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Original Article

Influence of Perceived Stress on the Depression of Information Technology (IT) Workers: Chain Mediating Effect of Self-Esteem and Self-Control

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Abstract

Background: Information Technology **(**IT) workers have long experienced high-intensity work pressure and overwork, thus bringing severe challenges to managing their mental health. As a key predictor of IT workers' mental health, perceived stress significantly affects their tendency to experience depression. Self-esteem and self-control are important factors that influence individuals to regulate their behaviors and emotions and cope with challenges, thereby playing a possible chain mediating role in the relationship between perceived stress and depression.

Methods: Overall, 708 IT workers in Shaanxi Province were investigated anonymously through questionnaires. The perceived stress scale, depression scale, self-esteem scale, and self-control scale were used to examine the influence of perceived stress on IT workers' depression. Subsequently, the chain mediating role of self-esteem and self-control in this relationship was tested.

Results: Perceived stress influenced IT workers' depression ($P < 0.01$). Furthermore, self-esteem and self-control played a chain mediating role in the relationship between perceived stress and IT workers' depression ($P < 0.01$). In addition, the duration of occupation in IT work influenced the depression of IT workers significantly ($P < 0.01$).

Conclusion: Accurate evaluation of the governance ability of urban public health could provide guidance and policy propositions to improve the governance system of public health.

Keywords: Perceived stress; Depression; Self-esteem; Self-control; Chain mediating effect

Introduction

In the era of information explosion and fast-changing technologies, IT workers, who constitute an important force that promotes social digitalization, are experiencing unprecedented occupational challenges and psychological pressure (1). The multidimensional psychological motivation and social impact behind the depression of IT workers, which is an increasingly prominent public health issue in the contemporary global workplace, cannot be ignored. A deep analysis from the perspective of public health management indicates that the depression of IT workers

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is not only a reflection of individual mental health disequilibrium but also a critical link that needs to be urgently solved in the whole workplace health ecosystem (2). The IT workers who are subjected to high-pressure working environments and high-intensity brainwork for a long time generally undergo physical and mental exhaustion with depressive emotions quietly eroding their mental health defense line like an undercurrent (3). However, the fast-working rhythm, the constant pressure of technological updating, and the blurred boundary between work and life constitute the important background of IT workers' depression (4).

The term "perceived stress" was first put forward by Cohen et al. in 1983. Cohen believed that perceived stress refers to the psychological reaction of individuals after analyzing and evaluating stress events (5). The theory of perceived stress provides a basis for understanding workplace stress and carves the path for the professional and systematic study on perceived stress (6). Perceived stress is a subjective feeling. If perceived by IT workers, high-intensity work pressure is often accompanied by the enhancement of job burnout and the decrease of self-efficacy. Under the combined action of these psychological changes, depression symptoms may be triggered or aggravated (7). IT workers who have been under high pressure for a long time are prone to decreased self-worth, the degradation of social skills, and uncertainty about the future. These psychological problems tend to cause or aggravate symptoms of depression (8). Based on the above analysis, the first research hypothesis H1 was put forward: Perceived stress has an evidently positive effect on IT workers' depression, that is, a high degree of perceived stress entails a high degree of depression.

The theory of self-esteem was first put forward by William James, the founder of functionalism psychology, in 1890. Self-esteem refers to the individual evaluation and experience of self-worth and self-ability and is a core component of the self-system. High self-esteem helps individuals to manage mental health better and be less prone to depression, whereas low self-esteem may lead to negative behavior and criminal behavior (9). When faced with continuous work pressure, IT workers may have doubts about their abilities, thus leading to a decline in self-esteem. This sense of frustration will further weaken their self-esteem especially when their actual performance fails to meet their own expectations (10). Therefore, self-esteem may play an important mediating role between stress and depression. IT workers with low self-esteem are likely to fall into negative emotions amid work pressure, which can then develop into depression. By contrast, individuals with high self-esteem are likely to adopt positive coping strategies when facing challenges, thus reducing the risk of depression (11, 12). Therefore, the second hypothesis H2 was proposed: Self-esteem plays a mediating role in the influence of perceived stress on IT workers' depression.

The positive role of self-control has been fully proven in psychological research. Self-control is an ability-transcending instinct. Self-control can enable individuals to suppress or change their instinctive reactions through conscious efforts and prevent the results from being contrary to the desired behavior to support their pursuit of long-term goals (13, 14). As proven by a large number of research documents, self-control is an important ability for individuals to adjust their mentality, cognition, and emotions when facing pressure (15-17). Different IT workers have been found to be significantly different in feelings and coping styles. Conversely, IT workers with weak self-control ability are likely to fall into negative emotions when facing pressure, which will increase the risk of depression. When perceiving excessive work pressure, IT workers may feel helpless, desperate, and depressed, and these emotions further aggravate the appearance of depressive symptoms (18, 19). In turn, these symptoms can affect the workers' work performance and life quality, thus forming a vicious circle. In this process, self-control plays a key mediating role. Therefore, the third hypothesis H3 was raised: Self-control plays a mediating role in the influence of perceived stress on IT workers' depression.

The continuous or high-intensity work pressure faced by IT workers is perceived by individuals, thereby forming perceived stress. The pressure may be derived from various factors, such as the urgency of work tasks, the speed of technological upgrading, and the uncertainty of career development. When feeling stressed, individuals may have doubts about their abilities and values, which can lower their self-esteem. Self-esteem, which involves individual evaluation and feelings of self-worth, affects one's psychological state and behavioral response. When self-esteem declines, individuals may feel helpless and out of control easily in the face of pressure, thus weakening their self-control ability. Self-control refers to the ability of individuals to remain calm and rational and act in line with long-term goals in the face of temptation, impulse, or pressure. Weakened self-control may cause difficulty for individuals in effectively managing their emotions and behaviors amid stress, thus increasing the risk of depression. Depression is a serious mental health problem, which manifests as dark mood, loss of interest, decreased energy, and other symptoms. Therefore, the fourth hypothesis H4 was put forward: Self-esteem and self-control play a chain mediating role in the relationship between perceived stress and IT workers' depression.

Materials and Methods

Study objects

IT workers in Shaanxi Province, China were sampled. An anonymous survey was performed on the IT workers by using a popular questionnaire survey platform in China (www.wjx.cn) to ensure the universality and diversity of the samples. The purpose, content, and importance of this survey were clearly introduced to all invited IT workers. The confidentiality principle of the survey data was especially highlighted to dispel their misgivings and enhance their willingness to participate. These steps were made to ensure the privacy of the participants. The IT workers filled in the questionnaire anonymously after signing the informed consent online. A total of 975 questionnaires were collected, and 708 valid questionnaires were obtained after the invalid questionnaires were eliminated. The recovery efficiency was 72.62%.

Research tools

Perceived stress was measured with the questionnaire put forward by Bartholomy and Sifers (20). The questionnaire consisted of 24 test questions, which were scored by a four-point Likert scale from 1 (no stress) to 4 (very stressed). A high score entailed a deep degree of perceived stress. The final score of the scale was 24–96, and the Cronbach's α coefficient of the scale in this study was 0.842.

Depression was measured using the questionnaire of Zung (21). The scale contained 20 items, which were scored by a four-point Likert scale ranging from 1 (seldom) to 4 (most of the time). A high score indicated a deep degree of depression. The final score of the scale was 20–80, and the Cronbach's α coefficient of the scale in this study was 0.871.

Self-esteem was measured through the questionnaire proposed by Awad and Voruganti (22). This questionnaire, which was innovated from the perspective of the relationship between weight, image, and self-esteem, was adopted in this study. This research considers that IT workers are in front of computers for a long time and their self-esteem status will be directly affected by weight and image. The questionnaire was scored by a three-point Likert scale ranging from 1 (disagree) to 3 (agree very much). A high score indicated strong adaptability and high self-esteem. The final score of the scale was 12–36, and the Cronbach's α coefficient of the scale in this study was 0.826.

Self-control was measured using the questionnaire of Lindner (23). This questionnaire is a simplified version of 13 items (including nine reverse test items) after deletion. The content range of the simplified version is the same as that of the full version. Both have good internal consistency and retest reliability. The questionnaire was scored by a five-point Likert scale ranging from 1 (disagree) to 5 (agree very much). A high

score entailed strong self-control ability and a high degree of self-control. The final score of the scale was 13-65, and the Cronbach's α coefficient of the scale in this study was 0.893.

All the data in this survey were analyzed using SPSS 26.0 (IBM Corp., Armonk, NY, USA) and the Process 4.1 macro plug-in in SPSS.

Result Analysis

Descriptive statistical analysis results

The descriptive statistical results of IT workers are shown in Table 1.

Table 1: Descriptive statistical results of IT workers

Name	Option	Frequency	Percentage (%)
Gender	Female	101	14.27
	Male	607	85.73
Marital status	Married	255	36.02
	Unmarried	453	63.98
Duration of occupation in IT work	Within 1 year	159	22.46
	1–3 years	214	30.23
	3–5 years	195	27.54
	Over 5 years	140	19.77
Age	Below 25 years old	206	29.10
	25–35 years old	159	22.46
	35–45 years old	200	28.25
	Over 45 years old	143	20.20
Education background	Doctor	65	9.18
	Master	250	35.31
	Undergraduate	393	55.51
Monthly income	Below RMB 10,000	298	42.09
	RMB 10,000-20,000	191	26.98
	Over RMB 20,000	219	30.93

Table 1 shows that male IT workers accounted for a high proportion (85.73%), thus indicating that men are still the main force in the IT industry. Unmarried IT workers accounted for 63.98%, thus being in the majority, which means that the IT industry has substantially attracted young people. In addition, 22.46% had been engaged in IT work for less than one year, and 30.23% had been engaged in IT work for one to three years, thereby manifesting the coexistence of a certain proportion of novices with senior personnel, which might be helpful to maintain the vitality and innovation of this industry. Those less than 25 years old accounted for 29.10%, while those who were 25 to 35 years old accounted for 22.46%. The age distribution was relatively balanced, thus reflecting the attraction of the IT industry for young people. Meanwhile, this outcome also revealed the high degree of participation of middle-aged people in the industry. Those with undergraduate backgrounds accounted for the highest proportion (55.51%), thereby indicating that the demand of the IT industry for highly educated talents is high but undergraduates are still the main force. Those with a monthly income of less than RMB 10,000 accounted for 42.09%, thus manifesting the internal differences in income and career development opportunities within the IT industry.

Common method bias test

All items in the four scales were subjected to the common method bias test through the Harman single-factor test method. As seen in Table 2, significant correlations were found among the four variables: perceived stress, depression, self-

esteem, and self-control. The test results showed multiple factors whose eigenvalues were greater than 1. The amount of variation explained by the first factor was 23.48%, which did not reach 40%. Therefore, no serious common method bias occurred in this study (24).

Correlation analysis

Table 2: Correlation analysis results of research variables (N = 708)

	Perceived stress	Depression	Self-esteem	Self-control
Perceived stress	1.000	-	-	-
Depression	0.328**	1.000	-	-
Self-esteem	−0.149**	−0.146**	1.000	-
Self-control	−0.243**	−0.051**	0.264**	1.000

(Remark: ** means $P < 0.01$)

Linear regression analysis

Table 3 demonstrates that the adjusted R2 of the model was 0.894. In addition, the model passed the F test (F (1,706) = 5988.137, P = 0.000), thus indicating that perceived stress can influence IT workers' depression. Hence, H1 was confirmed.

Table 3: Linear regression results

Variable	Regression coefficient	T value	P value
Constant	1.214	-37.371	0.000**
Perceived stress	0.019	77.383	0.000**
Adjusted R2 = 0.894; F (1,706) = 5988.137, P = 0.000			

(Remark: ** means $P < 0.01$)

Chain mediating effect analysis

(Remark: BootLLCI refers to the lower limit of Bootstrap sampling 95% interval; BootULCI is the upper limit of Bootstrap sampling 95% interval, bootstrap type: percentile bootstrap method).

Tables 4 and 5 show that for the mediating path of "perceived stress->self-esteem->depression," the 95% interval does not include 0 (95% CI:0.044-0.147), thus indicating that this mediating path exists. Therefore, H3 holds true.

Table 4: Model test of chain mediating effect

	Perceived stress	Depression	Self-esteem	Self-control
Constant	58.507** (589.342)	66.877** (21.292)	-49.951** (-240.467)	50.505** (11.253)
Perceived stress	−0.596** (-379.117)	−0.802** (-25.034)	1.559** (474.155)	0.448** (9.122)
Self-esteem	-	0.852** (15.881)	-	−0.256** (-3.674)
Self-control	-	-	-	−0.732** (-17.445)
Adjusted R2	0.995	0.998	0.997	0.998
F value	F (1,706) = 143729.608, P = 0.000	F (2,705) =171040.857, P = 0.000	F (1,706) = 224823.096, P = 0.000	F (3,704) = 130191.131, P = 0.000

(Remark: ** means $P < 0.01$, and T values are in the brackets)

For the mediating path of "perceived stress->self-control->depression," the 95% interval did not contain 0 (95% CI:0.330-0.426), thereby manifesting that this mediating path exists. Hence, H3 is confirmed. For the mediating path of "perceived stress->self-esteem->self-control->depression," the 95% interval did not contain 0 (95% CI:0.207-0.275), thus indicating that this mediating path exists. Hence, H4 is verified.

Table 5: Mediating effect analysis

Item	Effect	Boot SE	BootLLCI	BootULCI	z	P
Perceived stress->self-esteem->depression	0.152	0.026	0.044	0.147	5.788	0.000
Perceived stress->self-control->depression	0.587	0.024	0.330	0.426	24.144	0.000
Perceived stress->self-esteem->self-control->depression	0.372	0.017	0.207	0.275	21.627	0.000

Difference analysis

Table 6 demonstrates that all samples with various durations of occupation in IT work were significantly different in the aspect of depression ($P < 0.01$), thus demonstrating their diverse influences on IT workers' depression.

Table 6: Difference analysis results

Duration of occupation in IT work	Depression (mean ± standard deviation)
Within 1 year	45.24 ± 15.82
1–3 years	50.90 ± 14.64
3–5 years	43.82 ± 16.10
Over 5 years	48.96 ± 15.15
F value	8.696
P value	0.000**

(Remark: ** means $P < 0.01$, and *T* values are in the brackets)

Discussions

Perceived perception has a positive effect on IT workers' depression

IT workers undergo multiple pressure sources, such as high-intensity work pressure, competitive pressure, and technology update pressure, which will not only affect their physical health but also have a serious impact on their mental health. Related studies have shown a significantly negative correlation between perceived stress and mental health (25, 26), that is, high perceived stress indicates decreased mental health levels. Long-term perceived stress may lead to psychological problems, such as anxiety and depression, among IT workers (27). Meanwhile, according to the theory of perceived stress interaction, IT workers will make a primary evaluation and a secondary evaluation of potential pressure sources under a stressful situation (28). These cognitive evaluation processes will affect IT workers' perception of pressure sources and their coping styles (29).

Self-esteem plays a mediating role in the influence of perceived stress on IT workers' depression

Under high-stress situations, the self-esteem level of IT workers will decline, which will increase the risk of depression (30, 31). The decline in self-esteem can increase negative self-evaluation,

which will trigger depressive symptoms. However, IT workers with high self-esteem can use emotional adjustment strategies, such as cognitive reappraisal and expression inhibition, effectively under pressure and reduce the impact of depression by changing their views and attitudes toward stressful events (32).

Self-control plays a mediating role in the influence of perceived stress on IT workers' depression

When IT workers face high-intensity work pressure, their self-control ability may be weakened. Stress will reduce the cognitive resources of individuals, thus causing difficulty for them to control their behaviors, emotions, and desires effectively. Additionally, long-term stress may also damage an individual's self-regulation system, thus further reducing one's self-control ability (33). The decline in self-control ability will increase the risk of depression symptoms among IT workers. On the one hand, the lack of self-control ability may lead to the lack of coping strategies amid challenges and difficulties, thus increasing frustration and helplessness; on the other hand, the decline in self-control ability may also affect an individual's emotional adjustment ability so that they are likely to fall into negative emotions (34).

Self-esteem and self-control play a chain mediating role in the relationship between perceived stress and IT workers' depression

In the influence of perceived stress on IT workers' depression, self-esteem and self-control jointly play a key role as chain mediating variables. Perceived stress first affects the level of individual self-esteem, thus leading to a decline in self-esteem (35). This decline further affects the self-control ability of individuals, thus making them likely to lose control under pressure. Weakened self-control ability eventually increases the risk of depression because individuals lack sufficient coping strategies and emotional adjustment ability when facing difficulties (36). This chain mediating effect reveals the complex psychological mechanism between perceived stress and depression; moreover, it emphasizes the important role of self-esteem and self-control (37).

A significant difference exists in the influence of duration of occupation in IT work on IT workers' depression

The depression score of the subjects occupied in IT work for one to three years was the highest (50.90 ± 14.64), while that of the subjects engaged in IT work for three to five years was relatively low (43.82 ± 16.10). This outcome possibly means that in the initial stage of IT work (especially one to three years), individuals may face intense work pressure, career uncertainty, or life pressure, thus leading to relatively high depression scores. With the accumulation of work experience (three to five years), individuals may have gradually adapted to the working environment and established stable work and social relations, thus contributing to the decline in their depression scores. However, the scores of the subjects engaged in IT work for over five years rose again (48.96 ± 15.15), which might reflect the influence of long-term work pressure, job burnout, or life pressure on mental health. This conclusion can encourage IT workers to maintain healthy lifestyles, including reasonable diets, moderate sports, and sufficient sleep, to maintain their mental health.

Conclusion

Depression among IT workers not only poses a serious threat to their career and mental health but also brings substantial troubles to families and society. Therefore, this important issue in public health management in various countries cannot be ignored. In this study, an anonymous survey was performed on 708 IT workers in Shaanxi Province using perceived stress, depression, self-esteem, and self-control scales. The influence of perceived stress on IT workers' depression was tested. Then, the chain mediating role played by self-esteem and self-control in this relationship was deeply explored. The empirical results reveal that IT workers' depression is sig-

nificantly positively affected by perceived stress. Self-esteem and self-control not only play mediating roles in the influence of perceived stress on IT workers' depression but also exert a chain mediating effect between perceived stress and IT workers' depression.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of Interest

The authors declare that there is no conflict of interests.

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