the description of professors who participated in the survey, the socioeconomic and demographic information are presented in Table 1 of the respondents as to sex, marital status, age and number of children.

Table 1 - Sample characterization, as to sex, marital status, age and number of children.

Sex			Marital Status		
Male	129	55.41%	Single	30	13.51%
Female	93	44.59%	Married/Living together	179	80.63%
			Separated/Divorced	13	5.86%
Age (in years)			**Number of children**		
From 23 to 30	10	4.50%	0	79	35.59%
From 31 to 40	82	36.94%	1	47	21.17%
From 41 to 50	62	27.93%	2	70	31.53%
From 51 to 60	56	25.23%	3	18	8.11%
Over 61	9	4.05%	4 our more	6	2.70%

Source: Research Data, 2015.

It is noticed that the majority of professors is male, married and have children, corroborating the findings of Moraes (2013), regarding the number of children and marital status. In relation to age, the majority is between 31 and 50 years old, divided between those who are starting a career and those with greater experience. As the professors' age, similar results were found in the study of Aguiar (2010) with the mean age between 31 and 39 years. Whereas the study of Camargo (2013), presented different results being his sample composed of 50.1% women and the average age of 44 ± 10.3 years.

In addition to the personal characteristics, information was raised in relation to the professional characteristics of these professors, such as: if there is a link with the graduate studies, if participates in extension projects, which was the workload in disciplines, the Science Center to which he or she belongs, titulation, scientific production, involvement with administrative activities and has commissioned position (Gratified Function - FG and Board of Management Position - CD). The results can be seen in Table 2.

Table 2 - Professional Characteristics of UFV's professors

Linked to Graduate Studies			Linked tom Extension Projects		
Yes	132	**59.46%**	Yes	134	**60.36%**
No	90	40.54%	No	88	39.64%
Mean time	10.51 years				
Graduate Studies Workload			**Sciences Center**		
Up to 6 hours	9	4.05%	CCH	56	25.23%
From 7 to 10 hours	84	37.84%	CCB	57	25.68%
From 11 to 14 hours	92	**41.44%**	CCA	46	20.72%
Over 15	34	**15.32%**	CCE	60	27.03%
Titulation			**Scientific Production**		
Specialization	0	0.00%	Low	152	68.47%
Master's Degree	45	20.27%	High	70	31.53%
Doctor's Degree	177	**79.73%**			

Are you involved in administrative activities?			Do you have commissioned position?		
Yes	141	**63.51%**	Yes	40	18.02%
No	81	36.49%	No	182	81.98%

Source: Research Data, 2015.

It is observed in the results that the majority professors (59.49%) have a link with the *Stricto sensu* graduate studies; 60.36% of the professors participate in extension projects; over half of the teachers has workload of disciplines of more than 10 hours per week, and 63.51% of them are involved with administrative activities. Furthermore, a great part not possessing commissioned positions for this purpose. Regarding to the titulation, the majority of professors who participated in this study had doctoral degrees (79.73%), thus corroborating the results of Souza (2014) who observed that 58.7% of the professors in their study were PhD.

The results showed great overload of tasks for the professors, once the majority performs various activities besides teaching, allowing the stress increase. Thus, according to Cassiolato (2010) the professors, suffer and complain about their job, considering it as tiring, especially when it comes near to the end of each semester, they might sometimes feel exhausted/stressed.

Usually this period is accompanied by psycho physiological changes, resulting from aspects required by the professor's work. Thus, it was sought to evaluate whether professors are affected by diseases that may result from work overload in the teaching profession. The results may be observed in the Table 3 as follows:

Table 3 - Major Diseases that affect the UFV's Professors.

Diseases	Frequency	%
Back ache	86	**38.74%**
Vocal Alteration	58	**26.13%**
Frequent Headache	49	**22.07%**
None	42	**18.92%**
Hypertension	41	**18.47%**
Depression	23	**10.36%**
Gastritis/Ulcers	19	**8.56%**
Respiratory Diseases	17	**7.66%**
Panic Syndrome	14	**6.31%**
Diabetes	5	**2.25%**
Cardiac Diseases	4	**1.80%**

Source: Research Data, 2015.

The results showed a high incidence of diseases in the surveyed professors, since only 18.92% are not affected by any described disease. The main reports were backacke with 38.74%, 26.13% vocal alteration, frequent headache with 22.07% and 18.47% with hypertension, which can be compared with the work overload. Servilha (2008), while studying the health, the voice and the working conditions of university professors, found that the same presented, as in this study, hypertension, vocal alterations and 28.6% had a disorder in the backbone.

This can be explained by the fact that the stress is able to trigger serious problems of several orders in the individual. The stress situations can weaken the body defense systems, make that the mechanisms that trigger the inflammatory processes be activated or, conversely, are inactivated those that inhibit them. Thus, blood pressure, respiratory system, pains in the joints can emerge, because the low body defenses cause these dysfunctions, becoming more active in stress situations. Hence the reason why people become more susceptible to diseases, since the antibodies are less active (BARRETO, 2007).

Before this risk of diseases, physical activity can help in stress reduction. According to Nascimento Junior et al. (2012), the practice of physical activity may be an intervening element in a person's life, a time that is related with the improvement or control of many diseases or dysfunctions, such as hypertension, diabetes, cardiovascular diseases, dyslipidemias, obesity, metabolic syndromes, depression and lack of memory, besides reducing the risk of chronic diseases. In this sense, it was sought, in Table 4, to assess whether the professors engage in regular physical activity.

Table 4 - Regular physical activity of the UFV's professors

Physical Activity	Frequency	%
Daily (6 to 7 days a week)	26	11.71%
Regularly (4 to 5 days a week)	65	29.28%
Regularly (1 to 3 days a week)	91	40.99%
Does not perform/Sedentary	38	17.12%

Source: Research Data, 2015.

The results demonstrate that the majority of the professors practice physical activities with little regularity, because those who do not practice added to those who practice possibly correspond to 58.11% of the sample. The percentage found approximates the value recorded in the studies of Souza (2014), where the teachers that are sufficiently active accounted for 54.4% of the sample. Thus, it is necessary to create policies for the encouragement of activities allowing the stress reduction from the practice of regular physical activity.

Another factor that causes concern in teaching career is the realization of activities outside the regular schedule of work. Within the teaching profession, there are activities such as preparation of projects and articles, correction of final papers, dissertations and monographs that are difficult to be performed on a day to day basis of the profession, i.e., in the regular work schedule, due to the overload in other activities.

The pressures suffered by the professors, especially those involved with the Graduate Program, for productivity in research, the great burden of administrative activities and the conciliation with the activities of teaching generates the need to work outside of normal business hours, making it impossible for leisure activities and living with family and friends, impairing the quality of life.

The professors most of the time act in standard deviation of function, limiting the time for dedication in the work of technical-scientific nature, hindering productivity and leading to frustration. The ineffectiveness of internal administrative procedures, possibly caused by an excess of bureaucracy increase the anxiety and hamper the career development.

Thus, professors can take activities to perform at home, undermining the family life and removing hours of their personal entertainment. In order to evaluate if this occurs, it was asked how often they work during the weekend, which is the period of rest. The results can be seen in Table 5.

Table 5 - Professors who undertake work activities on weekends

Activities on weekends	Frequency	%
Never	**9**	4.05%
Sometimes (up to 30%)	**74**	33.33%
Almost always (31 to 75%)	**85**	38.29%
Every weekend (above 76%)	**52**	23.42%

Source: Research Data, 2015.

It is possible to observe that only 4.05% never work on the weekend and 61.71% work in all or in nearly every weekend. These results show the risk of high levels of stress within the career, once that professors abdicate leisure and family life to devote themselves to work, increasing the chances of physical and mental fatigue and disease.

In relation to the professors' stress levels, raised through the PSS-14, the average stress was 25.89 points. For purposes of comparison, a mapping was done of other studies that used the PSS-14 to measure stress levels of other careers and groups of individuals. The results can be seen in Table 1.

Table 1 - Comparison of stress among the various careers and populations

Class	Article	Mean PSS-14
Master and Doctor's degree students	Faro (2013)	29.10
UFV's professors	**Research data**	**25.89**
Elderly Caregivers	Trentino et al. (2009)	23.30
Bank workers	Viana et al. (2010)	23.15
Employees of a financial institution	Kafrouni (2014)	22.86
Military Policemen	Paredes (2012)	22.48
Nursing Assistant	Leonelli (2013)	22.06
Nurse	Leonelli (2013)	21.73
Elderly	Luft et al. (2007)	21.37
Doctor	Leonelli (2013)	20.38
High level wind surfers in sports competition	Segato et al. (2010)	20.00
Healty Communytary Agent	Leonelli (2013)	19.99
Elementary and High School Teachers	Silva et al (2009)	19.90

Source: Research Data, 2015.

It should be noted that the mean stress of the UFV's professors is greater than the majority of careers analyzed in other studies, being below only the group of master and doctor's degree students, who are also inserted in the academic environment, suffering the same pressures for productivity and compliance with deadlines, showing great potential for the increase in the stress levels.

It is noteworthy that the professors have levels above the military police which is a career exposed to great pressure and risk of death.

4.2 Validation of the Scale

The scale of perceived stress showed significant adjustment represented by the result of the test of KMO (Kaiser-Meyer-Olkin) of 0.905 and by Bartlett's Sphericity test, significant, above 0.01% probability, attesting to the possibility of factorial analysis realization.

To calculate the index of the professors' stress, exploratory factor analysis was used by the method of principal components with Varimax rotation in order to find the main constituent factors of PSS-14. In line with the original scale, two significant factors were found, both with eigenvalues ≥1. It was found that two factors accounted for 58.20% of the total variance of scale, being the factor 1 responsible for 48.16% of the total variation (eigenvalue=4.82). Factor 2 was responsible for 10.04% of the total variation (eigenvalue=1.01), as shown in Table 2. According to Hair et al.(2009), in the Social Sciences, where the information is generally less accurate, a solution that explain 60% of the total variance and in some cases, even less, is considered satisfactory.

Due to the analysis of the loadings corresponding to the coefficients of correlation between the variable and the factor j, after orthogonal rotation through the Varimax method, it was possible to classify two factors and define them according to their homogeneous representation. In Table 2 the loadings of each question are presented in the two factors extracted from the PSS-14.

Table 2 - Factorial matrix after orthogonal VARIMAX rotation of the PSS-14

Variables	Component	
	1	2
1. Have you been sad because of something that happened unexpectedly?	0.484	
2. Have you been feeling incapable of controlling the important things in your life?	0.548	
3. Have you felt nervous and stressed out?	0.635	
8. Have you found that you could not cope with all the things that you have to do?	0.722	
11. Have you be angry because things that happen are out of your control?	0.590	
12. Have you found yourself wondering about things that you must do?	0.689	
14. Do the difficulties accumulate to the point of believing that you cannot overcome them?	0.631	
4. Have you successfully treated with the difficult problems of life?		0.759
5. Have you felt that you are dealing well with changes that are occurring in your life?		0.841
6. Have you felt confident in your ability to solve personal problems?		0.817
7. Have you felt that things are happening according to your will?		0.678

9. Have you been able to control the irritations in your life?	0.662
10. Have you felt that things are under your control?	0.704
13. Have you been able to control how you spend your time?	0.467

Source: Research Data, 2015.

By analyzing Table 2, it was observed that the issues directly related to perceived stress loaded more in factor 1, while those with positive connotation (4, 5, 6, 7, 9, 10 and 13), showed the highest loads in factor 2. The results are satisfactory, because all the questions have factorial load above 0.4, minimum recommended according to Hair (2009).

For the analysis of the internal consistency of the factors extracted by factor analysis, the Cronbach's alpha was calculated for each factor, as shown in Table 6. In addition, it was calculated the overall reliability of the model, encompassing all the questions.

Table 6 - Test of Cronbach's alpha coefficient for categories considered by the PSS-14

Category	Set of questions	Cronbach's Alpha
Stress perceived	4,5,6,7,9,10,13	0.866
Positive Conotation	1,2,3,8,11,12,14	0.818
PSS-14	All	0.893

Source: Research Data, 2015.

The analysis of the results (Table 6) showed that the values are above the lower limit of acceptability for all factors evidencing the existence of reliability in the measurement. The results are satisfactory, because according to Hair (2005), it can be considered reliable alphas above 0.8.

Although the results of the PSS-14 are satisfactory, it was decided to validate the version PSS-10, to assess whether this version has greater consistency to measure the professors stress levels. This test is justified by previous studies conclude that the PSS-10 presents a better factorial adequacy (COHEN and WILLIAMSON, 1988; Luft et al., 2007).

Applying the exploratory factor analysis for the variables suggested for the PSS-10, it was observed that it presented significant adjustment represented by the result of the KMO test of 0.887 and by the Bartlett test, significant, above 0.01% of probability, attesting to the possibility of factorial analysis realization.

After the application of exploratory factorial analysis by the method of principal components with Varimax rotation, it was observed that two significant factors were found, both with eigenvalues ≥1. It was found that two factors accounted for 54.042% of the total variance of scale, being the factor 1 responsible for 43.55% of the total variation (eigenvalue=6.097). Factor 2 was responsible for 10.49% of the total variation (eigenvalue=1.47).

The results demonstrate lower explanatory power of the PSS-10 in relation to PSS-14, demonstrated by the lowest percentage of total variance explained (58.201% against 54.042%). However, it is suggested the application of Cronbach's Alpha to assess if the PSS-10 has greater internal consistency. The results can be seen in Table 7.

Table 7 -Test of Cronbach's Alpha Coefficient for categories considered in the research

Category	Set of questions	Cronbach's Alpha
Stress perceived	6,7,9,10	0.827
Positive Conotation	1,2,3,8,11, 14	0.804
PSS-10	All	0.876

Source: Research data

Analyzing the reliability of the factors, it is observed that the factors extracted from the PSS-10 have lower reliability than the PSS-14, as well as the set of all variables. Thus, for measurement of the professors' stress levels of the UFV's higher level teaching , the PSS-14 is more applicable.

It is important to assess whether the results of this research are satisfactory in relation to previous research, with the aim of assessing whether the results can be considered relevant to contribute to the scale validation. Comparing with the results of other studies, it is possible to observe the results in table 3.

Table 3 - Cronbach's alphas using the PSS in different populations

Version/Country	Author	PSS-10	PSS-14
Spain	Remor (2006)	0.82	0.81
Spain*	Remor and Carrobles (2001)	-	0.67
Brazil (Elderly)	Luft et al. (2007)	0.83	0.82
USA	Cohen and Williamson (1988)	0.78	0.75
USA (High School)	Roberti, Harrington and Storch (2006)	0.89	-
Hungary	Adrienne and Barna (2006)	0.88	0.79
	Mimura and Griffiths (2004)	-	0.81
Japan	Shigetoshi et al., (2002)	-	0,82**-0,89***
	Sumi (2006)	0.71	0.76
Mexico	Ramírez and Hernández (2007)	-	0.83
Brazil	Soares and Mafra	**0.876**	0.89

Source: Adapted from Trigo (2010)

It should be noted that the results of this research are among the best, in relation to the reliability as measured by Cronbach's Alpha, in both applications (PSS-10 and PSS14), demonstrating the validation of the scale of perceived stress in the UFV's professors.

It is important to emphasize that the results obtained differ from the majority of applications, because, most of the times the PSS-10 showed greater reliability, with the exception of this and Sumi's study (2006).

5. Conclusions

It was possible to observe that the professor career creates stress, which may be linked to the emergence of several diseases in the research participants, namely backache, depression, vocal alteration, hypertension some of the major diseases reported.

The professors end up accumulating many activities such as teaching, research, extension and administrative activities and time dedicated to work never seems enough. This makes them to take activities home and thus they do not dedicate enough time for leisure, physical activities and family life, increasing their stress levels and the risk of diseases. In this sense, it is necessary to create public policies that organize the teaching career and that this organization worries with the incidence of stress and other emerging diseases among this occupational category.

In this study, the results of PSS 14 and PSS 10 were similar. However, when comparing the averages of perceived stress by means of inferential tests, the index obtained with the PSS 14 allowed to differentiate more the groups. In addition, the PSS 14 showed internal consistency slightly higher (r=0.89) than the PSS 10 (r=0.87) and distinct factorial adequacy, being more effective to detect differences among the groups.

The psychometric characteristics of PSS 14 and PSS 10 met the criteria for internal consistency, construct validity and showed similar results to those that gave rise to the original version of the scale and the subsequent validations in different cultures. For these reasons, it is concluded that the PSS Brazilian version is valid for measuring the perceived stress of Brazilian professors.

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