Factors Influencing the Psychological Stress Perception of Police Officers: The Case of Tianjin City

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Abstract: To investigate the factors influencing the psychological stress perceptions of police personnel, a cross-sectional study was conducted in August 2021 on 133 auxiliary police officers and 178 civilian police officers in 14 grassroots police stations in Tianjin using the Demographic Variables Questionnaire, Social Support Scale, Relative Deprivation Scale, Negative Coping Scale, Emotional Exhaustion Scale, and Psychological Stress Perception Scale to analyze the current situation of their psychological stress perceptions and their influencing factors, using random forest analysis to rank the importance of independent variables that may affect the psychological stress perceptions of police officers, and selected variables to be included in a multiple linear regression model to analyze the magnitude of the effects of different independent variables on psychological stress perceptions. The final random forest and multiple linear regression analysis results showed that the six independent variables of relative deprivation, negative coping style, emotional exhaustion, gender, social support, and job position were the relevant factors affecting the psychological stress perception scores of police officers, indicating that the three stressors of work, society, and individual and the coping style mediating system jointly influenced the psychological stress perception of police officers.

Keywords: Police officers; Psychological stress perception; Random forest; Multiple linear regression

1. Introduction

The sense of psychological stress among police officers refers to the process by which an individual's work behavior is threatened by a stressor for a long period of time in a work environment, resulting in a series of physiological, psychological and behavioral responses, which are also influenced by individual characteristics and coping styles [1]. Research shows that the psychological stressors of police officers are mainly divided into work stressors, life stressors, and individual stressors [2].

Job stressors refer to the nature of work such as overload and dangerous work of police officers [3] which makes police officers' psycho-emotional energy severely depleted [4]. Life stressors refer to the family situation of police officers that plagues the hearts of police officers, and the conflicts that arise can easily lead to an imbalance in the mindset of civilian police officers. Individual stressors refer to the fact that police officers often come into contact with the darker side of society and psychopathic and aggressive recidivists and recidivists in their work, and undertake the education and rehabilitation of them, making the psychological problems of police officers more serious.

At present, the research on the psychological stressors of police officers in China is mainly qualitative, and there are few quantitative studies on the psychological stressors and the mediating systems of coping styles, i.e., the influence of different psychological stressors and the mediating systems of coping styles on psychological stress perceptions [2], and there are no studies to rank the importance of related influencing factors. Random Forest is a machine learning algorithm that can be combined with traditional linear algorithms to more efficiently process large-scale complex irregular data and more accurately assess the risk factors of psychological stress perceptions of police officers [5].

2. Subjects and Methods

2.1. Survey Subjects

The study used a randomized whole-group sampling method to conduct a questionnaire survey of 133 auxiliary police officers and 178 civilian police officers in 14 grassroots police stations in Tianjin in

August 2021. The questionnaires were filled out online on the basis of a web-based mobile application, and the original data were collected by the system backend after the police officers filled out the questionnaires completely. The total number of survey subjects is 311 cases, 298 valid surveys, the effective rate of 95.82%.

2.2. Survey Tools

2.2.1. Questionnaire on demographic variables

The survey covers twelve demographic variables including gender, age, marital status, children's status, education, years of service, rank, and civilian police positions.

2.2.2. Emotional Exhaustion Scale

The four items of the emotional exhaustion dimension of the Maslach and Jackson Job Burnout Scale were used with a Likert-6 scale score of 1=strongly disagree and 6=strongly agree, with higher total scores indicating stronger emotional exhaustion felt by the individual. In the present study, the alpha coefficient of this questionnaire was 0.918.

2.2.3. Social Support Scale

The "Social Support Determination Scale" developed by Xiao Shui Shui was used, with 10 items, including 1-5 items and 8-10 items, each of which was selected as one item, and the items 1, 2, 3, and 4 were scored as 1, 2, 3, and 4, respectively; items 6 and 7 were scored as 0 if the answer was "no source" and 0 if the answer was "the following sources". The higher the total score, the more social support for the individual has. In the present study, the alpha coefficient of the questionnaire was 0.724.

2.2.4. Relative Deprivation Scale

The Sense of Relative Deprivation Scale, developed by Ma Wei, was used with four items and scored on a Likert-6 scale, with 1=strongly disagree and 6=strongly agree, with higher total scores indicating a stronger sense of relative deprivation felt by the individual. In the present study, the alpha coefficient of this questionnaire was 0.777.

2.2.5. Negative Coping Scale

The Simple Coping Style Questionnaire, revised by Xie Yaning in the Chinese context, was used, and eight items of the negative coping dimension were selected and scored on a multilevel scale, with 0,1,2,3 points for the options of not, occasionally, sometimes, and often, respectively, with higher total scores indicating that individuals are more likely to adopt negative coping styles. In the present study, the alpha coefficient of this questionnaire was 0.755.

2.2.6. Psychological Stress Scale

The Chinese version of the Stress Perception Scale, revised by Tingzhong Yang et al. was used, with 14 items, using a 5-point scale, with a higher total score indicating a stronger sense of psychological stress felt by the individual. In the present study, the alpha coefficient of this questionnaire was 0.776.

2.3. Statistical Methods

Spyder (Python 3.9) and SPSS 23.0 were used to analyze the data, factors that may affect the sense of psychological stress were included in the random forest model, correlations between variables were analyzed based on the results of model importance ranking, and multiple linear regression was used to analyze the factors affecting the sense of psychological stress. The differences in this study were judged to be statistically significant at a two-sided $P<0.05$.

3. Results

3.1. Current state of psychological stress perception among police officers

A total of 298 police officers were included in this study, and the results of the research on the psychological stress perception of police officers showed that the mean value of psychological stress perception was 39.50. To further illustrate the current psychological stress perception of police officers, the results of the study were compared with the mean value of the scale revised by Yang, Tingzhong (2003) ($M1=24.22$, $SD1=5.81$) [6], and the results showed that the police officers Psychological stress

perception is significantly higher than M1 (t=40.395, p<0.001, Cohen's d=2.472), which shows that the current average level of psychological stress perception of police officers is relatively strong.

3.2. Random Forest

The variables in descending order of importance were relative deprivation, negative coping style, emotional exhaustion, gender, social support, job position, education level, children's status, rank, marital status, years of work, and age. Based on the importance ranking results, the top 6 variables of importance were selected for inclusion in the correlation analysis and regression prediction, namely, total score on the relative deprivation scale, total score on the negative coping style scale, total score on the emotional exhaustion scale, gender, total score on the social support scale, and work position.

3.3. Related Analysis

Pearson product difference correlation analysis was conducted between psychological stress perception and other variables. The results are shown in Table 1. Based on the magnitude of the correlation coefficients, it is clear that (1) there is a significant positive correlation between psychological stress perception and relative deprivation, negative coping style, and emotional exhaustion. (2) There was a significant negative correlation between psychological stress perception and social support, gender, and job position.

Table 1: Correlation analysis between psychological stress perception and other variables

Variables	Psychological Stress	Variables	Psychological Stress
Relative deprivation	0.655**	Social Support	-0.573**
Negative response	0.482**	Gender	-0.227**
Emotional exhaustion	0.837**	Job position	-0.367**

3.4. Multiple linear regression analysis

Based on the results of random forest analysis, the 2 categorical variables of gender (1=male, 2=female), job position (1=case position, 2=community position, 3=patrol position, 4=internal duty position, 5=clerical position, 6=duty position, 7=other position) were coded and assigned into the independent variables, and the scores of relative deprivation, emotional depletion, social support, and negative coping style scales were included as The continuous variables were included in the independent variables, and the scores on the psychological stress scale were used as the dependent variables to conduct multiple linear regressions on the influencing factors. The results were as following：

(1) Heteroskedasticity autocorrelation analysis: the results showed that there was no heteroskedasticity (p>0.05) for gender, civilian police position, social support, relative deprivation, and emotional exhaustion, and marginal heteroskedasticity (p=0.045) for negative coping, which required further autocorrelation analysis. The results showed that Durbin-Watson=2.061 and there was no autocorrelation.

(2) Multicollinearity test: the results showed that the VIF of the six variables of social support, relative deprivation, negative coping style, emotional depletion, job position, and gender were <2, indicating that there was no multicollinearity among the variables, implying that the results of this operation were accurate and reliable.

(3) Model fit analysis: The fit of the multiple linear regression model R^2=0.871, standard deviation=2.35, which means that the independent variables can explain 87.1% of the variation of the dependent variable, i.e., 87.1% of the dependent variable "psychological stress" is affected by "relative deprivation", "emotional depletion", "social support", "negative coping style", "gender", and "psychological stress". The dependent variable "perception of psychological stress" is explained by 87.1% of the variation in "relative deprivation", "emotional exhaustion", "social support", "negative coping style", "gender", "job position", and "job". " and "job position". The model fit was over 50% and the model fit was good.

(4) Significance test of independent variables: the results showed that social support, relative deprivation, negative coping style, emotional exhaustion, job position, and gender were the relevant factors affecting the psychological stress perception scores of police officers, as shown in Table 2.

Table 2: Multiple linear regression of factors influencing psychological stress perception

Variables	B	SE	β	t	p
Social Support	-0.22	0.02	-0.31	-13.55	0.00
Sense of relative deprivation	0.47	0.04	0.28	10.92	0.00
Negative response	0.09	0.03	0.06	2.64	0.01
Emotional exhaustion	0.61	0.03	0.51	17.96	0.00
Jobs	-0.73	0.08	-0.21	-8.72	0.00
Gender	1.29	0.35	0.09	3.72	0.00

4. Discussion

Random Forest is an emerging machine learning algorithm with the advantages of noise resistance, prevention of overfitting, independence from co-linearity and the ability to handle nonlinear data [7]. The results of this study indicate that the overall intensity of psychological stress perceptions among police officers is high, which is consistent with the results of previous studies[8]. The random forest analysis in this study showed that the top 6 variables in terms of importance were relative deprivation, negative coping style, emotional exhaustion, gender, social support, and job position, in that order. The results of this study showed that psychological stress was significantly and positively correlated with relative deprivation, negative coping style, and emotional exhaustion, which is consistent with the results of previous studies [9-10]; psychological stress was significantly and negatively correlated with social support, gender, and civilian police position. The significant negative correlation between psychological stress and gender indicates that the level of psychological stress is higher in males than in females; the significant negative correlation between psychological stress and civilian police positions indicates that the psychological stress is higher in case, community and patrol positions than in house, civilian and duty positions, which is consistent with the results of previous studies [11].

Meanwhile, the multiple linear regression analysis showed that the six independent variables of relative deprivation, negative coping style, emotional exhaustion, gender, social support, and job position were the relevant factors influencing the psychological stress score of police officers, and the hypothesis of this study is valid, that is, the psychological stress is generated by both the psychological stressors and the mediating system. The psychological stressors were divided into work stressors, life stressors, and individual stressors, where work stressors corresponded to the emotional exhaustion variable; life stressors corresponded to the social support variable; individual stressors corresponded to the relative deprivation variable; and the mediating system corresponded to the negative coping style variable. This is consistent with the results of the current study[12]. The different psychological stressors of work, society, and individuals as well as the mediating system of coping styles jointly affect the psychological stress perception of police officers, and the staff of the Public Security Psychological Center needs to promptly organize the specific problems encountered in the three stressors and provide feedback to their superiors, formulate corresponding policies, and develop appropriate intervention methods from the perspective of psychological theories to reduce the tendency of police officers to adopt negative coping styles and to master more positive coping styles in order to reduce psychological stressors. To reduce the adverse effects of emotional experience caused by psychological stressors.

The present study still has shortcomings and limitations in terms of research subjects, and research contents, and further research is needed to improve them. In terms of the study population, this study only examined police officers in a single municipality, and it is necessary to further investigate the psychological stress conditions of police officers in different cities to increase the interpretability and expandability of the results. In terms of research content, this study only selected three types of symptoms corresponding to psychological stressors, and lacked the examination of the effects of other symptoms generated by stressors, and also lacked the examination of police officers' physical illnesses on their psychological stress feelings.

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