Health Utility and Its Risk Factors in University Staff in China: A Cross-Sectional Survey from an Occupational Health Perspective

Hui Jun Zhou (lockgo2luck@126.com)  
University of Shanghai for Science and Technology  https://orcid.org/0000-0003-3179-6809

Guo Fen Luo  
University of Shanghai for Science and Technology

Nasheen Naidoo  
Stellenbosch University

Jian Shen  
Donghai Hospital, Ningbo University

Meng Meng Gao  
University of Shanghai for Science and Technology

Wei Xin Cheng  
Beijing Royal Integrative Medicine Hospital

Yong Le Dai  
University of Shanghai for Science and Technology

Jie Wei  
Airforce Medical Center  https://orcid.org/0000-0001-6351-7849

Research

Keywords: Health related quality of life, EQ-5D-5L, university staff, utility, occupational health, generalized linear model, China

Posted Date: December 9th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-1057675/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License
Abstract

Backgrounds: The health of university staff is a major occupational health concern worldwide. Studies have reported low health-related quality of life (HRQOL), low job satisfaction and poor mental health in this occupational group. However, none of previous studies have measured health utility and compared it to a national norm. Therefore, this study was conducted to gain a deeper understanding of the HRQOL of university staff in China and to identify risk factors influential to their health.

Methods: This was a cross-sectional survey conducted in a public university in China. Participants were interviewed face-to-face for demographic and socioeconomic information and health conditions. The Chinese version of the EQ-5D-5L instrument was used to measure HRQOL for calculating health utility. The relationship between health utility and sample characteristics was first examined using t-test and correlation analysis. Multivariate generalized linear models were further applied to evaluate the significance of these associations while adjusting for other variables.

Results: The sample (n=154) had a mean age of 40.65 years and slightly more females (51.30%). The overall prevalence of diseases or symptoms was 81.17%. Participants attained the means (SDs) of 0.945 (0.073) and 83.00 (11.32) for the health utility and visual analogue scale respectively. The most affected domain was the anxiety/depression with 40.26% of participants reporting problems and 37.66% of the sample reported problems in the pain/discomfort domain. There were less than 5% participants reported problems in the mobility, self-care or daily activity domains individually. Multivariate models revealed that psychological/emotional conditions were associated with the largest utility loss of -0.067 (95%CI: -0.089, -0.045) followed by having a Master's degree or higher (-0.048, 95%CI: -0.09, -0.005) and pain in body parts other than the head, neck and back (-0.034, 95%CI: -0.055, -0.014).

Conclusions: University staff in China may have worse HRQOL than the general population, which manifested mainly with the pain/discomfort and anxiety/depression domains. The significant factors for utility loss were having a Master's degree or higher, psychological conditions and pain in body parts other than the head, neck and back. Targeted health promotion policies and programs should be created to benefit this occupational group and society overall.

Introduction

The health of university staff is a major occupational health concern in China and worldwide (1, 2). Academics are tasked with cultivating competent graduates and progressing science and culture to better society, and thus ill-health in this population has extensive social and national implications. Studies have found that burnout is a common occurrence in university staff which has contributed to poor health (3, 4). Mental health is also impaired in this occupational group (5). This situation may be worse in China where the “996” (working 9 a.m. to 9 p.m. six days a week) work culture is prevalent (6, 7). Studies have already reported that college teachers suffered low health-related quality of life (HRQOL) (8), poor mental
health and low job satisfaction (9, 10). It has been further suggested that the HRQOL of university staff is worse than the general population.

The Chinese government has paid attention to the HRQOL of its people with the “Healthy China 2030” national strategy (11). Since 2003, the National Health Services Survey (NHSS) conducted every 5 years has started to measure the HRQOL of the Chinese population (12). The NHSS HRQOL data aims to provide a landscape of the health status of Chinese populations, and create national norms of health utility for clinical and economic use (12–14). However, national norms can serve as an authoritative reference system for comparison purposes, but they are limited in providing valid HRQOL estimates for subpopulations, such as various occupational groups.

University staff are a unique occupational group in that they are highly skilled and highly educated, and their jobs demand intensive physical and mental work. To date, few studies have directly investigated the HRQOL of university staff with most previous studies centered on health care personnel (3, 15). The results from such studies cannot be applied to university staff in other academic disciplines. Furthermore, health utility was rarely reported and compared with a national norm. Thus, the health status of the population of university staff remains largely unknown.

Recognizing this gap, we investigated the HRQOL of a sample of university staff using the newer version of the EQ-5D (European Quality of Life 5 Dimensions) instrument from an occupational health perspective. The study set two objectives: 1) To gain a deeper understanding of the HRQOL of university staff and its specific characteristics in China; 2) To identify risk factors influential to their health utility. From this study, we hope to provide scientific evidence to healthcare authorities and university management for health policy-making and the design of health promotion programs.

**Methods And Materials**

**Study setting and population**

This was a community-based cross-sectional survey conducted in a public university, the University of Shanghai for Science and Technology (USST) in Shanghai, which is the economic engine in China. The study population was defined as all staff, either academic or nonacademic, currently working in the university. Academia in China is a specialized profession characterized by high education attainment, job security and good welfare. Conventionally they are considered to be in the middle or upper social class. Due to convenience and resource limitations we chose the staff of the USST Business School.

During the study period from 1 November 2020 to 15 January 2021, the Business School had a workforce of 216 personnel. There were 17 personnel away for reasons such as studying overseas, long-term sick or parental leave, hospitalization, resignation or near-retirement. Nine personnel officially rejected the invitation and a further 35 were out of contact. Finally, a total of 155 people participated in the study - a response rate of 78%.
Data Collection

The eligibility criteria were: 1) officially employed at USST; 2) not hospitalized or immediately after hospital discharge; 3) not handicapped or disabled; 4) able to carry out day-to-day work normally; 5) able to give personal consent.

All staff were personally invited through email, WeChat or face-to-face contact. The recruitment advertisement was also announced at school-level meetings and internal WeChat workgroups. All participants signed written consent forms before joining the study. The study was approved by the IRB committee of the Air Force Medical Center in Beijing.

Data were collected through face-to-face interview. Participants completed the questionnaires in the presence of the interviewer. One postgraduate and four undergraduate students conducted the interviews. The five interviewers attended three training sections each lasting two hours. This pre-interview training aimed to ensure equivalent task understanding, procedures and interactions with respondents. Interviewers were trained to give briefings and answer questions only, and not to promote a “right” or “wrong” answer as a measure to minimize the social desirability effect.

Health Utility Measurement

We used the Chinese version of the EQ-5D-5L instrument to measure HRQOL (16). The EQ-5D is a preference-based HRQOL instrument asking participants to rate their present-day health. Compared to the old version of the EQ-5D-3L instrument, the EQ-5D-5L instrument is more favorable for HRQOL measurement due to its greater discriminatory power and lower ceiling effect (17, 18). Its validity and reliability have been previously validated in various Chinese populations (17, 19, 20).

The EQ-5D instrument has two parts. The first part is the descriptive system which classifies 3,125 health states in five health domains (mobility, self-care, usual activities, pain/discomfort and anxiety/depression), each with five ordinal severity levels (no problems, slight problems, moderate problems, severe problems, and extreme problems/unable to). A respondent rates his/her health subjectively against the most appropriate statement in each of the five dimensions based on their health on the day of interview. The scores of the five dimensions were used to calculate health utility according to the Chinese specific value set (21). Health utility by definition has a range of 0 (death) to 1 (full health). The second part is called the visual analogue scale (VAS), a 10-cm vertical bar anchored at 0 (worst imaginable health) and 100 (best imaginable health). The VAS measures the overall health status rated by the respondents themselves.

Health Determinants Investigation
We also collected information on health risk factors including demographic (age, gender, height, weight), lifestyle or behavioral (smoking, drinking) and socioeconomic (education, marital status, number of children) variables (22). Clinical information was also collected including current diseases, symptoms and other health conditions using the WHO Health and Work Performance Questionnaire (23).

**Statistical analysis**

One participant was removed due to missing data. The final sample size for analyses was 154 participants. Categorical variables were described as counts and proportions. The prevalence of health conditions was estimated as the proportion of the sample presenting with certain health conditions. Continuous variables were presented as the mean and standard deviation (S.D.). The skewness and kurtosis of continuous variables were also explored to choose the appropriate models for multivariate analysis.

BMI was categorized into three groups - underweight/normal weight, overweight and obese using a gender-specific standard for Chinese populations (24, 25). Marital status was dichotomized into alone (single, divorced or widowed) and married. A total of 40 health conditions were reported. This was too many to be each treated as independent variables in the multivariate analysis for the sake of statistical power given the sample size. To carry out valid multivariate analyses, the six most prevalent conditions (≥20%) were treated as independent variables. These conditions were back/neck pain, pain in other areas, fatigue, high blood cholesterol, headache and sleeping problems. The remaining 34 conditions were combined into 7 groups by anatomical and/or physiological system, i.e. allergy, high blood pressure/cardiovascular, digestive system, respiratory system, muscular-skeleton and psychological/emotional conditions and others.

Univariate analysis involved correlation analysis between health utility and individual continuous variables, and t-test and ANOVA comparing the utility of different risk level of categorical variables. A generalized linear model (GLM) was chosen to perform multivariate analyses as the dependent variable, EQ-5D utility, followed a negatively skewed distribution (skewness = -1.89) to which GLMs were immune. Multivariate analysis evaluated the associations of health utility with sample characteristics. To remove the effect of collinearity and to produce consistent coefficients, the GLMs were set to use robust methods for parameter estimation and profile likelihood methods for confidence intervals. Unlike ordinary linear regression that models raw data of the dependent variable, GLMs model the means of the dependent variable. Thus, in our study the parameter coefficients of the GLMs represented the mean utility change associated with the specific variables.

The multivariate analysis had two steps. The first step was to build 12 condition-specific GLMs for individual health conditions when controlling for demographic and socioeconomic variables. In the second step, multiple conditions were evaluated simultaneously in one model together with demographic and socioeconomic variables. These conditions were selected for inclusion in the model on the condition
that they achieved borderline significance (p<=0.01) in their own models. The analysis took p<0.05 as being statistically significant. SPSS version 19 (SPSS Inc) was used for the analysis.

**Results**

The characteristics of the sample are presented in Table 1. Our sample belongs to the working-age population and therefore had a mean age of 40.65 years with an upper age limit of the retirement age at 60 years. The mean BMI was 23.49 kg/m² indicating that enrolled staff were generally considered overweight for males and females alike (24). Only seven (4.55%) persons working at the school had a Bachelor's degree only. The majority were married and living with their families. For the staff with children, the majority had one child only which was consistent with the One-Child policy in China. Up to 74% of the sample never smoked whereas half had the experience of drinking alcoholic beverages.
Table 1
Characteristics of the sample

| Variables                      | Mean (SD) | Range (minimum, maximum) | Skewness / Kurtosis |
|--------------------------------|-----------|--------------------------|---------------------|
| Age                            | 40.65 (8.5) | (23, 60)                 | 0.45 / -0.47        |
| BMI (kg/m²)                    | 23.49 (4.36) | (16.14, 49.31)          | 2.24 / 9.61         |
| Category                       | n         | Percentage (%)           |                     |
| Gender                         |           |                          |                     |
| female                         | 79        | 51.30                    |                     |
| male                           | 75        | 48.70                    |                     |
| BMI                            |           |                          |                     |
| under weight                   | 8         | 5.19                     |                     |
| normal weight                  | 65        | 42.21                    |                     |
| overweight                     | 49        | 31.82                    |                     |
| obesity                        | 32        | 20.78                    |                     |
| Highest academic degree        |           |                          |                     |
| bachelor’s degree              | 7         | 4.55                     |                     |
| master’s degree or higher      | 147       | 95.45                    |                     |
| Marital status                 |           |                          |                     |
| alone                          | 25        | 16.23                    |                     |
| married                        | 129       | 83.77                    |                     |
| Number of Child                |           |                          |                     |
| 0                              | 39        | 25.32                    |                     |
| 1                              | 88        | 57.14                    |                     |
| 2                              | 27        | 17.53                    |                     |
| Smoking                        |           |                          |                     |
| never                          | 113       | 73.38                    |                     |
| past                           | 29        | 18.83                    |                     |
| current                        | 12        | 7.79                     |                     |
| Drinking                       |           |                          |                     |
| no                             | 77        | 50.00                    |                     |
| yes                            | 77        | 50.00                    |                     |

In total, 40 diseases or symptoms were reported showing that each staff member suffered on average 3.81 health conditions (Table 2). The overall prevalence of health conditions was 81.17%. The most prominent condition was pain (headache, back and/or neck pain, pain in other body parts) affecting 98
(63.64%) participants among whom nearly half were inflicted with back and/or neck pain. There were six conditions with a minimum prevalence of 20%. They were, in a descending order, chronic back and/or neck pain, pain in other body parts, chronic fatigue or low energy, high blood cholesterol, headache and sleeping problems.
Table 2
Self-reported health conditions

| Symptoms/ Diseases/ Conditions                  | n   | Percentage (%) |
|------------------------------------------------|-----|----------------|
| Back and/or neck pain                          | 76  | 49.35          |
| Pain in other body parts                       | 55  | 35.71          |
| Fatigue or low energy                          | 47  | 30.52          |
| High blood cholesterol                         | 46  | 29.87          |
| Headache                                       | 35  | 22.73          |
| Sleep problems                                 | 31  | 20.13          |
| Frequent diarrhea/constipation                  | 29  | 18.83          |
| Chronic heartburn/GERD                         | 28  | 18.18          |
| High blood pressure/hypertension               | 25  | 16.23          |
| Anxiety disorder                               | 24  | 15.58          |
| Frequent nausea/gas/indigestion                | 23  | 14.94          |
| Seasonal allergies/hay fever                   | 22  | 14.29          |
| Arthritis                                      | 22  | 14.29          |
| Other emotional conditions                     | 22  | 14.29          |
| Stomach/intestine ulcer                        | 16  | 10.39          |
| Depression                                     | 14  | 9.09           |
| Osteoporosis                                   | 13  | 8.44           |
| Severe headaches                               | 11  | 7.14           |
| Chronic bronchitis                             | 10  | 6.49           |
| Diabetes/hyperglycemia                         | 5   | 3.25           |
| Substance problems (drugs /alcohol)            | 4   | 2.60           |
| Urinary or bladder conditions                  | 3   | 1.95           |
| Coronary heart disease                         | 3   | 1.95           |
| Fatty liver                                    | 2   | 1.30           |
| Multiple sclerosis                             | 2   | 1.30           |
| Emphysema                                      | 2   | 1.30           |
| Congestive heart failure                       | 2   | 1.30           |
| Symptoms/ Diseases/ Conditions               | n  | Percentage (%) |
|---------------------------------------------|----|----------------|
| Chronic obstructive airways disease         | 2  | 1.30           |
| Asthma                                      | 2  | 1.30           |
| Esophagitis                                 | 1  | 0.65           |
| Retinal operation                           | 1  | 0.65           |
| Lumbar small joint disturbance              | 1  | 0.65           |
| Hypotension                                 | 1  | 0.65           |
| Hypoglycemia                                | 1  | 0.65           |
| Hyperuricemia                               | 1  | 0.65           |
| Hepatic hemangioma                          | 1  | 0.65           |
| Hand deformity                              | 1  | 0.65           |
| Dermatitis                                  | 1  | 0.65           |
| Cholecystitis                               | 1  | 0.65           |
| Breast related conditions                   | 1  | 0.65           |

Despite the symptoms and diseases reported, the overall mean utility was 0.945, with only 0.055 (5.5%) utility loss compared to the full health of 1 (Figure 1). The mean VAS score was 83.00, which was 17% lower than 100 for the best health. Both health indices followed a negative distribution and were highly correlated ($r=0.595$, $p<0.001$).

The health profile of the sample was reflected by the 5 EQ-5D domains in Figure 2. There were 74 (48.1%) participants who did not report any problems in the 5 domains, i.e., they rated themselves in full health. This proportion also indicated the ceiling effect of the EQ-5D-5L instrument in measuring HRQOL of our sample. The most affected domain was anxiety/depression. Overall, 40.26% of participants reported anxiety or depression problems, one subject had severe problems, 7 subjects had moderate problems and 54 subjects had slight problems. The second most affected domain was pain/discomfort in which 37.66% of the sample reported problems including 7 subjects with moderate severity. On the other hand, much less participants reported problems in the mobility, self-care and daily activity domains. None of these domains captured a case with problems more severe than slight problems.

As shown in Table 3, age and number of health conditions were negatively correlated with utility. Univariate analysis did not find significant comparisons of health utility for demographic and socioeconomic factors. For health conditions, all conditions except respiratory system conditions were
associated with significant utility loss. Those subjects living with any condition reported lower utility than those without. The largest utility loss was related to psychological/emotional conditions. The subjects presenting with psychological/emotional conditions had a mean utility of 0.88, which was 0.09 lower than those without.
Table 3
Comparisons of health utility by risk groups of sample characteristics

| Category                        | n    | Correlation with health utility | 95% CI          | P value |
|---------------------------------|------|---------------------------------|-----------------|---------|
| Age (years)                     | 154  | -0.16                           | (-0.32, -0.002) | 0.045   |
| Number of conditions            | 154  | -0.56                           | (-0.68, -0.43)  | <0.001  |

| Gender                          |      |                                 |                 |         |
|---------------------------------|------|---------------------------------|-----------------|---------|
| Female                          | 79   | 0.94                            | (0.93, 0.96)    |         |
| Male                            | 75   | 0.95                            | (0.93, 0.96)    | 0.72    |

| Education                       |      |                                 |                 |         |
|---------------------------------|------|---------------------------------|-----------------|---------|
| Bachelor’s degree               | 7    | 0.98                            | (0.96, 1.01)    |         |
| Master's degree or above        | 147  | 0.94                            | (0.93, 0.96)    | 0.157   |

| BMI (kg/m²)                     |      |                                 |                 |         |
|---------------------------------|------|---------------------------------|-----------------|---------|
| normal/under weight             | 73   | 0.95                            | (0.93, 0.97)    |         |
| Overweight                      | 49   | 0.95                            | (0.94, 0.97)    |         |
| Obesity                         | 32   | 0.92                            | (0.89, 0.96)    | 0.176   |

| Marriage status                 |      |                                 |                 |         |
|---------------------------------|------|---------------------------------|-----------------|---------|
| Remain alone                    | 25   | 0.94                            | (0.91, 0.97)    |         |
| Married                         | 129  | 0.95                            | (0.93, 0.96)    | 0.534   |

| Number of Child                 |      |                                 |                 |         |
|---------------------------------|------|---------------------------------|-----------------|---------|
| 0                               | 39   | 0.94                            | (0.91, 0.96)    |         |
| 1                               | 88   | 0.94                            | (0.93, 0.96)    |         |
| 2                               | 27   | 0.96                            | (0.94, 0.98)    | 0.364   |

| Smoking                         |      |                                 |                 |         |
|---------------------------------|------|---------------------------------|-----------------|---------|
| never smoked                    | 113  | 0.94                            | (0.93, 0.96)    |         |

\(a\) Pearson correlation coefficient

95%CI: 95% confidence interval
| Category                  | n   | Correlation with health utility | 95% CI         | P value |
|--------------------------|-----|---------------------------------|----------------|---------|
| past smoker              | 29  | 0.95                            | (0.93, 0.98)   |         |
| current smoker           | 12  | 0.96                            | (0.91, 1.01)   | 0.611   |
| Drinking                 |     |                                 |                |         |
| no drinking              | 77  | 0.94                            | (0.93, 0.96)   |         |
| light drinking           | 77  | 0.95                            | (0.93, 0.96)   | 0.767   |
| Allergy                  |     |                                 |                |         |
| No                       | 132 | 0.95                            | (0.94, 0.96)   |         |
| Yes                      | 22  | 0.92                            | (0.87, 0.96)   | 0.036   |
| High cholesterol         |     |                                 |                |         |
| No                       | 112 | 0.96                            | (0.94, 0.97)   |         |
| Yes                      | 42  | 0.92                            | (0.89, 0.95)   | 0.003   |
| Back/neck pain           |     |                                 |                |         |
| No                       | 78  | 0.97                            | (0.96, 0.98)   | <0.001  |
| Yes                      | 76  | 0.92                            | (0.9, 0.94)    | <0.001  |
| Insomnia                 |     |                                 |                |         |
| No                       | 123 | 0.95                            | (0.94, 0.97)   |         |
| Yes                      | 31  | 0.91                            | (0.88, 0.94)   | 0.004   |
| Fatigue                  |     |                                 |                |         |
| No                       | 107 | 0.96                            | (0.95, 0.97)   | <0.001  |
| Yes                      | 47  | 0.91                            | (0.88, 0.93)   | <0.001  |
| Pain in other body parts |     |                                 |                |         |
| No                       | 99  | 0.97                            | (0.96, 0.98)   |         |
| Yes                      | 55  | 0.90                            | (0.88, 0.93)   | <0.001  |
| Headache                 |     |                                 |                |         |
| No                       | 116 | 0.96                            | (0.94, 0.97)   |         |

a Pearson correlation coefficient

95%CI: 95% confidence interval
| Category                          | n  | Correlation with health utility | 95% CI               | P value |
|----------------------------------|----|---------------------------------|----------------------|---------|
| Moderate                         | 27 | 0.93                            | (0.9, 0.95)          |         |
| Severe                           | 11 | 0.88                            | (0.79, 0.98)         | 0.002   |
| Cardiovascular condition         |    |                                 |                      |         |
| No                               | 127| 0.95                            | (0.94, 0.96)         |         |
| Yes                              | 27 | 0.92                            | (0.88, 0.96)         | 0.032   |
| Digestive system condition       |    |                                 |                      |         |
| No                               | 95 | 0.96                            | (0.95, 0.97)         |         |
| Yes                              | 59 | 0.92                            | (0.89, 0.94)         | <0.001  |
| Respiratory system condition     |    |                                 |                      |         |
| No                               | 140| 0.94                            | (0.93, 0.96)         |         |
| Yes                              | 14 | 0.96                            | (0.92, 0.99)         | 0.530   |
| Muscular-skeleton condition      |    |                                 |                      |         |
| No                               | 124| 0.95                            | (0.94, 0.97)         |         |
| Yes                              | 30 | 0.91                            | (0.87, 0.95)         | 0.003   |
| Psychological/emotional condition|    |                                 |                      |         |
| No                               | 116| 0.97                            | (0.96, 0.98)         |         |
| Yes                              | 38 | 0.88                            | (0.85, 0.91)         | <0.001  |
| Other health condition           |    |                                 |                      |         |
| No                               | 140| 0.95                            | (0.94, 0.96)         |         |
| Yes                              | 14 | 0.91                            | (0.85, 0.96)         | 0.036   |

* Pearson correlation coefficient

95% CI: 95% confidence interval

The condition-specific multivariate GLMs were combined and summarized in Table 4. In all 12 models, age was a consistently significant factor as one year older was related to a mean utility loss between -0.003 and -0.002. Likewise, education level of a Master’s degree or higher was significantly associated with a mean utility loss ranging from -0.071 to -0.044 when compared with having a Bachelor’s degree only. Other demographic or socioeconomic variables were either not significant or had unstable significance levels in these models. While the GLM controlling for other variables, high cholesterol, back
and/or neck pain, insomnia, fatigue, pain in other body parts, severe headache, digestive system conditions and psychological/emotional conditions were significant indicators for utility loss. The mean utility impairment associated with these health conditions ranged from -0.088 for psychological/emotional conditions to -0.030 for severe headache.
Table 4
Condition-specific GLMs evaluating associations of individual health conditions with health utility while adjusting other factors.

| Independent factors                             | Combined mean utility change | Combined 95% CI | Combined P values |
|------------------------------------------------|-----------------------------|----------------|------------------|
| Dependent variable is EQ-5D health utility      |                             |                |                  |
| Age                                             | (-0.003, -0.002)            | -0.004         | (0.004, 0.037)   |
| Male                                            | (0.001, 0.013)              | -0.028         | 0.041 (0.4, 0.958)|
| Obesity                                         | (-0.04, -0.02)              | -0.071         | 0.011 (0.042, 0.295)|
| Overweight                                      | (-0.007, 0.009)             | -0.032         | 0.035 (0.394, 0.945)|
| Master's degree or higher                       | (-0.071, -0.044)            | -0.123         | 0.007 (0, 0.006)  |
| Married                                         | (0.007, 0.022)              | -0.029         | 0.055 (0.173, 0.693)|
| Two children                                    | (0.017, 0.045)              | -0.015         | 0.084 (0.018, 0.232)|
| One child                                       | (0.008, 0.025)              | -0.022         | 0.059 (0.133, 0.564)|
| Current smoking                                 | (0.016, 0.042)              | -0.029         | 0.087 (0.09, 0.544)|
| Past smoking                                    | (0.008, 0.021)              | -0.024         | 0.054 (0.132, 0.551)|
| Drinking                                        | (-0.01, 0)                  | -0.035         | 0.021 (0.373, 0.964)|

| Mean utility change                            | 95% CI                      | P value        |
|------------------------------------------------|-----------------------------|----------------|
| Allergy                                        | -0.033                      | -0.065         |
| High cholesterol                               | -0.034                      | -0.06           |
| Pain with back/neck                            | -0.043                      | -0.065         |
| Insomnia                                       | -0.048                      | -0.075         |
| Fatigue                                        | -0.054                      | -0.076         |
| Pain with other body parts                     | -0.061                      | -0.083         |
| Severe headache                                | -0.030                      | -0.06           |

a Negative sign indicates mean utility loss associated with the factor and vice versa.

b Range of mean utility change associated with that variable from 13 condition-specific GLMs

c Overall range of 95% CI associated with that variable from 13 condition-specific GLMs

d Range of P values for that variable from 13 health condition-specific GLMs

95%CI: 95% confidence interval; GLM: generalized linear model
| Independent factors                                      | Combined mean utility change<sup>ab</sup> | Combined 95% CI<sup>c</sup> | Combined P values<sup>d</sup> |
|----------------------------------------------------------|------------------------------------------|----------------------------|-------------------------------|
| Moderate headache                                        | -0.065                                   | -0.108                     | -0.022                        | 0.091                        |
| High blood pressure/Cardiovascular condition             | -0.023                                   | -0.055                     | 0.01                          | 0.225                        |
| Digestive system conditions                              | -0.040                                   | -0.062                     | -0.017                        | 0.001                        |
| Respiratory system conditions                            | 0.023                                    | -0.015                     | 0.062                         | 0.193                        |
| Muscular skeleton conditions                             | -0.028                                   | -0.058                     | 0.001                         | 0.12                         |
| Psychological/emotional conditions                      | -0.088                                   | -0.109                     | -0.067                        | <0.001                       |

<sup>a</sup> Negative sign indicates mean utility loss associated with the factor and vice versa.

<sup>b</sup> Range of mean utility change associated with that variable from 13 condition-specific GLMs

<sup>c</sup> Overall range of 95% CI associated with that variable from 13 condition-specific GLMs

<sup>d</sup> Range of P values for that variable from 13 health condition-specific GLMs

95%CI: 95% confidence interval; GLM: generalized linear model

In the GLMs evaluating multiple health conditions (Table 5), psychological/emotional conditions were associated with the biggest mean utility loss of -0.067, followed by education level of a Master's degree or higher and pain in other body parts, which were associated with a utility loss of -0.048 and -0.034 respectively. Notably male gender, marriage, smoking or having children were associated with utility gain. However, these factors did not achieve statistical significance in predicting health utility.
Table 5
Multivariate GLM simultaneously evaluating associations of individual risk factors with health utility

| Risk factors                      | Mean utility change | 95% CI      | P values |
|----------------------------------|---------------------|-------------|----------|
| Intercept                        | 1.063               | 0.997–1.129 | <0.001   |
| Age                              | -0.001              | -0.002–0.001| 0.08     |
| Male                             | 0.002               | -0.021–0.024| 0.867    |
| Obesity                          | -0.025              | -0.051–0.002| 0.091    |
| Overweight                       | -0.008              | -0.028–0.013| 0.354    |
| Master's degree or higher        | -0.048              | -0.09–0.005 | 0.011    |
| Married                          | 0.023               | -0.006–0.052| 0.104    |
| Two children                     | 0.015               | -0.015–0.045| 0.267    |
| One child                        | 0.007               | -0.021–0.034| 0.619    |
| Current smoker                   | 0.012               | -0.025–0.05 | 0.522    |
| Past smoker                      | 0.007               | -0.019–0.034| 0.485    |
| Drinking                         | -0.004              | -0.024–0.016| 0.672    |
| High cholesterol                 | -0.009              | -0.031–0.013| 0.348    |
| Back and/or neck Pain            | -0.009              | -0.029–0.012| 0.444    |
| Insomnia                         | -0.005              | -0.031–0.02 | 0.739    |
| Fatigue                          | -0.014              | -0.036–0.009| 0.229    |
| Pain in other body parts         | -0.034              | -0.055–0.014| 0.003    |
| Headache severe                  | -0.010              | -0.048–0.027| 0.736    |
| Headache moderate                | -0.001              | -0.025–0.023| 0.955    |
| Digestive system conditions      | -0.009              | -0.029–0.011| 0.375    |
| Psychological/emotional conditions| -0.067              | -0.089–0.045| <0.001   |

a Negative sign indicates mean utility loss associated with the factor or vice versa.

95%CI: 95% confidence interval, GLM: generalized linear model

Discussion
Our study investigated the HRQOL of a sample of university staff and discovered that the mean health utility was 0.945 and mean VAS was 83.00. The utility loss was mainly caused by problems with two health domains, anxiety/depression and pain/discomfort in which 40.26% and 37.66% of participants respectively reported some problems. Multivariate analyses identified three risk factors related to utility loss. They were psychological/emotional conditions, higher education level and pain in body parts other than back, neck and head, where each factor was associated with a utility loss of -0.067, -0.048 and -0.034 respectively. Additionally, all self-reported health conditions were more or less related to lower utility regardless of their statistical significance. To the best of our knowledge this is the first study reporting on the health utility of university staff in China.

It has not been confirmed that the health of university staff is worse than the general population although previous studies have suggested so (3, 5). The direct comparison of HRQOL between university staff and the general population is lacking and the difference, if it ever existed, has not been analyzed quantitatively. Health utility measured in our study can be compared to population norms directly and quantitatively in order to gain an in-depth understanding of the HRQOL of university staff. A study describing Chinese HRQOL norms was recently published and reported on the health utility of EQ-5D-5L scores for 1,296 dwellers in five China cities (26). In this study, the subjects in the same age range (n=965) as our sample achieved a mean utility of 0.961, which is higher than the mean utility of 0.945 of our sample. Additionally, the mean VAS score (86.28) of this cohort was also higher than that of our sample (83.00). The differences in both indices did not reach statistical significance reflecting that the two study populations are generally considered healthy. For individual EQ-5D health domains, our sample did worse by reporting more problems in all five domains than the age-matched participants in that study. The differences in the anxiety/depression and pain/discomfort domains were statistically significant. There were 40.26% and 37.66% of subjects in our study that reported problems in the anxiety/depression and pain/discomfort domains respectively, compared to 27.56% and 28.7% of age-matched subjects reported in the population norm study (26). The statistical significances were 0.0013 and 0.0155 respectively.

Considering the social determinants of health, we compared our sample to subjects with similar socioeconomic characteristics such as employment status, health insurance status, geographical area and education level in the population norm study (26). Our university staff reported (a) significantly lower VAS scores and a larger proportion of pain/depression problems than those who were fully employed or with health insurance, and (b) lower VAS scores than the city dwellers regardless of other socio-economic factors. Our sample also had more problems in the pain/discomfort domain when compared to people with university degrees or higher (26). These findings suggest that university staff may have poorer HRQOL than comparable general populations.

The above observation was further supported by comparing our study with the NHSS 2013 enrolling 188,720 Chinese across mainland China (13). Our sample had a significantly lower utility than the national population (0.945 vs 0.985). Given that the national sample was heterogenous with respect to health determinants, our sample was further compared to subpopulations with similar socioeconomic
characteristics, especially to people with university degrees or higher considering that education level is the strongest characteristic of university staff and is closely relevant to other factors such as dwelling area, employment status, health insurance etc. Compared to the education-matched cohort, the larger utility and VAS gaps were revealed. Our school staff were 0.049 and 2.44 points lower in health utility and VAS respectively - both of which were statistically significant. Moreover, our sample was 7.68 times more likely to have pain/discomfort and 16.10 times more likely to have anxiety/depression.

It could be inferred that the poor HRQOL of university staff was specifically related to the pain/discomfort and anxiety/depression domains. Our staff were three times and 7.56 times more likely to have pain/discomfort and anxiety/depression compared to the national population. Compared to other socioeconomically similar cohorts of working age, employment status or living in an urban area, the likelihood of pain/discomfort and anxiety/depression in our sample were at least three and eight times higher respectively, in addition to a significantly lower utility (13). However, the probability of having problems with mobility, self-care and usual activity are comparable. Our findings were consistent with previous reports. University lecturers are highly stressed and tend to have poor mental health (5, 9, 27). Lecturers with Doctoral and Master's degrees tended to have impaired mental health in comparison with their peers with Bachelor's degrees only (9).

In the NHSS, people categorized into the highest education level, university degree or higher, enjoyed the best HRQOL (12, 13). This is understandable given that higher education usually translates to a good work environment, job security, insurance and living in economically developed areas. The similar association has been reported in a variety of populations (28). We found conflicting results that having a Master's degree or higher is related to reduced health utility relative to those with a Bachelor's degree only. This contradiction may reveal the limits and risks when applying the findings from a national survey or general population to a specific population given its unique set of occupational and socioeconomic characteristics. Actually, our sample would be categorized into the highest education group if enrolled in the NHSS (12, 13, 26). We analyzed one of the highest educated populations in the NHSS and provided a detailed picture of their HRQOL. The value of our study is that we have generated necessary supplementary evidence.

There were 63.64% of participants reporting physiological pain while only 37.68% reported problems in the pain/discomfort domain. Conversely, 24.68% of participants reporting psychological or mental conditions while 40.26% reported problems in the EQ-5D anxiety/depression domain. The health profile from a clinical perspective appears quite different from a HRQOL perspective. This disparity is most likely culture-related (29). The Chinese are not willing to admit their mental problems for fear of discrimination. The social stigma surrounding mental disease is stronger in China than in the West (30, 31). However, it is the opposite with respect to pain. Being traditionally viewed as diligent or industrious, the Chinese have a high tolerance to pain for fear of appearing weak (32). This finding has also highlighted the need for extending the HRQOL assessment beyond disease or symptom if health is to be assessed comprehensively. After all, HRQOL and clinical conditions are different concepts by themselves.
There were several advantages in our study. The ceiling effect of the EQ-5D instrument in our study was only 48%, much lower than the 84.2% in the NHSS and other similar studies in Asia, specifically China (33–35). It was also lower than those reported in US and European studies (36, 37). The ceiling effect of a HRQOL instrument limits its ability to measure relatively suboptimal health when subjects are generally healthy such that health utility tends to be overestimated. A modest ceiling effect in our study secures the reliability and validity of our findings. This should be attributed to the EQ-5D-5L instrument, which has strong discriminatory power (17, 18). Another advantage is that we employed a GLM for multivariate analysis, which is superior to more commonly used linear regression models, and produces more stable estimates for populations.

Some limitations with our study are notable. The sample size is small which may affect its representativeness of the population of university staff in China. However, university staff are homogenous in terms of age, education level, job duty and socioeconomic characteristics. This means that, statistically, a small sample may have good representativeness of the study population (38). Health conditions of our participants are self-reported indicating the presence of symptoms and known diseases. This may be prone to information bias. However, studies have shown that self-reported chronic conditions are accurate and even more accurate than clinical diagnosis (39, 40). Moreover, asking participants to report their own health problems in some way captures their subjective perception of the severity of health conditions. The conclusion drawn from our study that university staff have a worse health status than the general population might be subject to measurement bias. Our study used the EQ-5D-5L instrument to measure HRQOL whereas the NHSS studies used the EQ-5D-3L instrument (12, 13), which due to its lower discretionary power, systematically generated higher health utility than the EQ-5D-5L instrument (17). Our conclusion might also be explained by the trend that the health status of the Chinese has been decreasing over time (14, 41). Following this trend, the health utility in the present study would naturally be lower because our study came up seven and 12 years later than the NHSS studies (12, 13). However, our findings were less likely to be caused by measurement bias or the natural trend. Compared with the more recent study that also used the EQ-5D-5L instrument (26), university staff had lower health utility and significantly more problems in the pain/discomfort and anxiety/depression domains.

**Conclusion**

The present study found that that university staff in China have worse HRQOL than the general population. The health utility loss was mainly manifested with impairment in two health domains, the pain/discomfort and anxiety/depression domains. The significant factors associated with utility loss were having a Master’s degree or higher, psychological conditions and pain in body parts other than the back, neck and head. Our findings raise an important occupational health issue concerning university staff and call for targeted health promotion policy and programs by university management and government to benefit university staff and society overall.
Abbreviations

HRQOL
health-related quality of life
NHSS
National Health Services Survey
EQ-5D
European Quality of Life 5 Dimensions
USST
University of Shanghai for Science and Technology
SD
standard deviation
GLM
generalized linear model
VAS
visual analogue scale
95% CI
95% confidence interval

Declarations

Ethics approval and consent to participate

The study was approved by the IRB committee of the Air Force Medical Center in Beijing.

Consent for publication

Not applicable

Availability of data and materials

The datasets generated and/or analyzed during the current study are not publicly available due to university regulations. But they are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests

Funding:

This work was funded by Shanghai Municipal Education Commission through the “Program for Professor of Special Appointment (Eastern Scholar)” at Shanghai Institutions of Higher Learning
awarded to HJZ, (grant number: 10-20-303-601). The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Authors' contributions

HJZ conceptualized and designed the study. Then he was in charge of data analysis and interpretation and finally drafting the manuscript. GFL conceptualized the study, refined the questionnaire and collected the data. NN interpreted the results and was a major contributor in writing the manuscript. JS and WXC designed the study and provided important administrative support. MMG and YLD interviewed the participants and compiled the data. JW conceptualized and supervised the study and collected important scientific materials. All authors read and approved the final manuscript.

Acknowledgements

The authors are very gratitude to the Business School USST for supporting the study.

References

1. Sanchez HM, Sanchez EGM, Barbosa MA, Guimarães EC, Porto CC. Impact of health on quality of life and quality of working life of university teachers from different areas of knowledge. Cien Saude Colet. 2019;24(11):4111–23.
2. Wang P, Chu PP, Wang J, Pan RS, Sun Y, Yan M, et al. Association Between Job Stress and Organizational Commitment in Three Types of Chinese University Teachers: Mediating Effects of Job Burnout and Job Satisfaction. Front Psychol. 2020;11.
3. Yao SM, Yu HM, Ai YM, Song PP, Meng SY, Li W. Job-Related Burnout and the Relationship to Quality of Life Among Chinese Medical College Staff. Arch Environ Occup H. 2015;70(1):27–34.
4. Alves PC, Oliveira AF, Paro H. Quality of life and burnout among faculty members: How much does the field of knowledge matter? PLoS One. 2019;14(3):e0214217.
5. Chen N, Li X, Liu Q, Liu Y. [Systematic review of university teachers’ mental health based on SCL-90]. Wei Sheng Yan Jiu. 2014;43(6):990–7.
6. Yang TN, Liu R, Deng JW. Does Co-worker Presenteeism Increase Innovative Behavior? Evidence From IT Professionals Under the 996 Work Regime in China. Front Psychol. 2021;12.
7. Chappell B. Employers Can't Require People To Work 72 Hours A Week, China's High Court Says USA: National Public Radio; 2021 [Available from: https://www.npr.org/2021/08/30/1032458104/12-hour-6-day-996-work-schedule-illegal-china-deaths-tech-industry.
8. Ge C, Yang X, Fan Y, Kamara AH, Zhang X, Fu J, et al. Quality of life among Chinese college teachers: A cross-sectional survey. Public Health. 2011;125(5):308–10.
9. Liu C, Wang S, Shen X, Li MY, Wang L. The association between organizational behavior factors and health-related quality of life among college teachers: a cross-sectional study. Health Qual Life Out. 2015;13.
10. Li MY, Wang ZY, Wu H, Wang JN, Wang L. [Occupational mental health and job satisfaction in university teachers in Shenyang, China]. Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi. 2017;35(2):137–40.

11. Tan X, Zhang Y, Shao H. Healthy China 2030, a breakthrough for improving health. Glob Health Promot. 2019;26(4):96–9.

12. Sun S, Chen J, Johansson M, Kind P, Xu L, Zhang Y, et al. Population health status in China: EQ-5D results, by age, sex and socio-economic status, from the National Health Services Survey 2008. Qual Life Res. 2011;20(3):309–20.

13. Yao Q, Liu C, Zhang Y, Xu L. Population norms for the EQ-5D-3L in China derived from the 2013 National Health Services Survey. J Glob Health. 2021;11:08001.

14. Yao Q, Liu C, Zhang Y, Xu L. Changes in health-related quality of life of Chinese populations measured by the EQ-5D-3 L: a comparison of the 2008 and 2013 National Health Services Surveys. Health Qual Life Outcomes. 2019;17(1):43.

15. Zhang M, Loerbroks A, Li J. Job burnout predicts decline of health-related quality of life among employees with cardiovascular disease: A one-year follow-up study in female nurses. Gen Hosp Psychiat. 2018;50:51–3.

16. Luo N, Li M, Liu GG, Lloyd A, de Charro F, Herdman M. Developing the Chinese version of the new 5-level EQ-5D descriptive system: the response scaling approach. Qual Life Res. 2013;22(4):885–90.

17. Pan CW, Sun HP, Wang X, Ma Q, Xu Y, Luo N, et al. The EQ-5D-5L index score is more discriminative than the EQ-5D-3L index score in diabetes patients. Qual Life Res. 2015;24(7):1767–74.

18. Jia YX, Cui FQ, Li L, Zhang DL, Zhang GM, Wang FZ, et al. Comparison between the EQ-5D-5L and the EQ-5D-3L in patients with hepatitis B. Qual Life Res. 2014;23(8):2355–63.

19. Wang HM, Patrick DL, Edwards TC, Skalicky AM, Zeng HY, Gu WW. Validation of the EQ-5D in a general population sample in urban China. Qual Life Res. 2012;21(1):155–60.

20. Luo N, Li M, Chevalier J, Lloyd A, Herdman M. A comparison of the scaling properties of the English, Spanish, French, and Chinese EQ-5D descriptive systems. Qual Life Res. 2013;22(8):2237–43.

21. Luo N, Liu G, Li M, Guan H, Jin X, Rand-Hendriksen K. Estimating an EQ-5D-5L Value Set for China. Value Health. 2017;20(4):662–9.

22. Marmot M. Social determinants of health inequalities. Lancet. 2005;365(9464):1099–104.

23. Kessler RC, Barber C, Beck A, Berglund P, Cleary PD, McKenas D, et al. The World Health Organization Health and Work Performance Questionnaire (HPQ). J Occup Environ Med. 2003;45(2):156–74.

24. He W, Li Q, Yang M, Jiao J, Ma X, Zhou Y, et al. Lower BMI cutoffs to define overweight and obesity in China. Obesity (Silver Spring). 2015;23(3):684–91.

25. Consultation WHOE. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. Lancet. 2004;363(9403):157–63.

26. Yang Z, Busschbach J, Liu G, Luo N. EQ-5D-5L norms for the urban Chinese population in China. Health Qual Life Outcomes. 2018;16(1):210.
27. Li WJ, Kou CG. Prevalence and correlates of psychological stress among teachers at a national key comprehensive university in China. Int J Occup Env Heal. 2018;24(1-2):7–16.

28. Song T, Ding YW, Sun Y, He YN, Qi DJ, Wu Y, et al. A population-based study on health-related quality of life among urban community residents in Shenyang, Northeast of China. Bmc Public Health. 2015;15.

29. Li M, Bao Z, Lv G, Zhou J, Chen P, Luo N. Culture-Related Health Disparities in Quality of Life: Assessment of Instrument Dimensions Among Chinese. Front Public Health. 2021;9:663904.

30. Phillips MR, Pearson V, Li FF, Xu MJ, Yang L. Stigma and expressed emotion: a study of people with schizophrenia and their family members in China. Brit J Psychiat. 2002;181:488–93.

31. Stuart H. Reducing the stigma of mental illness. Glob Ment Health. 2016;3.

32. Tung WC, Li ZZ. Pain Beliefs and Behaviors Among Chinese. Home Hlth Care Man P. 2015;27(2):95–7.

33. Huang WD, Yu HJ, Liu CJ, Liu GX, Wu QH, Zhou J, et al. Assessing Health-Related Quality of Life of Chinese Adults in Heilongjiang Using EQ-5D-3L. Int J Env Res Pub He. 2017;14(3).

34. Abdin E, Subramaniam M, Vaingankar JA, Luo N, Chong SA. Population norms for the EQ-5D index scores using Singapore preference weights. Quality of Life Research. 2015;24(6):1545–53.

35. Shiroiwa T, Fukuda T, Ikeda S, Igarashi A, Noto S, Saito S, et al. Japanese population norms for preference-based measures: EQ-5D-3L, EQ-5D-5L, and SF-6D. Quality of Life Research. 2016;25(3):707–19.

36. Janssen MF, Szende A, Cabases J, Ramos-Goni JM, Vilagut G, Konig HH. Population norms for the EQ-5D-3L: a cross-country analysis of population surveys for 20 countries. Eur J Health Econ. 2019;20(2):205–16.

37. Garcia-Gordillo MA, Adsuar JC, Olivares PR. Normative values of EQ-5D-5L: in a Spanish representative population sample from Spanish Health Survey, 2011. Qual Life Res. 2016;25(5):1313–21.

38. Desai R. Optimum Sample: Definition and Factors | Social Research
   https://www.yourarticlelibrary.com/2021 [Available from: https://www.yourarticlelibrary.com/social-research/optimum-sample-definition-and-factors-social-research/92926.

39. Heliovaara M, Aromaa A, Klaukka T, Knek P, Joukamaa M, Impivaara O. Reliability and validity of interview data on chronic diseases. The Mini-Finland Health Survey. J Clin Epidemiol. 1993;46(2):181–91.

40. Halabi S, Zurayk H, Awaida R, Darwish M, Saab B. Reliability and validity of self and proxy reporting of morbidity data: a case study from Beirut, Lebanon. Int J Epidemiol. 1992;21(3):607–12.

41. Sun H, Zhang Q, Luo X, Quan H, Zhang F, Liu C, et al. Changes of adult population health status in China from 2003 to 2008. PLoS One. 2011;6(12):e28411.

Figures
Figure 1

Distribution of health utility and visual analogue scale
Figure 2

Health profile of the sample in EQ-5D domains Numbers are percentage