

# Effects of effort-reward imbalance, job satisfaction, and work engagement on self-rated health among healthcare workers

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## Research

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# Abstract

**Background:** Healthcare workers, whose job is to protect and improve the health of populations, are critical to the success of health systems and to achieving national and global health goals. To respond effectively to the health needs of populations, healthcare workers themselves must be in a perfect state of health. However, healthcare workers face various psychosocial pressures, including night shifts, long working hours, demands of patient care, medical disputes, workplace violence, and emotional distress due to poor interactions with patients and colleagues and poor promotion prospects. Constant exposure to these psychosocial hazards adversely impacts healthcare workers' health. This study aimed to examine the influence of effort-reward imbalance, job satisfaction, and work engagement on self-rated health among healthcare workers, which is conducive to providing policy guidance from several aspects as possible as to improve healthcare workers' health.

**Methods :** The Chinese Sixth National Health and Services Survey in Sichuan Province was conducted from August 2018 to October 2018, and we analysed 1327 valid responses. We used structural equation modelling (SEM) to test the hypothesized relationship among the variables.

**Results:** Only 40.1% of healthcare workers rated their health as 'relatively good' or 'good'. Effort-reward imbalance had a significant negative correlation with self-rated health ( $\beta=-0.053$ , 95%CI: (-0.163) - (-0.001)). The relationships of effort-reward imbalance and work engagement with self-rated health were both mediated by job satisfaction (95%CI: (-0.150) -(-0.050), (0.011) -(0.022)). Work engagement mediated the relationship between effort-reward imbalance and self-rated health (95%CI: (-0.064) - (-0.008)).

**Conclusion:** In order to improve the health of healthcare workers, administrators should balance effort and reward and provide opportunities for career development and training for healthcare workers. In addition, health managers should help healthcare workers realize the significance and value of work and help keep them actively devoted to their work through incentive mechanisms.

## Background

Healthcare workers, whose job is to protect and improve the health of populations, are critical to the success of health systems and to achieving national and global health goals [1]. Poor health among healthcare workers could affect the quality of care they provide. A previous study found that depression might affect healthcare workers' decision making at work and relationships with colleagues and patients [2]. Likewise, poor health among healthcare workers was found to increase turnover, which not only led to workforce shortage but also a decline in human resource quality [3, 4]. To respond effectively to the health needs of populations, healthcare workers themselves must be in a perfect state of health.

However, healthcare workers face various psychosocial pressures, including night shifts, long working hours, demands of patient care, medical disputes, workplace violence, and emotional distress due to poor interactions with patients and colleagues and poor promotion prospects [5]. Constant exposure to these

psychosocial hazards adversely impacts healthcare workers' health. Healthcare workers have been found to have higher rates of suicide, burnout, minor mental disorders, hypertension, hyperlipidaemia, and asthma than other population groups [6-9]. UK data showed that healthcare workers' sickness rates were four times higher than those seen in other sectors [10].

Effort-reward imbalance is an important factor causing the decline in the health status of healthcare workers [11, 12]. Siegrist proposed the effort-reward imbalance model (ERI) to explain this association. This model focuses on the reciprocity of extrinsic and intrinsic effort with reward [13], which consists of two core indicators: effort-reward ratio (ERR) and overcommitment (a personality characteristic). According to Siegrist et al., an imbalance between effort and reward ( $ERR > 1$ ) may lead to a state of 'active distress' by evoking strong negative emotions [14]. This model also proposes that this process will be reinforced by overcommitment, such that highly overcommitted employees will respond with more strain reactions to an effort-reward imbalance compared to less overcommitted employees. Previous studies found that ERR and overcommitment were significantly associated with adverse health among healthcare workers in Gambia, Japan, and China [11, 12, 15, 16]. Likewise, empirical studies found that ERR and overcommitment significantly predicted other negative outcomes, such as lower job satisfaction and lower work engagement [15, 17, 18].

Job satisfaction can be defined as a subjective feeling of how well one's needs are being met by their job, or as 'the extent to which people like their jobs'[19]. Numerous studies found that as workers' job satisfaction decreased, their health problems increased. Job satisfaction had significant negative correlations with headaches and gastro-intestinal problems in Malaysian working women [20]. A study among nurses in China also reported that higher levels of job satisfaction are protective against developing anxiety symptoms [21]. Meanwhile, some scholars focused on the mediating effect of job satisfaction on self-rated health; for example, Shimizu's study identified that job stress among Japanese full-time occupational physicians contributed negatively to self-rated health indirectly through job satisfaction [22].

Work engagement is defined as a positive, fulfilling, work-related state of mind characterized by vigour, dedication, and absorption [23]. Work engagement was usually found to be negatively associated with health problems; for example, the studies of Hakanen et al. (2012) and Shu et al. (2018) found that work engagement had a negative effect on depressive symptoms. Meanwhile, Shu et al.'s study found that the relationship between job stress and depressive symptoms was partly mediated by work engagement. Work engagement has been shown to impact workers' personal outcomes, such as job satisfaction [24]. Nurses with high levels of work engagement showed high levels of job satisfaction in Belgian hospitals [25]. A study among employees of a petrochemical enterprise in China suggested that interventions for improving job satisfaction may be enhanced by improving work engagement [26].

Healthcare workers' health is critical to patients' health and even the general population's health. Although there have been several studies on the health of healthcare workers, they have only explored the health impacts of one or two aspects, such as socio-demographic characteristics, work characteristics, effort-

reward imbalance, job satisfaction, or work engagement. Few studies have combined these components to explore how they collectively affect the health of healthcare workers, and it is unknown how changes in the mechanisms underlying the relationships between effort-reward imbalance, job satisfaction, and work engagement affect healthcare workers' health. Based on the above theoretical analysis and empirical evidence, we tried to link the relationships among effort-reward imbalance, job satisfaction, work engagement and self-rated health. All theoretical hypotheses about structural equation models are shown in Table 1. This study aimed to examine the influence of effort-reward imbalance, job satisfaction, and work engagement on self-rated health among healthcare workers, which is conducive to providing policy guidance from several aspects as possible as to improve healthcare workers' health.

**Table 1** Theoretical hypotheses

## Methods

### Study design and study population

The Chinese Sixth National Health and Services Survey (NHSS) in Sichuan Province was conducted from August 2018 to October 2018. All healthcare workers who had a practicing qualified certificate on file in third-class comprehensive hospitals, second-class hospitals, community health service centres, and township hospitals of Sichuan Province were eligible to be study subjects. Multistage stratified random sampling was used to acquire the study sample. In the first stage, 14 cities were randomly selected from among 21 prefecture-level cities, and 70 towns and streets were randomly selected from the 14 cities. In the second stage, all third-class comprehensive hospitals and some of the second-class hospitals were selected from the 14 cities, and all the community health service centres and township hospitals in the 70 towns and streets were enrolled in this survey. In the third stage, 20 physicians and 10 nurses were selected from each third-class comprehensive and second-class hospital by a simple random sampling method. Five physicians, three nurses, and two public health professionals were randomly selected from each community health service centre and township hospital. Respondents were asked to fill out the questionnaire anonymously. Informed consent was obtained from each healthcare worker following a detailed explanation about the purpose of the study. Overall, 1685 healthcare workers were investigated; we obtained and analysed 1327 (78.80%) valid responses.

### Measures

The questionnaire was designed by an expert panel from the National Health Commission of the People's Republic of China.

#### *Socio-demographic characteristics of healthcare workers*

The socio-demographic characteristics examined included: gender, age (<30, 30–39, 40–49, and ≥ 50 years), marital status (single, divorced, widowed, or married), education level (junior college or below,

bachelor, master, or above), specialty (physician, nurse, and public health professional), technical title (no title, primary title, middle title, vice-senior title or above), working years (<5, 5–9, 10–19, 20–29, and ≥30 years), weekly hours at work (≤40h, >40h), night shifts per month (none, 1–7, and ≥8), grade of medical institutions (community health service centres and township hospitals, second-class hospitals, and above).

### *Effort-reward imbalance*

The ERI scale includes three dimensions: extrinsic effort (3 items), reward (7 items) and overcommitment (6 items). The responses to all the items were scored on a four-point Likert scale (1=strongly disagree, 4=strongly agree). To assess the degree of imbalance between high cost and low gain at work, effort-reward ratio (ERR) was calculated as:  $E/(R \cdot C)$ . E was the total score of the effort dimension, R was the total score of the reward dimension, and C was the correction coefficient based on the difference in the number of numerators and denominators [27]. Here,  $C=3/7=0.4286$ . An ERR value of >1.0 indicates that the amount of effort is not rewarded adequately [19]. Higher scores represented higher overcommitment to work. The Cronbach's alpha coefficient of this scale in this study was 0.786.

### *Job Satisfaction*

### *Work Engagement*

Work engagement was measured by the Chinese version of the Utrecht Work Engagement Scale [28]. It comprised seventeen items measuring three aspects of work engagement: work vigour (6 items), work dedication (5 items), and work absorption (6 items). Responses were given on a seven-point Likert scale ranging from 0 (never) to 6 (every day) and were combined into summary scores. Higher scores indicated higher work engagement. The Cronbach's alpha coefficient of this scale in this study was 0.941.

### **Outcome variable**

Self-rated health status was assigned scores of 5(good), 4(relatively good), 3(fair), 2(relatively poor), and 1(poor) by asking the participants 'How do you feel about your health?' Higher scores indicated better self-rated health.

### **Statistical Analysis**

We first used descriptive statistics to examine the socio-demographic characteristics, ERR, overcommitment, job satisfaction, work engagement, and self-rated health among healthcare workers. Second, Pearson's correlation coefficient was used to analyse the correlations among ERR, overcommitment, work engagement, job satisfaction, and self-rated health. Third, a structural equation model (SEM) was employed to further test the hypothesized relationships among effort-reward imbalance, job satisfaction, work engagement, and self-rated health among healthcare workers.

Several indicators were used to assess the fit between the current data and the hypothesized model, namely goodness of fit index (GFI) >0.9, norm fit index (NFI) >0.9, relative fit index (RFI) >0.9, comparative fit index (CFI) >0.9, incremental fit index (IFI) >0.9, Tucker-Lewis Index (TLI) >0.9, which indicated that the model fit was acceptable. All statistical analyses were performed using the IBM SPSS version 23.0 (SPSS Inc., Chicago, IL, USA) and Analysis of Moment Structures (AMOS) version 22.0 (IBM, New York, NY, USA). The statistical significance was set at  $P < 0.05$ .

## Results

### *Socio-demographic characteristics of healthcare workers*

The descriptive statistics of the sample are shown in Table 2. There were 771 physicians (58.1%), 412 nurses (31.0%), and 144 public health professionals (10.9%). Most healthcare workers were female (63.8%) with a mean age of 37.0 years (standard deviation,  $SD=10.0$ ). Most were married (78.8%) and had a junior college education or below (50.3%). Overall, 51.8% of the healthcare workers' technical title was primary, 33.4% of them worked for less than 5 years, and 61.1% of them worked in second-class hospitals and above. More than half of the healthcare workers worked more than 40 hours per week (63.9%), and 44.4% of them reported working night shifts 1-7 times per week.

The mean scores of ERR and overcommitment were  $1.2 \pm 0.4$ ,  $17.0 \pm 2.7$ , respectively. Most healthcare workers had an ERR higher than 1 (64.7%). The mean scores of job satisfaction and work engagement were  $41.6 \pm 9.7$  and  $69.5 \pm 19.8$ , respectively. Job satisfaction in compensation, welfare, and training opportunities was relatively lower than the other seven aspects, with scores of  $3.5 \pm 1.5$ ,  $3.7 \pm 1.4$ ,  $3.9 \pm 1.3$  respectively. The mean score of self-rated health was  $3.4 \pm 0.9$ , and only 40.1% of healthcare workers rated their health as 'relatively good' or 'good'.

**Table 2** Sample Descriptive statistics (n = 1327)

### *Correlations of Study Variables*

Pearson correlations among the study variables are shown in Table 3. ERR was negatively correlated with work engagement, while overcommitment was positively correlated with work engagement. ERR and overcommitment were negatively correlated with job satisfaction and self-rated health. Work engagement was positively correlated with job satisfaction and self-rated health. Job satisfaction was positively correlated with self-rated health.

**Table 3** Correlation coefficients among study variables

### **Linear regression analysis of study variable**

We used self-rated health as the dependent variable and socio-demographic variables, ERR, overcommitment, job satisfaction, and work engagement as independent variables in an enter linear regression model. Table 4 shows the statistically significant variables that emerged in the analysis ( $P < 0.05$ ). The results showed that two socio-demographic factors in addition to overcommitment, job satisfaction, and work engagement were significantly correlated with self-rated health: service years and grade of medical institution. Healthcare workers with five to nine years of service ( $\beta = -0.068$ ,  $P = 0.030$ ) were less likely to report good self-rated health compared with those with less than five years of service. Healthcare workers who worked in second-class hospitals and above ( $\beta = 0.070$ ,  $P = 0.022$ ) were more likely to report good self-rated health than those who worked in community health service centres and township hospitals.

**Table 4** Linear regression of factors associated with the self-rated health

### *Test of study model*

A SEM was used to correlate the four study variables and evaluate the relationships among them. The data and the theoretical model were fitted by the generalized least squares method, and the theoretical model was corrected according to the model fitting index. With the addition of socio-demographics as covariates, the direction of the arrow among the core variables in the SEM remained unchanged, and the changes in the corresponding coefficients were not significant. Therefore, social demographics were not confounding factors. The final output model is shown in Figure 1. The overall model fitting indexes of the modified hypothesis model were GFI = 0.917, NFI = 0.930, RFI = 0.912, CFI = 0.937, IFI = 0.937, and TLI = 0.920; all met the reference value, indicating that the model fitting was acceptable.

**Figure 1** The final model and standardized model path

Bias-corrected bootstrap with 2000 replications using maximum likelihood estimation was employed for each path. The estimates for direct, indirect, and total effects with bias-corrected 95% CI (Confidence interval) are shown in Table 3. Job satisfaction was significantly positively correlated with self-rated health ( $\beta = 0.255$ , 95%CI: 0.178-0.336). Effort-reward imbalance was significantly negatively correlated with self-rated health ( $\beta = -0.053$ , 95%CI: (-0.163) -(-0.001)) and job satisfaction ( $\beta = -0.244$ , 95%CI: (-0.384) -(-0.092)). Work engagement was significantly positively correlated with self-rated health ( $\beta = 0.086$ , 95%CI: 0.013-0.159) and job satisfaction ( $\beta = 0.516$ , 95%CI: 0.448-0.586). Effort-reward imbalance was significantly negatively correlated with work engagement ( $\beta = -0.245$ , 95%CI: -0.299-(-0.153)).

Table 5 also shows the significance testing of the mediation pathways. In these analyses, mediation is statistically significant if 95% CI does not include 0. The relationships of effort-reward imbalance and work engagement with self-rated health were both mediated by job satisfaction (95%CI: (-0.150) -(-0.050), (0.011) -(-0.022)). Work engagement mediated the relationship between effort-reward imbalance and self-rated health (95%CI: (-0.064) -(-0.008)).

Table 5. Path coefficients between structural variables and significance test of every mediating pathway

## Discussion

The purpose of this study was to explore the relationships between effort-reward imbalance, job satisfaction, work engagement, and self-rated health among healthcare workers. Meanwhile, the roles of job satisfaction and work engagement in mediating the associations between effort-reward imbalance and self-rated health were also examined. To our knowledge, this is the first study to examine the relationships among these four variables within one structural model and to shed light on how effort-reward imbalance, job satisfaction, and work engagement affect self-rated health among healthcare workers.

The mean score of self-rated health was  $3.4 \pm 0.9$ , and only 40.1% of healthcare workers rated their health as 'relatively good' or 'good', which was lower than that of healthcare workers from Norway (88.1%), Germany (63.3%), Gambia (85.0%), and Brazil (65.6%) [11, 29, 30]. Also, this rate was lower than that of general populations in previous studies [31, 32], suggesting that self-rated health among the healthcare workers in this study was generally low. Possibly, medical practice is a high-stress occupation in China, as healthcare workers must see many patients daily, have heavy workloads and high work requirements, and work night shifts. Moreover, they have to face the death and pain of patients, the risk of infection, the uncertainty of treatment, conflicts with patients, and the lack of social support, which are huge challenges in their work [16]. It is well documented that prolonged exposure to stressful work environments can reduce healthcare workers' health.

In our study, healthcare workers had lower satisfaction with compensation, welfare, and training opportunities. An investigation in the Chinese Province of Hubei found that most healthcare workers were evidently less satisfied with compensation packages and training opportunities [33]. The model verified that job satisfaction directly positively influenced healthcare workers' self-rated health, as mentioned in other studies. Satuf's study suggested that high levels of satisfaction with the nature of one's work and with one's colleagues positively influenced physical and mental health [34].

Overall, 64.7% of healthcare workers had an ERR higher than 1. This result can be explained by China's national conditions and the work characteristics of the healthcare sector. In China, the existing resources of healthcare workers lag behind the needs of the large patient population [35]; this situation requires healthcare workers to expend more effort to achieve the organizational overall goals [36]. The score of overcommitment among healthcare workers was high ( $17.0 \pm 2.7$ ) here, suggesting that they might overestimate their own abilities and put more effort into completing work that is beyond their capabilities. This research showed that effort-reward imbalance negatively influenced self-rated health; correspondingly, the same results have been obtained in studies of other occupations [37, 38]. A possible reason is that healthcare workers thought they received lower rewards such as an unsatisfactory salary and low career opportunities in relation to their efforts; once they perceive failed reciprocity between efforts and rewards, they will experience emotional distress, which may cause stress-related mental and

physical impairments [36]. Additionally, strain reactions are reinforced by high overcommitment, increasing the risk of mental and physical illness [39].

This study also identified that the relationship between effort-reward imbalance and self-rated health was mediated by job satisfaction. The model showed that effort-reward imbalance directly negatively predicted job satisfaction, which was similar to previous studies conducted among township cadres and community health workers [17, 40]. Job satisfaction depends on the degree of disparity between the reward that an employee actually receives and the reward that he/she expects [18]. This study suggests that lower-than-expected psychological or economic rewards for one's efforts might cause job dissatisfaction.

In this study, scores on the dedication and absorption dimensions of work engagement were both high ( $22.1 \pm 6.1$ ,  $24.0 \pm 7.4$ ). High scores on these dimensions can be attributed to the specificity of healthcare workers' job, which requires them to stay active, fostering dedication and high absorption [41]. The results revealed that work engagement had a direct positive effect on the self-rated health of healthcare workers. Previous research confirmed that employees with higher work engagement can recognize the value and significance brought by work, devote more energy and enthusiasm to their work, and have good mental and physical health [42].

This study also showed that the relationship between work engagement and self-rated health was mediated by job satisfaction. Consistent with previous studies, work engagement directly positively influenced job satisfaction. Employees with high work engagement are more likely to be satisfied with their material, psychological, or self-actualization needs in the organization, and thus exhibit high job satisfaction [43]. Based on the above findings, it is evident that work engagement not only influences self-rated health directly but also exerts an influence on self-rated health indirectly through the mediating role of job satisfaction.

The most interesting finding of this study was that work engagement served as a mediator in the relationship between effort-reward imbalance and self-rated health. When employees experience high effort-reward imbalance, it reduces their emotional and cognitive availability, which are key to their work engagement [44, 45]. Therefore, high effort-reward imbalance may lead to poor subsequent work engagement, which will cause a decline in self-rated health.

This study also identified that healthcare workers with five to nine years of service were less likely to report good self-rated health compared with those with less than five years of service. This finding may complement previous findings that indicated that employees employed between five to nine years experienced significantly more burnout as compared to those working for less than five years [46], while burnout was negatively associated with health [47]. Healthcare workers who worked in second-class hospitals and above were more likely to report good self-rated health than those who worked in community health service centres and township hospitals. This finding was different from that of Wang et al, who found that high-grade medical institutions was a risk factor of poor health among healthcare workers [48].

The limitations of the study should be considered. First, this study used a cross-sectional design, which precludes causal conclusions from being drawn; hence, longitudinal studies are needed to examine causal relationships among variables. Second, we relied on self-report questionnaire data rather than conducting face-to-face investigations.

## Conclusions

To our knowledge, this is the first study to shed light on how effort-reward imbalance, job satisfaction, and work engagement affect self-rated health among healthcare workers. In improving healthcare workers' health, effective measures should be adopted. In this regard, administrators should promote a balance between efforts and rewards for healthcare workers. Concurrently, health managers should provide opportunities for career development and training for healthcare workers. Moreover, health managers should help healthcare workers realize the significance and value of work and help keep them actively devoted to their work through incentive mechanisms.

## Abbreviations

ERI  
effort-reward imbalance model;  
ERR  
effort-reward ratio;  
NHSS  
National Health and Services Survey;  
SEM  
structural equation model;  
GFI  
goodness of fit index;  
NFI  
norm fit index;  
RFI  
relative fit index;  
CFI  
comparative fit index;  
IFI  
incremental fit index;  
TLI  
Tucker-Lewis Index;  
AMOS  
Analysis of Moment Structures;  
SD

standard deviation;  
CI  
Confidence interval.

## **Declarations**

### **Ethics approval and consent to participate**

Our investigation was based on the sixth National Health Service Survey (NHSS), which was approved by National Health Commission of the People's Republic of China. Human rights and ethics issues were taken into consideration when the survey was designed. All included subjects voluntarily participated in our study and their information was kept completely anonymous.

### **Consent for publication**

Oral informed consent was obtained from each healthcare worker following a detailed explanation about the purpose of the study.

### **Availability of data and materials**

All data generated or analysed during this study are included in this published article and its supplementary information files.

### **Competing interests**

The authors declare that they have no competing interests.

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### **Authors' contributions**

Conceptualization: Danping Liu, Jingjing Ge; Formal analysis: Jing He, Yan Liu; Methodology: Jingjing Ge, Jing He; Writing – original draft: Jingjing Ge, Jing He; Writing – review & editing: Danping Liu, Juying Zhang, Zhanqi Duan.

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## Tables

Table 1. Theoretical hypotheses

Hypotheses
1.Effort-reward imbalance has a direct negative effect on self-rated health
2.Job satisfaction has a direct positive effect on self-rated health
3.Work engagement has a direct positive effect on self-rated health
4.Effort-reward imbalance has a direct negative effect on job satisfaction
5.Work engagement has a direct positive effect on job satisfaction
6.Effort-reward imbalance has a direct negative effect on work engagement
7.The relationship between effort-reward imbalance and self-rated health is mediated by job satisfaction
8.The relationship between work engagement and self-rated health is mediated by job satisfaction
9.The relationship between effort-reward imbalance and self-rated health is mediated by work engagement

Table 2. Sample Descriptive statistics (n = 1327)

Characteristics	N	%
Gender		
Male	481	36.2
Female	846	63.8
Age(years)		
<30	361	27.2
30-39	471	35.5
40-49	335	25.2
≥50	160	12.1
Marital status		
Single, divorced, or widowed	281	21.2
Married	1046	78.8
Education level		
Junior college or below	667	50.3
Bachelor	569	42.9
Master or above	91	6.9
Specialty		
Public health professionals	144	10.9
Nurses	412	31.0
Physicians	771	58.1
Technical title		
No title	71	5.4
Primary title	687	51.8
Middle title	376	28.3
Vice-senior title or above	193	14.5
Service years		
<5	443	33.4
5-9	388	29.2
10-19	256	19.3
20-29	171	12.9
≥30	69	5.2
Weekly hours at work		
≤40h	479	36.1
>40h	848	63.9
Night shifts per month(n)		
None	394	29.7
1-7	589	44.4
≥8	344	25.9

## Grade of medical institutions

Community health service centres and township hospitals	516	38.9
Second-class hospitals and above	811	61.1
	<b>Contents</b>	<b>Range</b> <b>mean (SD)</b>
ERR	0.2-4.0	1.2±0.4
Overcommitment	6-24	17.0±2.7
Job satisfaction	10-60	41.6±9.7
Personal satisfaction	1-6	4.2±1.3
Colleagues	1-6	4.9±1.0
Compensation	1-6	3.5±1.5
Superiors	1-6	4.8±1.2
Facility	1-6	4.1±1.3
Advancement	1-6	4.0±1.3
Management status	1-6	4.2±1.3
Welfare	1-6	3.7±1.4
Training opportunities	1-6	3.9±1.3
Opportunities to demonstrate my abilities	1-6	4.3±1.2
Work engagement	0-102	69.5±19.8
Work vigour	0-36	23.4±7.5
Work dedication	0-36	22.1±6.1
Work absorption	0-36	24.0±7.4
Self-rated health	1-5	3.4±0.9

Notes: ERR: effort/reward ratio

Table 3. Correlation coefficients among study variables

Variables	(1)	(2)	(3)	(4)	(5)
(1)ERR	1				
(2)Overcommitment	0.526**	1			
(3)Work engagement	-0.267**	0.171**	1		
(4)Job satisfaction	-0.537**	-0.156**	0.525**	1	
(5)Self-rated health	-0.306**	-0.244**	0.234**	0.314**	1

Notes: ERR: effort/reward ratio; \*\* p &lt; 0.01

Table 4. Linear regression of factors associated with the self-rated health

Factors	Unstandardized coefficients		Standardized coefficients $\beta$	t	p-value	95%CI for $\beta$
	$\beta$	SE				
Constant	3.940	0.274	-	14.372	0.001	(3.402,4.478)
Service years (ref:<5]						
5-9	-0.129	0.059	-0.068	-2.172	0.030	(-0.245,-0.012)
10-19	-0.023	0.073	-0.010	-0.310	0.757	(-0.167,0.121)
20-29	0.055	0.092	0.021	0.593	0.553	(-0.126,0.235)
$\geq 30$	0.023	0.133	0.006	0.172	0.863	(-0.239,0.285)
Second-class hospitals and above(ref: Community health service centres and township hospitals)	0.124	0.054	0.070	2.294	0.022	(0.018,0.230)
ERR	-0.113	0.080	-0.051	-1.412	0.158	(-0.270,0.044)
Overcommitment	-0.067	0.011	-0.206	-6.307	<0.001	(-0.087,-0.046)
Job satisfaction	0.013	0.003	0.145	4.261	<0.001	(0.007,0.019)
Work engagement	0.007	0.001	0.169	5.280	<0.001	(0.005,0.010)

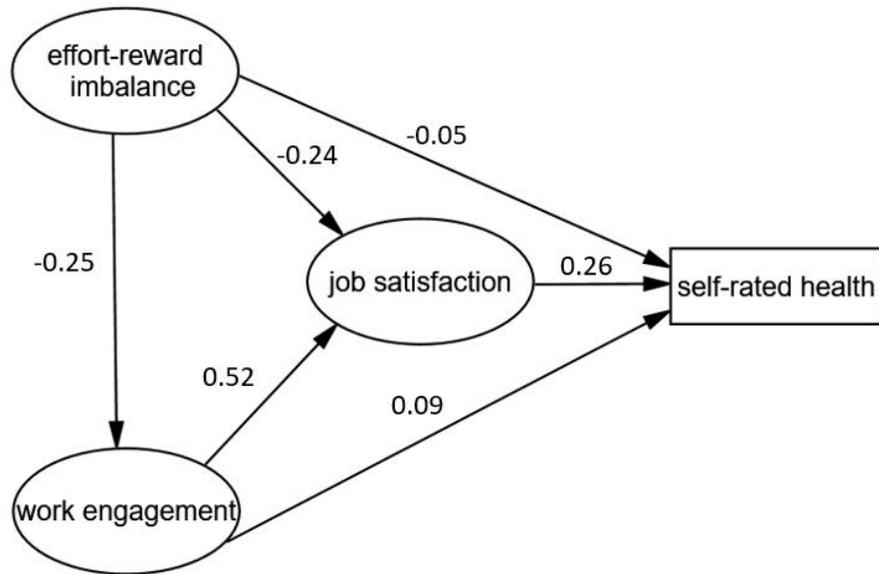
Notes: R<sup>2</sup>=0.168, F=12.135, p<0.001

**Table 5** Path coefficients between structural variables and significance test of every mediating pathway

Model pathways	Estimated	95%CI
<b>Total effects</b>		
Job satisfaction → Self-rated health	0.255	(0.178) -(0.336)
Effort-reward imbalance → Self-rated health	-0.169	(-0.276) -(0.063)
Effort-reward imbalance → Job satisfaction	-0.371	(-0.502) -(0.169)
Work engagement → Self-rated health	0.217	(0.152) -(0.283)
Work engagement → Job satisfaction	0.516	(0.448) -(0.586)
Effort-reward imbalance → Work engagement	-0.245	(-0.299) -(0.153)
<b>Direct effects</b>		
Job satisfaction → Self-rated health	0.255	(0.178) -(0.336)
Effort-reward imbalance → Self-rated health	-0.053	(-0.163) -(0.001)
Effort-reward imbalance → Job satisfaction	-0.244	(-0.384) -(0.092)
Work engagement → Self-rated health	0.086	(0.013) -(0.159)
Work engagement → Job satisfaction	0.516	(0.448) -(0.586)
Effort-reward imbalance → Work engagement	-0.245	(-0.299) -(0.153)
<b>Indirect effects</b>		
Effort-reward imbalance → Self-rated health	-0.116	(-0.154) -(0.064)
Work engagement → Self-rated health	0.132	(0.087) -(0.186)
<b>Significance test of every mediating pathway</b>		
<b>Model pathways</b>	<b>95%CI</b>	
Effort-reward imbalance → Job satisfaction → Self-rated health	(-0.150) -(0.050)	
Work engagement → job satisfaction → Self-rated health	(0.011) -(0.022)	
Effort-reward imbalance → Work engagement → Self-rated health	(-0.064) -(0.008)	

Abbreviation: CI, confidence interval.

## Figures



**Figure 1**

The final model and standardized model path

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Questionnaire.pdf](#)
- [Database.sav](#)