

Research on the Relationship between Mental Toughness and Job Performance of Front-line Employees in Chinese Manufacturing Enterprises under Covid-19

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Abstract. The relationship between employee psychological resilience and job performance has been one of the key concerns of scholars and entrepreneurs. The outbreak of Covid-19 has affected psychological toughness and job performance within frontline employees. However, existing research has focused on the connection between mental toughness and job performance among healthcare workers and has not been extended to the relationship between psychological capital dimensions and job performance among frontline employees in manufacturing firms at a specific time. In this paper, data will be collected from 219 frontline employees in manufacturing companies using the Mental Toughness Scale and the Job Performance Scale to explore the association between mental toughness and job performance among frontline employees in the Covid-19 epidemic. The findings revealed that mental toughness was significantly and positively related to job performance, with mental toughness explaining 62.3% of job performance. Frontline workers aged 36 and over have higher mental toughness. Improving psychological resilience can improve one's performance and developing appropriate strategies to improve the psychological resilience of frontline employees can help optimize work efficiency and achieve high quality production.

Keywords: Frontline staff; Mental toughness; Job performance.

1. Introduction

With the rise of national economies and technological advances, global competition is intensifying, and companies are facing new and unprecedented challenges. In order to keep pace with the times and stand firm in the ever-changing world market, business performance is particularly important. The performance of employees directly affects the performance of a company, but staff members are under great physical and psychological stress in order to complete their work tasks and improve their performance [1-3]. Specifically, with the outbreak of Covid-19, negative emotions such as anxiety and depression among employees in five countries, including China, have become more serious [4]. Therefore, it has become the goal of managers to improve and enhance the psychological state of their employees so that they can work in a positive and healthy environment and at the same time continuously improve their performance.

Mental toughness is the ability to resist different negative factors (e.g. trauma, health problems) and to cope with all of them [5]. Toughness, a protective barrier against stress and depression, plays an irreplaceable role in helping employees adapt and cope with the coronavirus pandemic. [6]. the continuation of Covid-19, the psychological toughness of the general population declined significantly relative to the non-outbreak period in 2018 [7]. Mental toughness can, to some extent, regulate the psychological situation of frontline employees and organize their departure from their jobs [8].

For China, the impact of resilience on the work performance of frontline employees during the COVID-19 pandemic has not been studied. Therefore, this study aims to explore the relationship between psychological toughness and job performance based on the descriptive characteristics of front-line employees. This paper adopts descriptive analysis and empirical research methods to establish a research model with psychological resilience as an independent variable and job performance and its two dimensions (task performance and peripheral performance) as dependent variables, seeking answers to the following questions:

What are the levels of job performance and psychological toughness among front-line workers in manufacturing? In terms of descriptive characteristics, are there any appreciable variations between the frontline manufacturing employees' mean scores on the Psychological Resilience Scale and the Job Performance Scale? Is there a correlation between resilience and job performance of frontline manufacturing workers?

2. Design and methodology

2.1 Data sources

The data for this descriptive and correlation study was collected from selected companies in Zouping, Shandong Province, China by means of an online questionnaire between April 2022 and May 2022. The selected companies all belong to the aluminum processing industry and are strongly supported by the local government. Company A mainly produces aluminum doors and windows and sunrooms and belongs to the largest aluminum doors and windows and sunrooms processing base in Shandong, China; Company B is mainly engaged in the manufacture and processing of aluminum panels and is a subsidiary of a global Fortune 500 company; Company C is mainly responsible for servicing companies A and B. The sample was selected by simple sampling method with 219 frontline employees, since gathering data from a population via the simple sample approach is the simplest, quickest, and most affordable option available [9]. With the rise of the old and new dynamics in recent years, aluminum-related enterprises have the characteristics of high profit generation, high proportion of frontline employees and high profitability of human capital in terms of business management. The analysis of the questionnaire shows that the frontline employees of these enterprises meet the needs of performance research and mental toughness research in work scenarios and have certain representativeness and typicality.

2.2 Data collection tools

Firstly, the number of employees selected was determined based on the total number of employees and different positions in each company, based on the employee lists provided by the HR departments of the three companies. The initial survey found that 130 employees from company A, 179 employees from company B and 20 employees from company C met the eligibility criteria for the survey. Secondly, employees used the Employee Questionnaire to answer a number of questions about mental toughness (this section was largely modified from the Luthans questionnaire) and job performance levels [10]. The research objectives, requirements and confidentiality commitments of the questionnaire will be explained prior to its release. Finally, the questionnaire was distributed via an online questionnaire app and was valid for 3 days, after which it was discontinued.

2.2.1 Descriptive information sheet

This section consisted of four items asking participants about their gender, age, marital status, and whether they were enthusiastic about doing their job [11-13].

2.2.2 psychological toughness

In this study, the Luthans Self-assessment of psychological Capital (Luthans Self-assessment of psychological Capital) questionnaire was used in measuring the psychological resilience variable [10]. The resilience questionnaire consisted of six questions and was measured on a Lickett scale of 1 to 6. Scores of 1 to 6 indicated strongly disagree, disagree, more or less disagree, more or less agree, agree and strongly agree respectively.

2.2.3 Job performance questionnaire

The Job Performance Questionnaire consists of 15 questions, most of which are from studies on the connection between self-efficacy, work performance, and perceptions of organization commitment. The questionnaire is divided into two parts, Task Performance (7 questions) and

Peripheral Performance (8 questions), both using a Likert scale of 1-5, with 1 to 5 indicating "strongly disagree, somewhat disagree, average, somewhat agree and strongly agree" respectively.

2.3 Statistical analysis

In the process of data analysis, this questionnaire mainly used spss26 as the statistical analysis software, through the survey of front-line employees to start with, descriptive analysis of 219 samples, generally grasp the basic distribution of the sample. Among the main information about the employees were: gender, age, marital status and whether they were enthusiastic about getting the job done.

3. Analysis of sample data results

3.1 Analysis of descriptive characteristics of frontline employees

The basic information on the demographic characteristics of the test sample was obtained through the questionnaire and is shown in Table 3-1 below. 135 of the 219 valid samples were male, accounting for 61.64% of the total, and 84 were female, accounting for 38.36% of the total; according to the differences in relationship status, the most people were married, accounting for 73.80% of the total, and there were no divorced people; as can be seen from the differences in age groups, those aged 35 The largest number of people were below the age of 35, 162 people accounting for 73.97% of the total, while the smallest number of people were above the age of 36, 57 people, accounting for 26.03% of the total; 72.15% of people considered that they maintained their enthusiasm at work.

Table 1. Demographic characteristics of the sample tests (N:219)

Demographic variables	category	The percentage
gender	Male	61.64%
	Female	38.36%
Relationship status	single	26.20%
	married	73.80%
	divorced	0.00%
Age	≤35	73.97%
	≥36	26.03%
Work enthusiasm	Yes	72.15%
	No	27.85%

Data source: Results of a questionnaire survey on the memory of selected front-line Chinese manufacturing employees

3.2 Psychological toughness

The measure of mental toughness of frontline employees in manufacturing companies oscillated between 4.88 and 5.40, with a mean value of 5.23, showing that all participants exhibited high levels of mental toughness. For each item on the scale, participants' minimum and maximum values were 1 and 6, respectively. The Cronbach's $\alpha = 0.968$ was obtained by calculation; greater than 0.8, so this is valid data.

Table 2. Descriptive statistics and reliability values of the Mental Toughness Scale

Items of the Toughness Scale	Mean ($\bar{x}$)	Standard deviation ($\pm$)	Minimum	Maximum	Skewness	Kurtosis
<i>T1</i>	5.40	0.905	1	6	-2.222	6.778
<i>T2</i>	5.38	0.856	3	6	-1.226	0.550
<i>T3</i>	5.30	0.873	3	6	-1.254	0.945
<i>T4</i>	5.14	1.027	1	6	-1.509	2.935
<i>T5</i>	5.34	0.956	2	6	-1.401	1.291
<i>T6</i>	4.88	1.149	2	6	-0.581	-0.922
<i>overall</i>	5.230	0.814	2.667	6.000	-1.077	0.543

 α Coefficients of the subscale=0.921

Note: 1.00–2.16: very low; 2.17–3.12: low; 3.13–4.08: moderate; 4.09–5.04: high; 5.05–6.00: very high. $\bar{x}$: arithmetic mean; $\pm$: standard deviation.

3.3 Job performance

The measures of job performance of frontline employees in manufacturing companies oscillated between 4.32 and 4.74, with a mean value of 4.55, indicating that participants all had high levels of job performance. For each item on the scale, the participants' maximum and minimum values were 5 and 1, respectively. The Cronbach's $\alpha = 0.857$ was obtained by calculation; greater than 0.8, based on the reliability coefficient standard proposed by scholar Wu (2003), this is valid data, Cronbach's α of task performance and contextual performance are more significant than 0.5, the data obtained from this questionnaire is valid [14].

Table 3. Descriptive statistics and reliability values of the Job Performance Scale

Items of the job performance Scale	Mean ($\bar{x}$)	Standard deviation ($\pm$)	Minimum	Maximum	Skewness	Kurtosis
<i>TP1</i>	4.55	0.724	2	5	-1.706	2.674
<i>TP2</i>	4.45	0.685	3	5	-0.863	-0.453
<i>TP3</i>	4.58	0.662	2	5	-1.573	2.292
<i>TP4</i>	4.71	0.653	1	5	-3.224	13.391
<i>TP5</i>	4.67	0.724	1	5	-2.699	8.446
<i>TP6</i>	4.71	0.609	3	5	-1.967	2.539
<i>TP7</i>	4.36	0.671	3	5	-0.564	-0.714
<i>overall TP</i>	4.58	0.544	2.714	5	-1.634	2.365
<i>CP1</i>	4.71	0.586	2	5	-2.327	5.988
<i>CP2</i>	4.34	0.866	1	5	-1.625	2.897
<i>CP3</i>	4.32	0.793	2	5	-0.960	0.260
<i>CP4</i>	4.32	0.793	2	5	-0.793	-0.438
<i>CP5</i>	4.59	0.594	2	5	-1.540	3.265
<i>CP6</i>	4.63	0.632	2	5	-1.823	3.421
<i>CP7</i>	4.74	0.498	3	5	-1.751	3.244
<i>CP8</i>	4.55	0.705	1	5	-2.196	7.267
<i>overall CP</i>	4.524	0.516	2.875	5	-1.102	0.676
<i>JP</i>	4.550	0.508	2.867	5	-1.334	1.407

 α Coefficients of the *TP*=0.909 α Coefficients of the *CP*=0.892 α Coefficients of the *JP*=0.857

Note: 1.00–2.16: very low; 2.17–3.12: low; 3.13–4.08: moderate; 4.09–5.04: high; 5.05–6.00: very high. $\bar{x}$: arithmetic mean; $\pm$: standard deviation.

3.4 Analysis of differences in descriptive characteristics

This paper examined whether there was a significant difference between the mean scores of mental toughness and job performance for the four variables of gender, age, marital status and maintaining enthusiasm at work. The results indicated that no statistically significant difference existed ($p > 0.05$) between the mean scores of mental toughness and job performance obtained by frontline employees in manufacturing companies for the three variables of gender, marital status and enthusiasm at work; however, there was a significant difference ($p < 0.05$) for age. The differences were found in the levels of mental toughness and job performance of employees aged 36 years and above.

Table 4. Differences between the descriptive characteristics of the employees who participated in the survey and the mean scores they obtained from the scale

Variables	Groups	Resilience		P	Job performance		P
		Mean ($\bar{x}$)	Standard deviation ($\pm$)		Mean ($\bar{x}$)	Standard deviation ($\pm$)	
Age (years)	≤ 35	5.160	0.802	0.018	4.503	0.501	0.026
	≥ 36	5.450	0.813		4.674	0.507	

Note: $\bar{x}$: arithmetic mean; $\pm$: standard deviation.

3.5 Correlation analysis

There is a positive and significant correlation between the age of frontline employees in manufacturing companies and their mental toughness and job performance. These outcomes suggest that as employees age, their psychological toughness and work performance levels increase, accompanied by an increase in their level of psychological resilience.

Table 5. Correlation between the Psychological Toughness and Job Performance

Variables	Resilience		Job performance	Age (years)
Psychological Toughness	Pearson correlation	1	0.790**	0.159*
	<i>p</i> value		0.000	0.018
Job performance	Pearson correlation	0.790**	1	0.150*
	<i>p</i> value	0.000		0.026
Age (years)	Pearson correlation	0.159*	0.150*	1
	<i>p</i> value	0.018	0.026	

Note: $\bar{x}$: arithmetic mean; $\pm$: standard deviation.

3.6 The impact of psychological toughness on Job performance

The study calculated an adjusted R^2 : 0.623 which indicates that mental toughness explains 62.3% of the variation in job performance in this study, suggesting that mental toughness significantly influences job performance, further confirming that the selection of mental toughness as a variable is correct and meaningful. $\beta = 0.790$, $p = 0.000$ which indicates that the effect of mental toughness on job performance is positive and significant, meaning that for every unit increase in mental toughness of frontline employees, other things being equal, their level of job performance will increase by 0.79 units.

Table 6. The effect of psychological resilience on the participating Front-line staffs' job performance

Variables	Unstandardized coefficient		Standardized β	t	p
	β	Standardized error			
(constant)	1.966	0.138		14.292	0.000**
Psychological resilience	0.493	0.026	0.790	19.005	0.000**

Note: R^2 : =0.625; adjust R^2 =0.623 F: 361.188; ** means significant at the 5% significance level.
The dependent variable: Job performance

4. Limitations

Due to the constraints of the epidemic, time and region, there are still limitations in this study. Indicating the gaps and shortcomings of this study is more important for further research in the future, therefore the research shortcomings and limitations of this paper are summarized as follows.

4.1 Sample determination

From the characteristics of the sample collection, the number of frontline employees collected is high and the distribution of positions is wide, which is more persuasive in terms of employee characteristics. However, this sample only selected some companies in Shandong, China as the original data sample and did not cover sample data from other provinces and cities, and the sample is not widely distributed geographically. As a result, there may be geographical differences and influences in the study results, such as the difference between coastal cities and inland cities. In the future, a multi-regional sample could be collected when selecting the sample to enhance the geographical persuasiveness of the sample and make the research results more generalizable and valid.

4.2 Completion by employees

This questionnaire was collected and published using the Questionnaire Star app, which lacks importance compared to face-to-face interviews and paper questionnaires. Some employees did not fully understand and formally treat this questionnaire, which to a certain extent affected the authenticity of data collection and the accuracy of the research results. Therefore, the possibility of face-to-face communication should be strengthened in future studies to obtain richer and more accurate evaluation questionnaires.

5. Suggestion

In this study, front-line employees in the Chinese manufacturing industry during the Covid-19 pandemic were selected as the research model, which has important reference value for the attention and prevention of psychological problems of front-line employees in the whole manufacturing industry. This study fully confirms the impact of mental toughness on job performance, and that mental toughness has a positive impact on job performance, so how it can further draw the attention of business managers and apply the research results to practice is an issue that must be taken seriously at this stage. Therefore, managers should pay more attention to the mental toughness of employees and make corresponding adjustments [15]. Firstly, companies can conduct regular psychological surveys to find out the level of mental toughness of their employees and provide psychological guidance and counselling to employees with low levels of mental toughness. Secondly, the company sets annual or quarterly goals for each employee to increase their awareness of their goals, as goal awareness can help them improve their mental toughness [16,17]. Finally, during the Covid-19 epidemic, stress levels and working hours of employees should be reduced, which helps employees to be more efficient and productive [18].

6. Conclusions

The state of employees' psychological capital is closely related to their own work performance as well as corporate profits. With this aim in mind, this study draws on cutting-edge research literature by relevant authors and selects a sample of frontline employees from selected manufacturing firms in Zouping, Shandong, China during the Covid-19 pandemic as data support, while making Chinese local adaptations to the Mental Toughness Scale developed by Luthans et al. The relationship between psychological toughness and job performance of frontline employees in manufacturing firms was discussed based on descriptive characteristics, and differences in mental toughness and job performance of employees under individual differences were investigated in depth. It is noteworthy that among the frontline employees of the participating manufacturing firms, the level of psychological toughness and job performance is generally high.

Based on the analysis of the results of the sample data, the three questions posed were addressed. The level of mental toughness and work performance of frontline manufacturing employees is generally high. Both the psychological resilience and job performance of frontline manufacturing employees were influenced by age, and there was a significant positive relationship between the age variable and psychological resilience and job performance, with both psychological resilience and job performance increasing significantly with age. Significant correlation exists between frontline employee's psychological toughness and their job performance levels, with higher levels of psychological resilience leading to higher levels of job performance. Of course, in addition to the mental toughness variable, other variables should also be considered, such as whether they have suffered from Covid-19, fear of Covid-19, stress, etc. These variables may have an impact on the work efficiency, work capacity and working hours of frontline employees in manufacturing companies.

References

- [1] Zhang Chuang, Zhang Zhikun, Xia Chunyu. Role ambiguity and its consequences for border personnel: the role of management control and its matching with role orientation. *Journal of Management Engineering*, 2021, 35(01): 69-78.
- [2] Li Lei. Analysis of the impact of fairness in corporate pay management on employee performance. *Old Brand Marketing*, 2022, 1(01): 46-48.
- [3] Fan Jing. Research on the implementation strategy of humane management of metro employees. *Chinese and Foreign Corporate Culture*, 2021, 1(08): 32-33.
- [4] Xiong J, Lipsitz O, Nasri F, et al. Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *Journal of Affective Disorders*, 2020, 277(01): 55-64.
- [5] Özdemir N ,Adıgüzel, V. The relationship between social intelligence, self-esteem and resilience in healthcare professionals and the affecting factors. *Journal of Psychiatric Nursing*, 2021, 12(01): 18-28.
- [6] Cooke F L , Wang J , Bartram T . Can a supportive workplace impact employee resilience in a high-pressure performance environment? An investigation of the Chinese banking industry. *Applied Psychology*, 2019, 68(04): 695-718.
- [7] Mmab C , Awg D , Yee F , et al. The impact of the prolonged COVID-19 pandemic on stress resilience and mental health: A critical review across waves. *European Neuropsychopharmacology*, 2022, 55(01): 22-83.
- [8] Am O . Nurses' Resilience and Effective Factors. *Journal of psychiatric nursing*, 2017, 8(02): 118-126.
- [9] Zikmund, WilliamG. *Marketing research*.USA,2007.
- [10] Luthans F, Youssef-Morgan C M, Avolio B J. *Psychological Capital: Developing the Human Competitive Edge*. Oxford University Press, 2007.
- [11] Yang Hong. *An Empirical Study on the Influence of Employee Mental Health on Job Performance*. Liaoning University,2019.

- [12] Xue Xiaoyin, Zhu Zhuohong. The impact of leaders' low phone use on employee performance: a social learning theory perspective. *Human Resource Development in China*, 2021, 38(06): 55-67.
- [13] Hogr H , Mevlüt Yaman. Investigation of the relationship between psychological resilience and job performance in Turkish nurses during the Covid-19 pandemic in terms of descriptive characteristics. *Journal of nursing management*, 2021, 30(01): 44-52.
- [14] Wu Minglong. SPSS statistical application practice: questionnaire analysis and application statistics. *Journal of scientific*, 2003, 7(03): 38-45.
- [15] Lu Xifeng, Yu Haijing , Shan Biaoan. Relationship between Employee Mental Health and Job Performance: Mediation Role of Innovative Behavior and Work Engagement. *Public Health*, 2022, 19(11): 1-12.
- [16] Wang Yanzi, Wang Congrong. The impact of spiritual leadership on employees' deviant behavior at work. *Journal of the Capital University of Economics and Business*, 2019, 21(02): 62-71.
- [17] Fan Zili, Ma Jun. The impact of personalised work agreements on employees' proactive professional behaviour from an affective event theory perspective. *Journal of the Soft Science*, 2022, 36(06): 89-92.
- [18] Wang S, Daiga K, Brendan B, et al. What matters more for employees' mental health: job quality or job quantity? *Cambridge Journal of Economics*, 2022, 46(02): 251-274.