

Teacher Stress Inventory: validation of the Greek version and perceived stress levels among 3,447 educators

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Background: The Teacher Stress Inventory (TSI) is an instrument for measuring occupational stress in teachers. This study aimed to translate and adapt it for use in Greece, and then assess its reliability and validity.

Methods: The Greek versions of the TSI and the 14-item Perceived Stress Scale (PSS-14) were posted on all Greek educators' official sites during May 2012. A nationwide sample of 3,447 teachers of all levels and specialties completed the questionnaires via the Internet. Reliability was determined by the calculation of Cronbach's alpha coefficient. Confirmatory factor analysis was conducted and validity was further examined by investigating the correlation of the TSI with the PSS-14 and their association with demographics and work-related factors.

Results: Satisfactory Cronbach's alpha values (above 0.70) were found for all TSI dimensions. Confirmatory factor analysis confirmed the two-factor construct of TSI (root mean square error of approximation, comparative fit index, and goodness-of-fit index values were 0.079, 0.956, and 0.951, respectively), confirming the pre-established theory for the two latent variables, Stress Sources and Stress Manifestations. Significant correlations were found between TSI subscales, PSS-14 sex, age, lack of support, and students' difficulties.

Conclusion: The Greek version of the TSI was found to have satisfactory psychometric properties, and its use for assessing stress in Greek teachers is warranted.

Keywords: TSI, reliability, validity, Greek educators, occupational stress, psychosocial factors

Introduction

Occupational stress is one of the biggest challenges that Europe is facing regarding health and safety. Nearly one out of four workers appears to be significantly affected, and studies show that 50% to 60% of lost work days are associated with job stress.¹ In a continuously changing society of work, which keeps requiring more and more of its employees, the number of people suffering from stress-related working conditions shows an increasing trend.¹ Understandably, occupational stress forms a huge burden, not only on people's health and well-being, but on the economy of each country as well. Therefore, the reduction of work-related stress and of the psychosocial risks to which it is linked is dictated not only by the moral responsibility toward employees, but also by the need to ensure orderliness in the workplace and reduce the cost of lost working days and hours.²

We understand occupational stress as the physical and emotional response that occurs due to the perception of mismatch between the conditions and requirements of the job and the abilities, resources, or needs of the individual. As numerous studies have shown, the teaching profession is a field that seems to be significantly affected by

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occupational stress, with teachers being exposed to conditions resulting in highly intense stress and pressure.^{3–5} Research has also shown that teachers' stress increases the incidence of physical problems and mental health disorders, since it is recognized as the main factor for job-related illness and early retirement in England⁶ and also as the cause of high burnout.^{7,8}

Teaching was found by Barnabe and Burns to be one of the most stressful professions,⁹ with 42% of the teachers' sample in their study reporting high occupational stress and 36% of them reporting that they feel stressed most of the time. Time pressure, lack of control or support from colleagues and supervisors, lack of chances for career development, lack of recognition from parents, constant performance evaluations, and frequent conflicts with students were found to be some of the job characteristics that lead educators to anxiety, burnout, and job dissatisfaction.^{9–11} In Greece, quite a few studies have been conducted in an effort to assess Greek teachers' stress and its causes,^{12–14} but, to date, there has been no large-scale study investigating differences in the stress levels of different kind of educators.

Monitoring teachers' stress with valid instruments can be significantly useful to health services in order to support public policy decisions and consequently improve people's health. The Teacher Stress Inventory (TSI), which was developed by Fimian¹⁵ for the assessment of teachers' work-related stress, has demonstrated adequate reliability and validity measures.^{16–18} The satisfying psychometric qualities of the TSI have contributed to its use in several studies that have investigated the association between stress and a variety of symptoms, situations, or characteristics such as self-efficacy,¹⁹ biographic variables,²⁰ classroom management practices,²¹ and positive affectivity.²²

This study aims to assess the TSI's construct validity and reliability in a large sample of Greek educators of all levels and specialties and investigate its association with demographics and work-related factors. More specifically, this paper will examine the TSI's internal consistency, reliability, and construct validity by conducting confirmatory factor analysis (CFA) and by investigating its correlation with the 14-item Perceived Stress Scale (PSS-14), an instrument designed to define the perceived degree of stress caused by situations in an individual's life.²³

Methods

Sample and procedure

The research was conducted before the end of the 2011–2012 school year, in May 2012. The questionnaire was electronically uploaded for a whole month onto the official Greek site of

schools and educators (<http://www.sch.gr>), to which 99.8% of elementary and secondary schools are linked; in various teachers' associations official sites (eg, <http://www.pekade.gr>, <http://www.p-e-f.gr>, <http://www.inital.gr>, etc); and in other sites relevant to the education field (eg, <http://www.special-education.gr>, <http://www.alfavita.gr>, <http://www.omep.gr>, etc). The questionnaires were anonymous and the participating teachers were informed of the aim and the structure of the study in the first appearing page. It was also made known to them that by completing the questionnaire they would get information on effective ways to deal with stress. The information package included clarifications about the mechanism of stress and general advice about a lifestyle that supports resilience. Three thousand and thirty-nine questionnaires were derived from teachers working in the public sector (in 2012, there was a total of 152,910 educators from all levels and specialties in the public sector) and 408 (11.8%) were derived from teachers working in private educative institutions (in 2012, there was a total of 8,495 educators from all levels and specialties in the private sector). Among them, 5.5% of the sample worked in special education.

Measures

The TSI consists of 49 five-point Likert scale items that cover ten dimensions, divided into Stress Sources and Stress Manifestations Distributions. Stress Sources Distributions include Time management (which investigates whether a teacher is able to find the necessary time for every important professional or personal need), Work-related stressors (such as teaching or administrative workload, size of classes, professional responsibilities, etc), Professional distress (stressful factors such as promotion opportunities, recognition, career development, and earnings), Discipline and motivation (which examines whether a teacher feels capable of maintaining classroom control while motivating his or her students), and Professional investment (that assesses a teacher's involvement and beliefs regarding his or her job). Stress Manifestations Distributions include Emotional manifestations (teachers' emotional responses to stress, eg, anxiety, depression, etc), Fatigue manifestations (teachers' physical responses to stress, eg, changes in sleep, exhaustion, etc), Cardiovascular manifestations (teachers' cardiovascular system responses to stress, eg, blood pressure, heart rate, etc), Gastronomical manifestations (teachers' gastronomical system responses to stress, eg, stomach pains, cramps, etc) and Behavioral manifestations (the methods that teachers use in order to cope with stress, eg, use of prescription drugs/alcohol, sick leave, etc).

The PSS questionnaire consists of 14 items assessing the level of stress experienced during the previous month, as

expressed by the frequency of the individual's feelings and thoughts over the occurrence of events and situations. The PSS-14 responses range from 0 (never) to 4 (very often). PSS-14 total scoring ranges from 0 to 56 and comes from reversing the scores of four positive items and then summing up all 14 items. High scores on the PSS-14 indicate high levels of stress, while low ones indicate less stress. The Greek PSS-14 version that was used in the present study has been validated and found to have satisfying psychometric properties.²⁴

In the present study's questionnaire, participants were asked to report personal characteristics such as age, sex, education level, and years of working experience, and job-related information such as the kind of educational institution they worked at, the number of students they had in their class, the number of those having difficulties with the spoken language, and the number of those needing or seeming to need special educational support. They were also asked to note if they worked in special education, if they were obliged to reside away from their family because of their work, if they had support from their colleagues and their supervisors, and if they wished to attend a course in stress management.

Translation

After being granted permission from the author, we proceeded with translating the TSI into Greek as recommended in the literature guidelines.²⁵ Upon agreement, two bilingual professional translators independently completed the forward-translation procedure. Our team solved minor differences and the forward version was translated back into its original language by another professional translator. The back-translation and the original inventory were then compared and the minor discrepancies that were found led to minor changes to the Greek forward-translation. Our team reviewed this version and then administered it to a small group of teachers who voluntarily commented on the clarity of the wording, as well as on the existence of difficulties regarding the completion procedure. The information was used in order to finalize the Greek version of the TSI.

Statistical analysis

The theoretical model for the TSI was assessed by the conduction of CFA with maximum likelihood procedure. Independence of error terms was specified for all models. The comparative fit index (CFI), the goodness-of-fit index (GFI), the χ^2 goodness-of-fit test, and the root mean square error of approximation (RMSEA) were used to assess the fit of the CFA models.²⁶ CFI and GFI range from 0 to 1, while higher values express a better fit of the model. Recommended

cutoffs range from 0.90 to 0.95 or better.²⁷ Less than 0.05 RMSEA values indicate a good fit, while values as high as 0.08 indicate a reasonable fit.²⁷ A nonsignificant χ^2 statistic also indicates a good fit, but χ^2 is usually sensitive to sample sizes and significant for large sample sizes like ours.²⁶

Internal consistency reliability was determined by the calculation of Cronbach's alpha coefficient. Scales with reliability of 0.70 or higher are considered acceptable. The Student's *t*-test was used to investigate differences between TSI scales in reference to sex. Effect sizes were also reported in order to form an indication of the differences between men and women. Effect sizes of 0.2 to 0.5 are considered small, those of 0.51 to 0.81 are considered moderate, while those approximately 0.8 are considered large. Validity was further examined by the Pearson's correlation analysis. Correlation coefficients from 0.1 to 0.3 are considered low, those between 0.31 and 0.5 moderate, and those approximately 0.5 are considered high.

Linear regression analysis was performed in order to evaluate the univariate association of personal and job-related characteristics with the TSI total score. Afterward, in order to find variables independently associated with the TSI total score, multiple linear regression analyses in a stepwise method (*P* for removal was set at 0.1 and *P* for entry was set at 0.05) was performed. The results of the regression analyses produced the regressions coefficients. The reported *P*-values are two-tailed. The statistical significance level was set at 0.05. The analysis was conducted by the use of SPSS 19.0 and AMOS (SPSS Inc., Chicago, IL, USA) statistical software.

Results

The sample consisted of 3,447 participants (28.3% men and 71.7% women) with a mean age of 41.2 years (standard deviation = 8.7 years). Sample characteristics are shown in Table 1. Most of the participants worked in the public sector (88.2%), and the mean number of students in their classes was 20.7 (standard deviation = 11.8). During the 2011–2012 school year, 15.5% resided separately from their family due to their work. Most reported having support from their colleagues and from their supervisors (92% and 78.9%, respectively). The majority of the participants (83%) would attend a course in stress management.

TSI factor mean scores, floor and ceiling effects, and Cronbach's alpha are presented in Table 2. No large ceiling effects were seen and ranged from 0.1% to 5.7%. The largest floor effects were found for the Behavioral (61.4%) and Gastronomic manifestations scales (28.6%), while the floor effects were 12.4% for Cardiovascular manifestations and

Table 1 Sample characteristics

Characteristics	N (%)
Sex	
Men	974 (28.3)
Women	2,473 (71.7)
Age, years, mean (SD)	41.2 (8.7)
Degree	
University graduate	2,134 (61.9)
MSc/doctorate	1,080 (31.3)
Other	233 (6.8)
Years of previous employment, mean (SD)	13.1 (8.5)
Educational organization	
Public	3,039 (88.2)
Private	408 (11.8)
Teacher job status	
Permanent	2,697 (87.9)
Substitute	373 (12.1)
Number of students in the class, mean (SD)	20.7 (11.8)
Working in special education	
No	3,258 (94.5)
Yes	189 (5.5)
According to expert advice, students in class who are supported or need support from special educators	
No	1,631 (47.3)
Yes	1,816 (52.7)
According to personal opinion, students in class who are supported or need support from special educators	
No	1,120 (32.5)
Yes	2,327 (67.5)
Students in class who have difficulties in speaking or comprehension	
No	1,472 (42.7)
Yes	1,975 (57.3)
Residing far from family, due to work location	
No	2,913 (84.5)
Yes	534 (15.5)
Support to/from colleagues	
No	275 (8.0)
Yes	3,172 (92.0)
Support from supervisors	
No	726 (21.1)
Yes	2,721 (78.9)

Abbreviation: SD, standard deviation.

12.2% for Professional investment. Regarding Cronbach's alpha, all scales exceeded the minimum reliability standard of 0.70. The Cronbach's alpha was equal to 0.94 for the total TSI score. Differences between men and women (Table 2) concerning the TSI scales were all significant, except for Professional distress, Discipline and motivation, Professional investment, and Behavioral manifestations, indicating greater stress for women. Higher effect sizes were found for the Emotional and Fatigue manifestations scales.

CFA was first conducted for the ten single-factor models of TSI. All scales of the original version were confirmed (Table 3). For most of the scales, modification indices were used and then an acceptable fit was produced. The χ^2 tests

of the models were, in most cases, significant, as expected, due to the large sample size of the study, but CFI, GFI, and RMSEA confirmed that the items composing the ten scales measure the same construct.

CFA was used in order to determine if the number of factors and the measured variables confirm the pre-established theory. The Stress Sources latent variable was associated with Time management, Work-related stressors, Professional distress, Discipline and motivation and Professional investment, while the Stress Manifestations latent variable was associated with the Emotional, Fatigue, Cardiovascular, Gastronomic, and Behavioral manifestations. According to the results of CFA, the RMSEA, CFI, and GFI values were 0.079, 0.956, and 0.951, respectively, for the two-factor model. A modification index was used, allowing an error covariance between the error terms of Time management and Work-related stressors. A CFA was then conducted for a one-factor model. Even after the use of modification indices, the results indicated a less acceptable fit than the original two-factor model with respect to all the fit indices (Table 4).

Intercorrelations between TSI scales are shown in Table 5. There was a significant positive correlation between all TSI scales ranging from low to high. The highest correlations were found between Professional investment and Professional distress ($r=0.70$), Work-related stressors and Time management ($r=0.66$), Fatigue and Emotional manifestations ($r=0.63$), and Professional investment and Discipline and motivation ($r=0.56$). Almost 70% of the possible intercorrelations exceeded the 0.40 level, while 13% exceeded the 0.50 level. Also, all TSI scales were significantly and positively correlated with the PSS-14, indicating good convergent validity, while correlations ranged from moderate to high.

Univariate regression analysis (Table 6) showed that greater TSI scores were associated with female sex, younger age, fewer years of previous employment, substitute job status, residence far from family, increased number of students in the class, presence of students in need of special support according to expert advice or personal opinion, presence of students having difficulty in speaking or comprehending the spoken language, lack of support from colleagues or supervisors, and being willing to voluntarily attend a free educational course (lasting more than 2 days) in stress management.

Discussion

In the present study, we examined the psychometric properties of the Greek version of the TSI in a representative sample of teachers of all levels and specialties. Our study supports

Table 2 TSI scale mean scores, floor and ceiling effects, Cronbach's alpha, and differences according to sex

TSI scales	Total sample		% floor effects	% ceiling effects	Cronbach's alpha	Men		Women		P	Effect size
	Mean	SD				Mean	SD	Mean	SD		
Stress sources											
Time management	3.0	0.8	0.3	0.4	0.81	2.9	0.8	3.1	0.8	<0.001	0.25
Work-related stressors	2.8	0.9	1.4	0.5	0.81	2.6	0.9	2.9	0.9	<0.001	0.33
Professional distress	3.1	1.1	1.9	5.3	0.83	3.0	1.1	3.1	1.1	0.487	0.09
Discipline and motivation	2.7	1.0	3.1	1.5	0.85	2.6	1.0	2.7	1.0	0.086	0.10
Professional investment	2.3	1.0	12.2	1.2	0.78	2.3	1.0	2.2	1.0	0.113	0.10
Stress manifestations											
Emotional	2.8	1.1	3.9	4.9	0.88	2.4	1.0	3.0	1.1	<0.001	0.56
Fatigue	2.7	1.0	5.7	2.3	0.84	2.4	1.0	2.8	1.0	<0.001	0.40
Cardiovascular	2.6	1.2	12.4	5.7	0.82	2.4	1.2	2.8	1.2	<0.001	0.33
Gastronomic	2.1	1.1	28.6	3.4	0.82	1.8	1.0	2.2	1.2	<0.001	0.35
Behavioral	1.3	0.5	61.4	0.2	0.70	1.3	0.6	1.25	0.5	0.063	0.09
TSI total score	2.5	0.6	0.1	0.1	0.94	2.4	0.7	2.6	0.6	<0.001	0.32

Abbreviations: SD, standard deviation; TSI, Teacher Stress Inventory.

the reliability and validity of the Greek version of the TSI. The validation was based on data provided by a large number of educators using CFA. The results show that construct validity, internal consistency, and concurrent validity of the Greek version of TSI and its corresponding subscales were generally supported by our population. Our findings support that Stress Sources and Stress Manifestations are the two factors of the TSI. The internal reliability analysis of the TSI and its ten subscales showed satisfactory alpha coefficients, within the range of other studies. Cronbach's

alpha was highly satisfactory in all subscales, except for the Behavioral manifestations subscale, where it was acceptable. High Cronbach's alpha coefficients have also been reported in other studies referring to the reliability of the TSI.^{17,18}

The convergent validity analysis indicated that the TSI model showed a reasonable pattern of associations. The TSI and PSS-14 were largely correlated; almost 70% of correlation coefficients exceeded the 0.40 level, while 13% exceeded the 0.50 level, results similar with those reported in a previous study.¹⁵

The largest floor effects were found for the Behavioral, Gastronomic, and Cardiovascular manifestations scales, a finding consistent with that of other studies which have showed Stress Manifestations to be less frequently reported compared to Stress Sources,²⁸ probably because it is easier for an individual to recognize the sources of his/her stress than to realize the impact on his/her behaviors. Also consistent with previous studies was the finding that Emotional²⁰ and Fatigue manifestations are the most common Stress Manifestations.²⁸

The significant differences in the scores in most of the TSI scales between sexes, with the greatest of them – as defined by effect sizes – in Stress Manifestations (Emotional and Fatigue), also confirm previous researchers' conclusions

Table 3 Fit index results from confirmatory factor analysis for unifactorial Teacher Stress Inventory models

	χ^2	P	GFI	CFI	RMSEA
1. Time management	486.7	<0.001	0.964	0.940	0.080
2. Work-related stressors	271.3	<0.001	0.975	0.959	0.078
3. Professional distress	53.41	<0.001	0.994	0.993	0.070
4. Discipline and motivation	170.1	<0.001	0.983	0.981	0.079
5. Professional investment	1.1	0.294	1.000	0.999	0.005
6. Emotional manifestations	9.6	0.008	0.999	0.998	0.033
7. Fatigue manifestations	31.77	<0.001	0.997	0.996	0.066
8. Cardiovascular manifestations	26.9	<0.001	0.996	0.994	0.060
9. Gastronomic manifestations	8.28	0.016	0.999	0.998	0.030
10. Behavioral manifestations	1.0	0.330	1.000	0.999	0.001

Abbreviations: CFI, comparative fit index; GFI, goodness-of-fit index; RMSEA, root mean square error of approximation.

Table 4 Goodness-of-fit indices for different structural equation models

TSI	χ^2	P	GFI	CFI	RMSEA
Two-factor model	758.3	<0.001	0.956	0.951	0.079
One-factor model	1,848.9	<0.001	0.899	0.859	0.124

Abbreviations: CFI, comparative fit index; GFI, goodness-of-fit index; RMSEA, root mean square error of approximation; TSI, Teacher Stress Inventory.

Table 5 Intercorrelations between the Teacher Stress Inventory scales and correlation coefficients with PSS-14

	TM	WRS	PD	DM	PI	EM	FA	CARD	GAST	BE
WRS	0.66									
PD	0.37	0.41								
DM	0.35	0.40	0.52							
PI	0.34	0.37	0.70	0.56						
EM	0.44	0.39	0.40	0.41	0.41					
FA	0.42	0.40	0.37	0.39	0.40	0.63				
CARD	0.36	0.33	0.29	0.33	0.31	0.51	0.48			
GAST	0.31	0.30	0.25	0.25	0.26	0.43	0.37	0.45		
BE	0.19	0.20	0.20	0.22	0.27	0.27	0.28	0.28	0.28	0.28
PSS-14	0.50	0.43	0.40	0.40	0.42	0.54	0.49	0.39	0.34	0.31

Note: All correlations were significant at the <0.001 level.

Abbreviations: BE, Behavioral manifestations; CARD, Cardiovascular manifestations; DM, Discipline and motivation; EM, Emotional manifestations; FA, Fatigue manifestations; GAST, Gastronomic manifestations; PD, Professional distress; PI, Professional investment; PSS-14, 14-item Perceived Stress Scale; TM, time management; WRS, Work-related stressors.

Table 6 Results from univariate regression analyses with Teacher Stress Inventory total score as the dependent variable

	Univariate analysis	
	β (SE) ^a	P
Sex		
Men	0.00 ^b	
Women	0.22 (0.02)	<0.001
Age, mean (SD)	-0.01 (0.001)	<0.001
Degree		
University	0.00	
MSc/doctorate	0.02 (0.02)	0.335
Other	0.02 (0.04)	0.691
Years of previous employment	-0.01 (0.001)	<0.001
Educational organization		
Public	0.00	
Private	0.003 (0.03)	0.920
Teacher job status		
Permanent	0.00	
Substitute	0.08 (0.04)	0.032
Number of students in the class	0.003 (0.001)	0.004
Working in special education		
No	0.00	
Yes	0.08 (0.05)	0.089
According to expert advice, students in class supported or in need of support from special educators		
No	0.00	
Yes	0.11 (0.02)	<0.001
According to personal opinion, students in class supported or in need of support from special educators		
No	0.00	
Yes	0.18 (0.02)	<0.001
Students in class with difficulties in speaking or comprehension		
No	0.00	
Yes	0.13 (0.02)	<0.001
Residing away from family, due to work location		
No	0.00	
Yes	0.15 (0.03)	<0.001
Support from/to colleagues		
No	0.00	
Yes	-0.35 (0.04)	<0.001
Support from supervisors		
No	0.00	
Yes	-0.32 (0.03)	<0.001

Notes: ^aRegression coefficient (SE); ^bindicates reference category.

Abbreviations: SD, standard deviation; SE, standard error.

that female teachers have a tendency to report more mental health problems and higher levels of stress compared to their male counterparts.^{13,29-32} Differences in psychological and personality characteristics such as self-esteem between males and females may explain this finding.^{33,34} As research has shown, women are generally more emotional and more easily affected by negative emotions, while, by contrast, men are generally more independent and less significantly affected by their feelings.³⁵ Another possible explanation might be that women are affected more by possible family-job conflicts.¹³ Furthermore, women have different ways of interpreting and dealing with their problems,^{13,36} often dwelling on them and examining every aspect in order to understand them better, a fact that could probably lead to prolonging their stress.

The negative association of TSI with age might be explained by the experience that elder teachers have acquired through work and life, which has equipped them with effective coping strategies and thus made them more capable of dealing with stressors (a type of healthy worker effect).

Additional factors which require more patience and efficiency on the teacher's part, and which make his/her job harder, such as having an increased number of students in the classroom or having students that, according to expert advice or to personal opinion, need support from special educators or have difficulty in speaking or understanding the spoken language, were independently associated with greater total stress levels, findings that were previously reported as well.^{12,37-39}

Our study showed that, besides sex, working experience, and classroom conditions, there are also other factors that put pressure on teachers and result in high stress levels: being obliged to reside far from the family because of the place of work or not having support either from colleagues or from supervisors were found to be independently associated with greater total stress levels, findings also previously reported.³⁷⁻³⁹

All of the abovementioned findings support the evidence that the TSI can discriminate groups with high stress levels in the Greek teachers population.

Strengths and limitations

The main strength of the current study is the large sample size of teachers. Also significant is the fact that our findings are based on several goodness-of-fit criteria and associations of the measurement models.

However, there are limitations of this study as well. First, there is the lack of a group with clinically identified stress pathology in order to make comparisons between a clinical and nonclinical group and show evidence of discriminative ability. Thus, future studies should include teacher groups in which the existence of possible clinical conditions is known.

Furthermore, because of the cross-sectional design of the study, it was not possible to test the sensitivity of the TSI instrument to change over time or test–retest reliability.

Conclusion

Our study provides evidence that the TSI questionnaire seems to be a reliable and valid instrument for measuring stress in Greek teachers, giving information for various aspects and related factors of stress.

Acknowledgment

We are grateful to all the educators who participated in the survey.

Disclosure

The authors report no conflicts of interest in this work.

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