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Study on the Relationship between Occupational Stress and Job Burnout of Air Traffic Controllers of Civil Aviation

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***Abstract*:** To explore the relationship between occupational stress and job burnout of civil aviation air traffic controllers (ATCs) in a certain area. By using cluster sampling method 457 ATCs in an air traffic management bureau were selected as the investigation objects. The job content questionnaire (JCQ) and the effort reward imbalance questionnaire (ERI) were used to measure work requirements independent imbalance type and ERI type occupational stress levels separately. Maslach Burnout Inventory-General Survey (MBI-GS) was used to measure occupational burnout level. Then the relationship between them was analyzed. Of 457 ATCs 83.59% (382/457) had occupational burnout. Univariate analysis showed that scores of emotional exhaustion (EE) and cynicism (DP) of job burnout had statistical difference between the groups with and without ERI stress of ATCs ($P<0.05$). The degree of ATCs occupational burnout had statistical difference between the groups of different ERI stress level ($P<0.05$). Multiple Logistic regression analysis showed that job burnout level of ATCs was affected by social support scores, effort scores and ERI stress level ($P<0.05$). A large proportion of ATCs had occupational stress and occupational burnout. Occupational stress has obvious influence on job burnout.

1. Introduction

Occupational stress refers to the functional disorder when there is an imbalance between objective needs and subjective response ability[1]. Job burnout, also known as "job exhaustion", refers to the state of physical and mental fatigue and exhaustion produced by individuals under heavy work pressure. Job burnout is one of the important factors affecting people's physical and mental health[2]. Job burnout is affected by many factors such as individual factor, environment factor, organization/management factor and social factor. Due to the particularity of the occupation air traffic controllers (ATCs) are always under the high pressure which is easy to produce occupational

tension and job burnout. There are few studies on the relationship between job stress and job burnout about this special occupational group. The author will carry out a specific analysis and research on this issue through this article.

2. Object and methods

2.1. Research Object

Cluster sampling was adopted to randomly select the ATCs of an air traffic management bureau in China as the object of investigation. A questionnaire survey was conducted on the research subjects by combining self-report with inquiry by investigators. In the introduction to the questionnaire the purpose and significance of the survey were detailed and the voluntary nature of the survey was explained. A total of 488 questionnaires were collected. Due to serious absence of items in 31 questionnaires 457 valid questionnaires were actually obtained for analysis.

2.2. Method

2.2.1 Research Content:

Basic information form was used for investigation of general demographic characteristics (age, gender, marital status, educational level, family income, etc.) and professional related characteristics (title, job post, view of regular training, ever happen emergency within a month, the number of monthly shift, etc.).

Occupational stress level of ATCs is evaluated by the Chinese Job Content Questionnaire (JCQ) [3] and the Chinese Effort Reward Imbalance Questionnaire (ERI) [4]. JCQ includes three factors of work requirements, degree of autonomy and social support There are 5, 9 and 8 items respectively. Likert 5-level scoring method was adopted and each item was assigned a score of 1-5 points. Equation (1) was used to calculate the work demand- autonomy ratio (D/C ratio). If an individual's D/C ratio > 1.00 there is high JCQ occupational stress level; If the D/C ratio ≤ 1.00 it indicates low JCQ occupational stress level [5]. The Cronbach's α coefficient of the JCQ sample in this study was 0.72.

$$\text{D/C Ratio} = \text{Work Demand Factor Score}/(\text{Degree of Autonomy Factor Score} \times 5/9) \quad (1)$$

ERI includes three factors of effort ,reward and overload. There are 6, 11 and 6 items respectively. Likert5 grading method was used and each item was assigned 1 to 5 points. Equation (2) was used to calculate the effort- reward imbalance index (ERI ratio). If an individual's ERI ratio > 1.00 there is high ERI occupational stress level. If an individual's ERI ratio ≤ 1.00 there is low ERI occupational stress level.

$$\text{ERI ratio} = \text{effort factor score}/(\text{reward factor score} \times 6/11) \quad (2)$$

The Chinese Maslach Burnout Inventory-General Survey (MBI-GS) is used to evaluate the degree of job Burnout of ATCs[7]. The MBI-GS Survey consists of three dimensions: emotional exhaustion (EE), cynicism (DP) and professional efficacy (PA) with a total of 15 items. The score of each item ranges from 0 to 6 points. The score of each dimension is the sum of its corresponding items. The higher the scores of EE and DP the higher the burnout degree is; The lower the scores of PA the higher the burnout degree is. The burnout degree is calculated according to Equation (3). A total score <1.5 is considered as non-burnout, 1.5 to 3.5 as mild burnout and >3.5 as severe burnout [8].

$$\text{Occupational Burnout Score} = 0.4 \times \text{EE} + 0.3 \times \text{DP} + 0.3 \times (6 - \text{PA}) \quad (3)$$

2.2.2 Quality Control

JCQ,ERI and MBI-GS all have good reliability, validity and acceptability[3,9,10,11]. All the investigators have been trained and passed the examination. Excel software was used to establish database. Data entry adopted double entry and logic check. Questionnaires with three missing entries were deemed invalid.

2.2.3 Statistical Method

SPSS 21.0 software was used for statistical analysis. The measurement data were described as $\bar{x}\pm s$. The mean between groups was compared by rank sum test. Multivariate ordered Logistic regression analysis was used to analyze the influencing factors of job burnout and P<0.05 was considered statistically significant.

Rank sum test:

$$u = \frac{|T - n_0(N+1)/2|}{\sqrt{n_1 n_2 (N+1)/12}} \tag{4}$$

$$u_c = u \times c \tag{5}$$

$$c = \sqrt{\frac{N^3 - N}{N^3 - N - \sum_i (t_i^3 - t_i)}} \tag{6}$$

Multivariate ordered Logistic regression analysis:

$$\text{Logit}(P) = \ln\left(\frac{P}{1-P}\right) \tag{7}$$

$$\text{Log}\frac{P}{1-P} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_m x_m \tag{8}$$

2.3. Result

2.3.1 General characteristics of the survey subjects.

Of 457 respondents there were male 368 (80.53%) and female 89 (19.47%).Age between 22.0 and 50.0 (29.6±4.8). Among them there are internship 85 (18.60%), junior professional title ATCs 124 (27.13%) and intermediate and senior professional title ATCs 248(54.27%);Among them there are tower controllers 109 (23.85%), area controllers 112 (24.51%), approach controllers 236 (51.64%).

2.3.2 Scores of JCQ, ERI and MBI-GS.

The average scores of 457 ATCs of JCQ work requirement, degree of autonomy and social support were (12.42±2.85), (20.26±1.76), (15.59±2.77) respectively. ATCs were grouped according to D/C. There were 86 ATCs (18.81%) with no JCQ occupational stress and 371 ATCs (81.18%) with JCQ occupational stress.

The average scores of 457 ATCs of ERI effort, reward and overload were (16.77±4.67), (40.20±8.40), (15.54±2.49) respectively. ATCs were grouped according to ERI ratio. There were 56 ATCs (12.25%) with no ERI occupational stress and 401 ATCs (87.75%) with ERI occupational stress.

The average scores of 457 ATCs of MBI-GS EE, DP and PA were (13.71±3.00), (13.39±4.45), (25.36±6.18) respectively. ATCs were grouped according to Occupational Burnout Score. There were 75 ATCs (16.41%) with no occupational burnout, 202 ATCs (44.20%) with mild occupational burnout and 180 ATCs (39.39%) with severe occupational burnout.

2.3.3 The influence of occupational stress on MBI-GS score.

ATCS scores of emotional exhaustion (EE) and cynicism (DP) of job burnout had statistical difference between the groups with and without ERI stress of ATCs (P<0.05). Professional efficacy (PA) score had no statistical difference between the groups with and without ERI stress of ATCs (P>0.05). Scores of emotional exhaustion (EE), cynicism (DP) and professional efficacy (PA) of job burnout had no statistical difference between the groups with and without JCQ stress of ATCs (P>0.05). The degree of ATCs occupational burnout had statistical difference between the groups of different ERI stress level (P<0.05).See table 1 and table 2.

Table 1: Comparison of MBI-GS scores of atcs with different occupational stress levels

GROUP	N	%	MBI-GS		
			EE	DP	PA
JCQ occupational stress					
without	83	18.16%	13.33±3.04	13.67±4.36	25.03±5.53
with	374	81.84%	13.79±2.99	13.33±4.47	25.43±6.32
Z			-1.46	-0.52	-1.38
P			0.14	0.60	0.17
ERI occupational stress					
without	71	15.54%	13.05±2.99	11.16±4.48	23.89±7.31
with	386	84.46%	13.83±2.99	13.80±4.33	25.63±5.92
Z			4.76	21.06	3.20
P			0.03	0.00	0.07

Table 2: The rank sum test results of job burnout degree of atcs with different occupational stress levels

GROUP	Degree of occupational burnout					
	Without		Mild		Severe	
JCQ occupational stress						
without	15a	18.1%	35a	42.2%	33a	39.8%
with	60a	16.0%	167a	44.7%	147a	39.3%
χ^2			0.27			
P			>0.05			
ERI occupational stress						
without	26a	36.6%	24b	33.8%	21b	29.6%
with	49a	12.7%	178b	46.1%	159b	41.2%
χ^2			25.03			
P			<0.05			

2.3.4 Relationship between occupational stress and job burnout of air traffic controllers

The degree of job burnout was taken as the dependent variable. The independent variables were ATCs work requirement score, degree of autonomy score, social support score, effort score, reward score, overload score, JCQ stress degree and ERI stress degree. Rank sum test and multivariate ordered Logistic regression analysis were performed. Results showed that ATCs with high social support scores had lower burnout level than those with low social support scores (P<0.05). The burnout degree of ATCs with high effort scores was lower than that of ATCs with low effort scores (P<0.05). The job burnout degree of ATCs with low ERI tension was lower than that with high ERI tension (P<0.05). See table 3.

Table 3: Influence of different occupational stress on the degree of atcs job burnout

	β	S.E.	Wald	95% C.I. for Exp(B) lower	upper	P
social support score	-0.090	0.021	19.132	-0.130	-0.050	0.000
effort score	-0.086	0.041	4.467	-0.166	-0.006	0.035
ERI occupational stress						
without with	-1.543	0.404	14.601	-2.334	-0.751	0.000

3. Conclusion and discussion

Occupational stress is a nervous reaction which results from the interaction between individual characteristics and occupational environment factors. Job burnout is the state of a kind of exhaustion experienced because of long working hours, excessive workload and excessive working intensity. Job burnout may result from long-term occupational stress. If occupational stress exists for a long time and can't be alleviated it will eventually make employees physically and mentally tired. Air traffic control is a job with high risk, high responsibility and high stress compared to ordinary occupation. ATCs were always in a state of high mental stress. If the mental tension and stimulation accumulated to a certain extent and beyond a certain psychological boundary it is easy to lead to work resistance and boredom. The results of this survey showed that 83.59% of ATCs have job burnout which is higher than that of nurses and civil servants[12-14].

The results of univariate analysis in this study showed that the ATC's score of scores of emotional exhaustion (EE) and cynicism (DP) of job burnout had statistical difference between the groups with and without ERI stress of ATCs (P<0.05). Professional efficacy (PA) score had no statistical difference between the groups with and without ERI stress of ATCs (P>0.05). Scores of emotional exhaustion (EE), cynicism (DP) and professional efficacy (PA) of job burnout had no statistical difference between the groups with and without JCQ stress of ATCs (P>0.05). The degree of ATCs occupational burnout had statistical difference between the groups of different ERI stress level (P<0.05). The degree of ATCs occupational burnout had no statistical difference between the groups of different JCQ stress level (P>0.05). This is consistent with the research results of Zhang Yang et al[8]. They confirmed that the correlation coefficients of occupational stress and burnout dimensions and burnout total score were statistically significant and occupational stress is positively correlated with job burnout.

Through multivariate Logistic regression analysis this study found that social support score, effort score and ERI stress were influential factors for ATC job burnout degree (P<0.05). This study showed that ATCs with high social support scores had lower job burnout than those with low social support scores. This is consistent with the results of previous studies[15,16]. Social support refers to the spiritual and material support and help obtained from family, friends and society when individuals face stress events. Sun Dandan et al. 's research showed that nurses' social support is negatively related to job burnout. The higher the nurses' level of social support, the lower their burnout is. Wang Hongyu et al. proved that all dimensions of social support were negatively correlated with job burnout. The correlation coefficient between objective support and job burnout is the largest. The objective and practical support obtained by employees can have a positive effect on job burnout directly. Air traffic control units can reduce employee burnout by providing objective support (such as direct material incentives, team activities, etc.). ATCs should also communicate with others, improve social skills and obtain a wide range of social support.

The job burnout degree of ATC with high effort score was lower than that of ATC with low effort score (P<0.05). Most of the ATCs who give more are the key training objects and backbone. They can get more opportunities for training and promotion. They also can get better welfare. They are enthusiastic and satisfied with their work and identify with the organization. They wanted to stay in the job more and felt less burnout.

Conformance with the research results of Ji Yuqing et al. this study showed that the job burnout degree of ATCs with low ERI tension was lower than that of ATCs with high ERI tension (P<0.05). The study of Ji Yuqing et al.[17] confirmed that ERI occupational stress not only increases the risk of job burnout but also increases the risk of depression tendency.

The high level of ATC occupational stress will lead to the loss of career interest, desalination of career pursuit and doubt of the significance of career value. Job burnout affects work enthusiasm, work quality and work efficiency. The burnout ATC is prone to work errors and accidents. At the same time occupational stress has a positive predictive effect on job burnout. Air traffic control units must monitor and manage the occupational stress and job burnout of ATCs to ensure the health of employees and the safety of civil aviation.

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