Taylor & Francis
Taylor & Francis Group

Check for updates

ARTICLE

Prevalence and correlates of psychological stress among teachers at a national key comprehensive university in China

Wenjun Li[a] and Changgui Kou[b]

[a]Department of Social Medicine and Health Management, School of Public Health, Jilin University, Changchun, China; [b]Department of Epidemiology and Biostatistics, School of Public Health, Jilin University, Changchun, China

ABSTRACT

The present study investigated the levels of stress and associated factors in university teachers to provide a foundation for exploring strategies for preventing teacher stress. We conducted a cross-sectional survey using a composite questionnaire with the 10-item Kessler Psychological Distress Scale (K10) as the core at a comprehensive university located in northeast China. The number of effective respondents was 603. The average K10 score was 22.87 ± 8.18, and the positive rate (K10 > 21) was 54.06%. University teachers generally experienced high stress levels. The highest stress levels were observed in teachers whose academic title was lecturer or associate professor, according to a comprehensive consideration of several factors, including age, income, and teaching tenure. Teachers of engineering and agriculture and forestry have lower stress levels than teachers of other subjects. A lack of research funding and lack of routine rest on the weekends or on statutory holidays may increase teachers' stress, whereas regular exercise may reduce stress. Academic title promotion, scientific research pressure, and lack of routine breaks and physical exercise were the main sources of stress.

Introduction

Studies on teacher stress began in the 1970s, when Kyriacou and Sutcliffe [1] defined teacher stress as a response syndrome of negative effects (such as anger or depression) resulting from the teaching profession. Kyriacou [2] further defined teacher stress as a teacher's experience of unpleasant emotions, such as tension, frustration, anxiety, anger, and depression, resulting from aspects of his or her work as a teacher. According to some published research, teaching is a "highly" or "extremely highly" stressful occupation [3]. Mild stress can improve working efficiency, whereas excessive chronic stress among teachers has serious implications for their work performance [4,5], physiological health, and psychological status [6–10] and can even lead to burnout, which is defined as a syndrome of exhaustion, cynicism, and reduced professional efficacy [6,11]. Furthermore, teacher stress is also associated with problems of recruitment and retention of teachers [12,13]. Work stress has consistently been shown to negatively correlate with job satisfaction and positively correlate with turnover intention and turnover [14–17]. Teacher turnover has been reported to be associated with many serious educational problems, such as a low quality of education for students.

Teacher stress has attracted considerable attention in recent decades. Currently, the research on teacher stress has mainly been based on the study of primary and secondary school teachers [18,19], while research on university teachers is relatively sparse. Higher education is the most important subsystem and the highest level of the education system. It is responsible for the important task of training students in various types of advanced specialized skills and promoting the development of science and technology and social progress, which are critical for any country. University teachers, the most important resource of the higher education system, undertake the dual responsibilities of personnel training and science and technology research, suggesting that these professionals are at a high risk of developing stress. In China in particular, social development and education system reform not only provide opportunities for the development of teachers but also place unprecedented pressure on teachers. According to the China Statistical Yearbook 2014, 1.497 million full-time teachers were employed in the higher education system, of whom 1.055 million were employed at undergraduate universities, and 14.944 million undergraduate and 1.794 million master and doctoral students were reported. High levels of chronic stress can influence both teachers' professional development and students' performance. Accordingly, more attention should be paid to teacher stress in universities in China.

CONTACT Wenjun Li ✉ liwenjun@jlu.edu.cn ✪ Department of Social Medicine and Health Management, School of Public Health, Jilin University, Changchun, China

The purpose of the present study was to investigate the stress levels and associated factors in university teachers to provide a foundation for exploring strategies for preventing teacher stress. We conducted a sampling survey using a composite questionnaire with the 10-item Kessler Psychological Distress Scale (K10) as the core at a comprehensive university located in northeast China. The K10 has been widely used to assess psychological distress in multiple settings and populations and has a high reliability and high factorial and construct validity [20]. Since 2005, some studies performed in China have used the Chinese version of the K10 scale (C-K10) to measure the mental health status in several populations, such as the general population, aged people, white-collar workers, and undergraduates. Bu et al. [21] and Zhou et al. [22] tested the reliability and validity of the C-K10 and obtained high reliability and factorial and construct validity too. The Cronbach's alpha coefficient was 0.93 and 0.8011, respectively. Thus, the C-K10 scale is appropriate for evaluating mental health status in Chinese populations. By administering the survey, we can identify the mental health status and stress levels of university teachers and the factors influencing these levels. These data have substantial significance for improving higher education system reform, strengthening the management of teaching staff and ensuring the rational use of human resources. Additionally, contributing to the study of the psychological pressures teachers experience and exploring more effective stress coping strategies are important both for enhancing teachers' ability to cope with psychological burden to better adapt to the requirements of their work under new conditions and for improving the quality of education and teaching to better train physiological and psychological health college students.

Methods

Participants and sample

This survey was conducted from June 2013 to April 2014 in a multidisciplinary university with eight science centers, each with several institutes or schools. The full-time teachers of the university were our target population, excluding administrative management and technical personnel. The sampling strategy was stratification random with a probability proportional to the size in this study. According to subject, all full-time teachers were classified into six stratifications, including liberal arts, science, engineering, agriculture and forestry, medicine, and others. Teachers from each stratification were randomly selected using a simple random sampling procedure.

Instrument and content

We conducted in-depth interviews with some teacher representatives first. Then, a composite questionnaire was preliminarily designed based on the literature, the in-depth interview material, and the actual situation at the university. The questionnaire was modified and finalized after discussions and a pre-survey. We obtained the following information through the questionnaire: sociodemographic characteristics, self-reported psychological health status, stress assessment (based on the K10), teaching-related factors, and daily work and life.

Investigation procedure

First, information about the investigation was distributed using the campus Internet. Then, we contacted the union management to help us conduct the survey. This survey was anonymous and self-administered to increase its reliability. The teachers completed the questionnaire and returned it to the management. We emphasized trying as much as possible to distribute the questionnaires at plenary meetings and collect them on the spot to enhance the reliability and response rate. This study was approved by the ethics committee of the School of Public Health, Jilin University, China.

Statistical analysis

The questionnaires were collected and reviewed to remove the ineligible questionnaires. EpiData 3.1 software (The EpiData Association, Odense, Denmark) was used to create the database. We conducted parallel double entry and cross-checked the entries to correct for input errors. The difference in total K10 scores between groups was compared using one-way analysis of variance, the rate of positive K10 scores among groups was compared using chi-square tests, and the factors correlated with stress were examined using logistic regression analyses. All statistical analyses were performed using SPSS 21.0 software (SPSS Inc., Chicago, Illinois, USA).

Results

Sociodemographic characteristics

Of the 920 questionnaires distributed, we collected 674, yielding a response rate of 73.3%. We obtained 603 eligible questionnaires (nearly 10% of all academic teachers) after removing 71 ineligible questionnaires, and the effective response rate was 65.5%. Among the 603 individuals, the youngest was 25 years old and the oldest was 64 years old, with an average age of 41.27 ± 7.75 years. Please see Table 1 for a detailed description of the sociodemographic characteristics and teaching situations.

Table 1. Sociodemographic characteristics of the sample teachers.

Characteristic	n	Proportion（%）
Gender		
Male	295	48.9
Female	308	51.1
Ethnic group		
Han	570	94.5
Minority	33	5.5
Age (years)		
≤35	163	27.1
36–45	286	47.4
46–55	128	21.2
>55	26	4.3
Marital status		
Married	576	95.5
Unmarried	17	2.8
Divorced and widowed	10	1.7
Highest degree		
Doctor	443	73.5
Master	129	21.4
Bachelor	31	5.1
Academic title		
Professor	146	24.2
Associate professor	209	34.7
Lecturer	235	38.9
Assistant	13	2.2
Master tutor		
Yes	328	54.4
No	275	45.6
Doctoral tutor		
Yes	73	12.1
No	530	87.9
Administrative duty		
Yes	51	8.5
No	552	91.5
Working responsibility		
Teaching mainly	118	19.6
Researching mainly	14	2.3
Combination	471	78.1
Monthly income		
<¥4000	20	3.3
¥4000–6000	436	72.3
¥6000–8000	130	21.6
>¥8000	17	2.8
Teaching tenure (years)		
<3	45	7.5
3–5	74	12.3
6–10	114	18.9
11–15	151	25.0
>15	219	36.3
Subject of teaching		
Liberal arts	183	30.3
Science	88	14.6
Engineering	194	32.2
Agriculture and forestry	34	5.6
Medicine	90	14.9
Others	14	2.3

Teachers' psychological stress status

K10 scores and positive rates

The K10 contains 10 items and was used to evaluate the frequency of nonspecific psychological symptoms such as anxiety and stress over the preceding four weeks. Each of the 10 items was scored from 1 to 5 points, corresponding to the severity of a respondent's mental distress, and the scores were summed to provide a total score (K10). Thus, the possible total score ranged from 10 to 50 points. In the Victorian population health survey, participants' scores were categorized as follows: 10–15 (no risk of suffering from mental disorders),

16–21 (mild risk of suffering from mental disorders), 22–29 (moderate risk of suffering from mental disorders), and 30–50 (high risk of suffering from mental disorders). Therefore, we assumed that a K10 score ≤21 reflected relatively good mental health, which was a stricter criterion than those (scores less than 20 reflected relatively good mental health) used in other studies [23,24]. In our survey, the average K10 score was 22.87 ± 8.18 and the positive rate (K10 > 21) was 54.06%. Details are shown in Table 2.

Correlation analysis between self-rated mental health and the rate of positive K10 scores

The results of the teachers' self-reported mental health status are listed below. Notably, 4.98% of teachers reported a poor mental health status, 38.31% reported that their mental health was not good, and only 56.71% reported a positive attitude (good or very good) toward their mental health. The positive rate of stress based on the K10 increased as teachers' self-rated mental health decreased, and a significant correlation between the two was observed ($\chi^2 = 222.19$, $P < 0.001$). A significant difference in K10 scores was also observed between groups ($F = 217.92$, $P < 0.001$). See Table 3 for additional details.

Factors influencing teachers' psychological stress

We explored the factors influencing teachers' psychological stress based on three aspects, sociodemographic factors, teaching-related factors, and work and daily life factors, using a K10 score > 21 as the dependent variable and expected to identify risk factors for high psychological stress.

Sociodemographic factors

According to the results of univariate nonconditional logistic regression analysis, age and average monthly

Table 2. Classification composition and distribution of K10 scores.

Classification	n	Proportion（%）	K10
10–15	148	24.54	12.13 ± 1.57
16–21	129	21.39	19.04 ± 1.78
22–29	172	28.52	25.65 ± 2.32
30–50	154	25.54	33.29 ± 3.19
Total	603	100.00	22.87 ± 8.18

Table 3. Correlation between self-rated mental health and rate of positive K10 scores.

Self-rated mental health	n	n (K10 > 21)	Positive rate (%)[a]	K10[b]
Poor	30	30	100.00	34.40 ± 5.71
Not good	231	197	85.28	28.16 ± 5.46
Good	250	94	37.60	20.20 ± 6.37
Very good	92	5	5.43	13.10 ± 3.87
Total	603	326	54.06	22.87 ± 8.18

[a] Trend chi-square of positive rate comparison $\chi^2 = 222.19$，$P < 0.001$.
[b] Comparison of K10 score between groups $F = 217.92$，$P < 0.001$.

income were associated with the rate of positive K10 scores. Compared to participants aged less than 35 years, 36–45-year-old teachers experienced higher stress, OR = 1.805 (1.223–2.663), whereas teachers over the age of 56 experienced lower psychological stress, OR = 0.343 (0.131–0.899). Income was also an important factor contributing to teacher stress. Although only the highest income group showed a statistically significant difference, a trend was observed such that higher income levels resulted in lower stress levels in this sample of university teachers. After adjusting for other factors in the multivariate logistic regression analysis, the factor of income was no longer associated with teachers' stress levels. Gender, ethnic group, marital status, and highest degree achieved did not correlate with the K10 positive rate. Details are shown in Table 4.

Teaching-related factors

We investigated the effects of seven teaching-related factors on teachers' stress levels using a logistic regression analysis. As shown in Table 5, masters' or doctoral supervisors and administrative duties were not related to stress. Meanwhile, the academic title, working responsibilities (mainly teaching, mainly scientific research, or a combination of the two), teaching tenure, and subject taught were associated with the K10 positive rate. After considering other factors in the multivariate logistic regression analysis, academic title, teaching tenure, and subject taught were still associated with the K10 positive rate (see Table 7).

Work and daily life factors

For the work and daily life aspect, we collected seven factors, including daily working hours, teaching workload each semester, number of postgraduates mentored annually, number of current chaired scientific research projects, sleep time, normal holiday breaks, and physical exercise. According to the results of the univariate logistic regression analysis, five factors, daily working hours, teaching workload each semester, number of current chaired scientific research projects, normal holiday breaks, and physical exercise were associated with teacher stress (see Table 6). Moreover, the multivariate logistic regression presented in Table 7 also showed that daily working hours, number of current chaired scientific research projects, normal holiday breaks, and physical exercise were associated with the K10 positive rate.

Discussion

Two aspects of main findings were reported in the present study: (1) the positive rate of stress measured by the K10 (K10 > 21) was 54.06% among these university teachers, indicating that teachers experienced high stress levels, and (2) the academic title, teaching tenure, subject taught, daily working hours, a lack of research funding, a lack of normal breaks, and less physical exercise were associated with teachers' stress levels. Thus, the substantial competition for promotion (lack of research funding) and an unsuitable coping style (lack of normal holiday breaks and exercise) were the main stressors.

K10 scale and teachers' stress levels

The K10 was designed by Kessler and Mroczek at the University of Michigan in the 1990s. It is a brief screening scale designed to monitor the population prevalence and trends in nonspecific psychological distress [25]. Its brevity, strong psychometric properties, and ability to discriminate DSM-IV cases from noncases make the K10 attractive for use in general purpose health surveys. The scale has been used in

Table 4. Univariate logistic regression analysis of sociodemographic factors and teachers' stress.

Factors	β	SE	χ^2	df	P	OR	95% CI
Gender（F/M）	0.147	0.164	0.804	1	0.370	1.158	0.840–1.596
Age (years)			18.023	3	<0.001		
～35						1.000	
36–45	0.590	0.198	8.853	1	0.003	1.805	1.223–2.663
46–55	0.292	0.237	1.517	1	0.218	1.339	0.842–2.130
56–	−1.069	0.491	4.734	1	0.030	0.343	0.131–0.899
Ethnic group (minority/Han)	0.706	0.388	3.315	1	0.069	2.027	0.947–4.336
Marital status			4.339	2	0.114		
Married						1.000	
Unmarried	1.053	0.578	3.324	1	0.068	2.868	0.924–8.900
Divorced and widowed	0.722	0.695	1.079	1	0.299	2.059	0.527–8.041
Highest degree			1.107	2	0.575		
Bachelor						1.000	
Master	0.389	0.373	1.085	1	0.298	1.475	0.710–3.067
Doctor	0.334	0.402	0.691	1	0.406	1.396	0.635–3.069
Monthly income			22.485	3	<0.001		
<¥4000						1.000	
¥4000–6000	−0.025	0.467	0.003	1	0.958	0.976	0.391–2.435
¥6000–8000	−0.811	0.490	2.736	1	0.098	0.444	0.170–1.162
> ¥8000	−1.946	0.783	6.176	1	0.013	0.143	0.031–0.663

Table 5. Univariate logistic regression analysis of teaching-related factors and teachers' stress.

Factors	β	SE	χ^2	df	P	OR	95% CI
Academic title			15.587	2	0.001		
Assistant and lecturer						1.000	
Associate professor	0.394	0.192	4.212	1	0.040	1.482	1.018–2.159
Professor	−0.477	0.211	5.132	1	0.023	0.621	0.411–0.938
Master tutor (yes/no)	−0.090	0.164	0.298	1	0.585	0.914	0.663–1.261
Doctoral tutor (yes/no)	−0.217	0.250	0.752	1	0.386	0.805	0.493–1.314
Administrative duty (yes/no)	0.124	0.295	0.176	1	0.675	1.132	0.634–2.019
Working responsibility			10.663	2	0.005		
Teaching						1.000	
Researching	−0.118	0.591	0.040	1	0.842	0.889	0.279–2.831
Combination	−0.685	0.216	10.018	1	0.002	0.504	0.330–0.771
Teaching tenure (years)			22.579	4	<0.001		
<3						1.000	
3–5	0.310	0.395	0.616	1	0.432	1.364	0.629–2.959
6–10	1.466	0.375	15.293	1	<0.001	4.333	2.078–9.036
11–15	0.786	0.356	4.881	1	0.027	2.194	1.093–4.407
>15	0.960	0.344	7.764	1	0.005	2.611	1.329–5.127
Subject of teaching			38.798	5	<0.001		
Liberal arts						1.000	
Science	−0.560	0.266	4.433	1	0.035	0.571	0.339–0.962
Engineering	−1.226	0.216	32.084	1	<0.001	0.293	0.192–0.448
Agriculture and forestry	−1.099	0.383	8.254	1	0.004	0.333	0.157–0.705
Medicine	−0.244	0.269	0.822	1	0.365	0.784	0.463–1.327
Others	0.174	0.612	0.080	1	0.777	1.190	0.358–3.950

annual government health surveys in the US and Canada, as well as in the WHO World Mental Health Surveys [26,27].

Xu and colleagues [28] applied the K10 to survey the mental health status of 11,652 residents aged over 15 years in Weihai City, Shandong Province, China, and the mean value of the total K10 score was 13.28 ± 0.052. The majority (78.0%) of K10 scores ranged from 10 to 15 points in this general population, and only 9.1% of the residents achieved K10

Table 6. Univariate logistic regression analysis of work and daily life factors and teachers' stress.

Factors	β	SE	χ^2	df	P	OR	95% CI
Daily working hours			19.770	2	<0.001		
<8						1.000	
8–10	0.236	0.191	1.521	1	0.218	1.266	0.870–1.841
>10	−0.741	0.238	9.672	1	0.002	0.476	0.299–0.760
Teaching workload/semester (h)			21.791	3	<0.001		
<50						1.000	
50–99	−0.263	0.251	1.093	1	0.296	0.769	0.470–1.258
100–199	0.529	0.258	4.190	1	0.041	1.697	1.023–2.816
> 200	0.779	0.398	3.828	1	0.050	2.179	0.999–4.754
Postgraduates annually			2.033	2	0.362		
0						1.000	
≤ 5 persons	0.206	0.178	1.336	1	0.248	1.229	0.867–1.742
>5 persons	−0.167	0.383	0.191	1	0.662	0.846	0.399–1.791
Current chaired projects			31.308	3	<0.001		
0						1.000	
1	0.452	0.236	3.679	1	0.055	1.571	0.990–2.493
2–3	0.068	0.220	0.096	1	0.757	1.070	0.695–1.648
>4	−1.245	0.311	16.020	1	<0.001	0.288	0.156–0.530
Sleep time (h)			6.313	3	0.097		
≤5						1.000	
5–6	−0.747	0.680	1.208	1	0.272	0.474	0.125–1.796
7–8	−1.063	0.676	2.476	1	0.116	0.345	0.092–1.298
> 8	−1.340	0.779	2.958	1	0.085	0.262	0.057–1.206
Normal holiday breaks			30.324	2	<0.001		
Can						1.000	
Occasionally	0.322	0.175	3.367	1	0.067	1.379	0.978–1.945
Cannot	1.803	0.328	30.193	1	<0.001	6.066	3.189–11.540
Physical exercise			53.570	2	<0.001		
Often						1.000	
Sometimes	1.408	0.226	38.940	1	<0.001	4.088	2.627–6.363
Never	2.374	0.372	40.747	1	<0.001	10.737	5.180–22.253

Table 7. Multivariate logistic regression analysis of factors associated with teachers' stress.

Factors	β	SE	χ^2	df	P	OR	95% CI
Academic title			14.518	2	0.001		
Assistant and lecturer						1.000	
Associate professor	0.967	0.301	10.312	1	0.001	2.631	1.458–4.749
Professor	0.070	0.395	0.032	1	0.859	1.073	0.494–2.329
Teaching tenure (years)			24.642	4	<0.001		
<3						1.000	
3–5	1.197	0.524	5.225	1	0.022	3.312	1.186–9.246
6–10	2.355	0.511	21.217	1	<0.001	10.535	3.868–28.694
11–15	1.410	0.539	6.838	1	0.009	4.094	1.423–11.776
> 15	1.702	0.591	8.284	1	0.004	5.486	1.721–17.487
Subject of teaching			27.998	5	<0.001		
Liberal arts						1.000	
Science	−0.577	0.375	2.370	1	0.124	0.561	0.269–1.171
Engineering	−1.220	0.300	16.494	1	<0.001	0.295	0.164–0.532
Agriculture and forestry	−2.421	0.535	20.456	1	<0.001	0.089	0.031–0.254
Medicine	−0.465	0.328	2.007	1	0.157	0.628	0.330–1.195
Others	−0.631	0.691	0.833	1	0.361	0.532	0.137–2.062
Daily working hours			11.212	2	0.004		
<8						1.000	
8–10	0.066	0.261	0.063	1	0.802	1.068	0.640–1.781
>10	−1.053	0.388	7.357	1	0.007	0.349	0.163–0.747
Current chaired projects			16.427	3	0.001		
0						1.000	
1	0.482	0.306	2.470	1	0.116	1.619	0.888–2.951
2–3	−0.117	0.322	0.133	1	0.715	0.889	0.473–1.671
> 4	−1.213	0.465	6.820	1	0.009	0.297	0.120–0.739
Normal holiday breaks			44.239	2	<0.001		
Can						1.000	
Occasionally	1.192	0.268	19.730	1	<0.001	3.293	1.946–5.572
Cannot	2.808	0.442	40.454	1	<0.001	16.581	6.979–39.396
Physical exercise			47.742	2	<0.001		
Often						1.000	
Sometimes	1.863	0.297	39.352	1	<0.001	6.446	3.601–11.538
Never	2.752	0.474	33.685	1	<0.001	15.671	6.188–39.691

Gender and age enter model as control variable. Model χ^2 = 250.013, P < 0.001.

scores greater than 21 points. In our survey, the average K10 score was 22.87 ± 8.18. The K10 scores were distributed among the four grades evenly. Specifically, 24.54% of the K10 scores were distributed in the 10–15 point range, whereas 54.06% of teachers achieved K10 scores greater than 21 points. Thus, the overall stress level of this sample of university teachers was higher than that of the general population, and the former group had a higher risk of suffering from psychological problems. This further shows that the profession of a university teacher is a high stress career in China. Chinese university teachers are expected to experience high stress due to the expanding enrollment in universities without a proportional increase in teacher resources and the fact that all promotions for university teachers are determined based on not only teaching but also on the outcomes of their scientific research [29].

We also collected teachers' self-assessments of their mental health. When teachers' self-rated mental health levels decreased, the positive rate of K10 scores increased, and an obvious correlation existed between the two (χ^2 = 222.19, P < 0.001). Additionally, the K10 score accordingly increased as the teachers' self-rated mental health level decreased. A significant difference in K10 scores was observed between the different self-rated groups (F = 217.92, P < 0.001).

Based on these findings, the teachers had a certain level of awareness of their mental health problems and the use of the K10 scale to assess teachers' psychological stress status was scientific and authentic. The K10 scale may reflect teachers' actual psychological stress status.

Factors influencing teachers' stress levels

Sociodemographic factors

In terms of the sociodemographic factors, age and average monthly income were associated with the rate of positive K10 scores. An age between 36 and 45 years was a risk factor for high psychological stress (OR = 1.805 (1.223–2.663)), whereas an age over 56 years was a protective factor (OR = 0.343 (0.131–0.899)) compared to an age of less than 35 years. Age may have been a factor not because of the effect of age itself but because social status, academic title, economic status, family responsibilities (e.g. raising children and supporting parents), and other factors are related to age (as described in the next paragraph). Income was also an important factor influencing teachers' stress levels. A trend was observed that individuals in this sample of university teachers with higher income levels exhibited lower stress levels. For university teachers, income is closely related to the

academic title, and the lower income group over-lapped with the group with lower academic titles. So when considering all factors together, the income factor was not correlated with the K10 positive rate in the multivariate logistic regression analysis.

Teaching-related factors

Regarding teaching-related factors, the academic title, teaching tenure, working responsibilities, and subject taught were associated with stress.

According to the multivariate logistic regression analysis, associate professors experienced the highest stress level (OR = 2.631 (1.458–4.749)), and the stress level of professors was not different from that of assistants and lecturers. Teachers who had more than 3 years of teaching experience experienced higher stress levels (higher K10 positive rate) than teachers with less than 3 years of teaching experience (all $P < 0.05$), indicating that new teachers were likely to experience low stress levels. At universities in China, 5 years are generally required at each academic title before a teacher can apply for a promotion. Therefore, a duration of 6–15 years of teaching basically corresponds to the period in which lecturers and associate professors have worked. At this stage, teachers face multiple stressors, ranging from academic title promotion to finances and family responsibilities, which may increase their psychological burden. Most of the teachers with more than 15 years of teaching experience were associate professors or professors. These teachers experienced higher stress levels than new teachers. The teaching tenure was related to the academic title, but the boundaries were not well defined or clear. In other words, clear guidelines regarding the number of years the lecturer, associate professor, or professor must work to attain a promotion, which depended on his/her performance, were not available. Similar to income and teaching tenure, age is also related to the academic title. In general, higher academic titles are achieved among university teachers as they age. Therefore, these four factors, academic title, average monthly income, teaching tenure, and age, are mutually correlated. Relatively younger teachers (aged between 36 and 45 years) with 6 to 10 or 15 years of teaching experience who correspondingly had a lower income and lower academic title (including mainly lecturers and associate professors) suffered higher stress levels than older and newer teachers, which may have been due to the increased tension related to competition for promotion. Most of the older teachers were professors, who were very familiar with their academic work and had a stable research topic and direction. Moreover, the postgraduates they mentored could reduce their scientific research workload to a certain extent. New teachers

were mainly adapting to the change in their roles and were becoming familiar with the work and environment. Therefore, they experienced less stress associated with promotion.

Both univariate and multivariate logistic regression analyses revealed a lower K10 positive rate among engineering and agriculture and forestry teachers than among teachers of other subjects. This finding may result from the feature of subject. Engineering and agriculture and forestry are intuitionistic subjects, whereas liberal arts and science require more creativity and more active thinking. For medical teachers, teaching and research on life and the human body are more complex and abstract.

Regarding work responsibilities, we previously believed that a combination of teaching and scientific research resulted in the greatest pressure, but the opposite result was found. We assumed that two reasons underlie this finding. First, teaching and scientific research complement each other. Scientific research can enrich the teaching content and practice, and teaching in turn can provide a theoretical basis for scientific research. This complementarity may relieve pressure on both sides. Second, although both teaching and scientific research have distinct requirements, the assessment standards of university for teachers who undertake both teaching and scientific research work are relatively lower than those for teachers who only perform one kind of work. After adjusting for other factors, the effect was no longer apparent, suggesting that the type of work responsibilities was not a factor influencing stress levels. In other words, no difference in stress levels was observed between university teachers who engaged in teaching or science research. Of course, further studies are required to clarify this finding.

Work and daily life factors

With respect to work and daily life factors, both univariate and multivariate logistic regression analysis revealed associations between four factors and teachers' stress levels.

In this survey, we found an interesting result that the positive rate of the K10 scores decreased as daily working hours were extended and the number of current research projects increased, a finding that contradicted our expectation. The stress level of teachers who worked more than 10 h a day was less than that of teachers working less than 8 h a day (OR = 0.349 (0.163–0.747)). The reason for this association may be that the teachers who worked more than 10 h a day spent more time on self-improvement and research to improve their efficiency in their roles. Therefore their stress decreased accordingly. A lack of research funding has been reported to strongly affect occupational stress among academic staff at

universities. In the present study, we also confirmed this association in China. We used the number of current research projects to represent research funding. The lowest stress level was observed in teachers who were in charge of more than four current research projects (OR = 0.297 (0.120–0.739)). Understandably, teachers who were committed to their current research projects did well in the existing project. They had no pressure to apply for research projects. In addition, they experienced less pressure in economic attainment and academic title promotion because they mainly represented professors who chaired a greater number of current research projects. The association between the two factors and teachers' stress levels also suggested that having something to do was better than being disoriented.

Another important result was that a lack of normal holiday breaks and exercise increased the rate of positive K10 scores in teachers. In the survey, more than half of the teachers (344/603) were often not able to rest on the weekend or on statutory holidays. Therefore, a proper balance between work and rest should be advocated among the teachers surveyed. Based on the data from this survey, the teachers who never or sometimes exercised perceived more stress than those who exercised regularly, and the values of the corresponding ORs were 15.671 (6.188–39.691) and 6.446 (3.601–11.538), respectively. Frequent and regular exercise increases energy and helps individuals feel refreshed and optimistic, which is beneficial for improving work efficiency and relieving psychological pressure. It is worth mentioning that only 21.1% (127/603) of the teachers exercised regularly, and 78.9% (476/603) of the teachers occasionally or never exercised in the present study. Thus, teachers should take normal holiday breaks and participate in regular physical exercise to relieve their stress.

Although the teaching workload per semester did not show a statistically significant correlation with stress levels according to the multivariate analysis, the univariate analysis showed an increase in teachers' psychological stress levels as the teaching workload per semester increased. Therefore, additional studies are needed to clarify the effect of teaching workload on stress.

Proposed prevention and intervention measures

The transformation of the education system and the expanding enrollment strategy implemented in 1999 produced an immense workload for university teachers in China, which required them to gain more skills and knowledge to perform their jobs. In addition, a lack of research funding is believed to impose another strain on university teachers [29]. Furthermore, teachers are facing a rapidly changing social environment, an increasing amount of information, a high pace of life, and a variety of factors influencing individual workloads, which impose excessive job demands. These

and other effects, supplemented by difficulties in their personal lives, are potential threats to their psychological health.

Therefore, decreasing the workload and enhancing opportunities for occupational rewards (income, esteem, and career opportunities) proportional to teachers' higher work demands and improving the regulations for promotions seem to be methods to reduce the stress of academic teachers in universities. Additionally, psychological counseling and stress management courses should be provided to teachers to improve their stress-coping skills. By analyzing the factors related to teachers' psychological stress, we can identify high-risk groups and determine the focus of prevention and treatment strategies. Based on our results, the university should focus on providing interventions to lecturers and associate professors with a low income that aim to strengthen all academic teachers' abilities to cope with psychological stress. As academic leaders, professors in any field should provide more guidance and support for younger teachers. More importantly, young teachers should constantly strive to improve their own professional skills to meet the increasing needs of the profession and should adopt positive coping strategies to relax, such as taking normal holiday breaks and participating in regular physical exercise.

Limitations

This study was limited by its cross-sectional design; thus, we were unable to infer any causal associations between the risk factors and stress. Additionally, all data related to stress and other variables in the present study were collected using self-report measures. Third, all results were based on one university; thus, they might not represent the overall situation of stress in teachers at higher education institutions in China.

Conclusions

Our study was the first to assess psychological stress and its related factors among university teachers in China using the K10. Although the present study had several limitations, our data indicated that university teachers experienced high stress levels and that a heavy teaching workload, competition for promotion (particularly a lack of research funding), few rewards, and an unhealthy coping style (a lack of normal holiday breaks from work and a lack of exercise) were the main stressors. Lecturers and associate professors should be the focus of stress prevention and intervention measures.

Acknowledgments

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

References

[1] Kyriacou C, Sutcliffe J. Teacher stress: prevalence, sources, and symptoms. The British Journal of Educational Psychology. 1978 Jun;48(2):159–167. PubMed PMID: 687523.

[2] Kyriacou C. Teacher stress and burnout - an international review. Educ Res. 1987 Jun;29(2):146–152. PubMed PMID: WOS:A1987J608000007; English.

[3] , Pithers RT. Teacher stress research: problems and progress. Brit J Educ Psychol. 1995 Dec;65:387–392PubMed PMID: WOS:A1995TL04300002; English.

[4] Roeser RW, Schonert-Reichl KA, Jha A, et al. Mindfulness training and reductions in teacher stress and Burnout: results from two randomized, waitlist-control field trials. J Educ Psychol. 2013 Aug;105(3):787–804. PubMed PMID: WOS:000322752200016; English.

[5] Collie RJ, Shapka JD, Perry NE. School climate and social-emotional learning: predicting teacher stress, job satisfaction, and teaching efficacy. J Educ Psychol. 2012 Nov;104(4):1189–1204. PubMed PMID: WOS:000310861600022; English.

[6] Steinhardt MA, Jaggars SES, Faulk KE, et al. Chronic work stress and depressive symptoms: assessing the mediating role of teacher Burnout. Stress Health. 2011 Dec;27(5):420–429. PubMed PMID: WOS:000298298900009; English.

[7] Ra D-S, Hwang H-W. The effects of social support and perceived job stress on the mental health of teachers in child care centers. Journal of Korean Council for Children & Rights. 2004;8(4): 733–756. PubMed PMID: KJD:ART001116390.

[8] Liu R, Guo DJ. Teacher stress and psychosomatic health: a longitudinal study. Int J Psychol. 2004 Oct-Dec;39(5–6):456. PubMed PMID: WOS:000226118004137; English.

[9] Shen X, Yang YL, Wang Y, et al. The association between occupational stress and depressive symptoms and the mediating role of psychological capital among Chinese university teachers: a cross-sectional study. Bmc Psychiatry. 2014;14:329. PubMed PMID: 25433676; PubMed Central PMCID: PMC4261521

[10] Di Donato A, Di Giampaolo L, Reale M, et al. Effect of occupational stress and anxiety on natural killer lymphocyte activity of men and women employed in a university. International Journal of Immunopathology and Pharmacology. 2006 Oct-Dec;19(4 Suppl):79–84. PubMed PMID: 17291412.

[11] Burke RJ, Greenglass ER, Schwarzer R. Predicting teacher burnout over time: effects of work stress, social support, and self-doubts on burnout and its consequences. Anxiety Stress Copin. 1996;9(3): 261–

275. PubMed PMID: WOS:A1996VG64900007; English.

[12] Makela K, Hirvensalo M, Whipp P. Determinants of PE teachers career intentions. J Teach Phys Educ. 2015 Oct;34(4):680–699. . PubMed PMID: WOS:000365554100009; English.

[13] You S, Conley S. Workplace predictors of secondary school teachers' intention to leave: an exploration of career stages. Educ Manag Adm Lead. 2015 Jul;43(4):561–581. . PubMed PMID: WOS:000360483100006; English.

[14] Underwood A. Evaluation of work stress, turnover intention, work experience, and satisfaction with preceptors of new graduate nurses using a 10-minute preceptor model. Journal of Continuing Education in Nursing. 2015 Dec 1;46(12):533–534. PubMed PMID: 26641146.

[15] Hu YC, Chen SR, Chen IH, et al. Evaluation of work stress, turnover intention, work experience, and satisfaction with preceptors of new graduate nurses using a 10-minute preceptor model. Journal of Continuing Education in Nursing. 2015 Jun;46(6):261–271. PubMed PMID: 26057163.

[16] ShuJie L, Onwuegbuzie AJ. Chinese teachers' work stress and their turnover intention. International Journal Of Educational Research. 2012;53:160–170.

[17] Conley S, You S. Teacher role stress, satisfaction, commitment, and intentions to leave: a structural model. Psychological Reports. 2009 Dec;105(3 Pt 1):771–786. PubMed PMID: 20099538.

[18] Milner K, Khoza H. A comparison of teacher stress and school climate across schools with different matric success rates. S Afr J Educ. 2008 May;28(2):155–173. PubMed PMID: WOS:000255841200002; English.

[19] Clunies-Ross P, Little E, Kienhuis M. Self-reported and actual use of proactive and reactive classroom management strategies and their relationship with teacher stress and student behaviour. Educ Psychol-Uk. 2008;28(6): 693–710. PubMed PMID: WOS:000259102700007; English.

[20] Easton SD, Safadi NS, Wang Y, et al. The Kessler psychological distress scale: translation and validation of an Arabic version. Health Qual Life Outcomes. 2017 Oct 27;15(1):215. 10.1186/s12955-017-0783-9. PubMed PMID: 29078774; PubMed Central PMCID: PMC5658946.

[21] Xq B, You LM, Li Y, et al. Psychometric properties of the kessler 10 scale in chinese parents of children with cancer. Cancer Nurs. 2017 Jul-Aug;40(4):297–304. PubMed PMID: WOS:000403811400013; English.

[22] Zhou CC, Chu J, Wang T, et al. Reliability and validity of 10-item Kessler Scale (K10) Chinese Version in evaluation of mental health Status of Chinese population. Chinese Journal of Clinical Psychology. 2008 Dec;16(6):627–629. Chinese.

[23] Ibrahim A, Esena RK, Aikins M, et al. Assessment of mental distress among prison inmates in Ghana's correctional system: a cross-sectional study using the Kessler psychological distress scale. Int J Ment Health Sy. 2015 Mar 29;9:17–23. PubMed PMID: WOS:000351988400001; English.

[24] Qamar K, Kiani MR, Ayyub A, et al. Higher stress scores for female medical students measured by the Kessler Psychological Distress Scale (K10) in Pakistan. Journal of Educational Evaluation for Health Professions. 2014;11:27–28. PubMed PMID: 25308191; PubMed Central PMCID: PMC4309936.

[25] Kessler RC, Barker PR, Colpe LJ, et al. Screening for serious mental illness in the general population. Archives of General Psychiatry. 2003 Feb;60 (2):184–189. PubMed PMID: 12578436.

[26] Kessler RC, Andrews G, Colpe LJ, et al. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. Psychological Medicine. 2002 Aug;32(6):959–976. PubMed PMID: 12214795.

[27] Andrews G, Slade T. Interpreting scores on the Kessler Psychological Distress Scale (K10). Australian and New Zealand Journal of Public Health. 2001 Dec;25(6):494–497. PubMed PMID: 11824981.

[28] Xu LZ, Wang JX, Sun H, et al. Researching the application of Kessler 10 for the first time and it's important significance. Soft Science of Health. 2005;19(6):410–412. Chinese.

[29] Sun W, Wu H, Wang L. Occupational stress and its related factors among university teachers in China. Journal of Occupational Health. 2011;53(4): 280–286. PubMed PMID: 21691036.