The Relationship Between Self-Motivation and Research Performance of Postgraduates Based on PLS-SEM Analysis

Yufen Jin[1], Chaoyue Guo[2*]

{634892231@qq.com[1],2567281926@qq.com[2*]}

Hebei University of Science and Technology,Hbei,China

Abstract. The purpose of this study is to explore the relationship between self motivation and research performance of postgraduates. The sample consists of 153 postgraduates who have been employed in technology-based enterprises. In this paper, SPSS26.0 is used for pre-data processing and Smart-PLS 4 to construct a PLS-SEM model about self-motivation and scientific research, and analyze the data. Smart-PLS is a model validation mainly oriented to causal predictive analysis, which is usually used in the case of high complexity but low theoretical information,it is in line with the investigation situation in this paper. In the paper the p-value is less than 0.05, so it can be considered the relationships between variables are significant.The research results indicate that achievement motivation and self-management shows a significant positive correlation with both scientific research as well as application and rewards. Self-growth shows a significant positive correlation with achievement motivation and self-management, in addition belief motivation shows a significant positive correlation with self-management. The research provides corresponding reference value for the selection of talents in technology-based enterprises, the cultivation of talents in schools, and the self-development of students.

Keywords : self-motivation; research performance; PLS-SEM

1 Introduction

As technology-based enterprises serve the development of China's technology industry, strict requirements are placed on the comprehensive qualities of talents[1]. Through an understanding of technology-based enterprises, it is evident that the majority of their employees come from campus recruitments, while social recruitments are mainly for introducing experienced technical talents. Therefore, the quality of campus recruitments is particularly important. For enterprises, with the expansion of colleges and universities, the employment situation of students is becoming increasingly severe, and enterprises are also facing the problem of selecting suitable talents from a large number of fresh graduates. Due to the particularity of campus recruitment time, there are high requirements for campus recruitment efficiency. For universities, campus recruitment is an important way to improve the employment rate of graduates and enhance the reputation of the school, and it is necessary to cultivate talents that are more in line with market demand. For students, campus recruitment is an important way to understand the job market and access job opportunities.This article mainly discusses the self-motivation of postgraduates and the output of research performance during their academic

period.The research provides corresponding reference value for the selection of talents in science and technology enterprises, the cultivation of talents in schools, and the self-development of students.

The term motivation originated from research in the field of psychology and means that the process of continuously triggering a person's motivation,and in the process of motivation, with the triggering of internal and external stimuli, people can maintain a state of continuous excitement and complete tasks with a higher level of concentration [2] (McFarland, 1976). There are many branches of motivational motivation theory,it can be simply boiled down to two aspects: external motivational motivation refers to motivation caused by an individual's external needs or pressures, and internal motivation refers to motivation caused by an individual's intrinsic needs [3] (Tosi HL. Book ReViews,1991). This article examines the meaning of self-motivation, which is caused by the inner needs of the individual.Self-motivation is a primary source of self-management[4], and research on self-motivation first emerged in psychology.Research on self-motivation has focused on university faculty and Chinese civil servants. Peng Fang[5] and Zhang Ying[6] proposed ways of stimulating the latent capacity among civil servants and university faculty.Through an understanding of students who study related majors, at both the undergraduate and graduate level, it was found that the greater sense of achievement arises from their own interests or producing results[7].In this context research performance refer to the paper, monograph, participation in projects, competitions, applied outcomes, and scholarships.

2 Heoretical framework and research hypothesis

2.1 Theoretical framework

Motivation comprises three aspects: need, motive, and behavior.There are three main types of motivation theories, namely, content-based motivation theory, process-based incentive theory, and behavior modification incentive theory. Content-based motivation theory is mainly divided into four theories: hierarchy of needs theory, two-factor theory, ERG theory and achievement needs theory.This theory believes that need is the basis and premise of motivation, and the key to motivation is to understand people's needs, and by understanding people's needs, design certain incentives and methods to meet the needs of employees, so as to control and guide people's behavior, so that they can actively work towards a certain goal [8] (Li Changbao and Zhang Yang, 1999).Process-based motivation theories mainly include Expectancy Theory, Equity Theory, Goal-Setting Theory,[9] (Zhang Ning, 2012). Process-motivated theory attempts to explain why people's behavior occurs, develops, processes, and how it is terminated [10] (Xie Gaoxian and Liu Shanqing, 2012). Typical examples are B.F. Skinner's (1938) reinforcement theory and Kelley's (1967) attribution theory [11]. This type of theory mainly studies how to influence and control human behavior through external stimuli, and its purpose is to modify and modify human behavior [12] (Chang Yanan, 2015).

Research performance can be seen as the output of students during their academic period, and their influencing factors are multifaceted.When discussing factors that influence performance, it often starts from the following four aspects: skill, motivation, environment, and opportunity.The specific details are shown in **Figure1**.Self-motivation emphasizes the internal drive and self-satisfaction of individuals, enabling them to actively pursue goals and enjoy the

sense of achievement throughout the process, thereby having a certain impact on performance output.
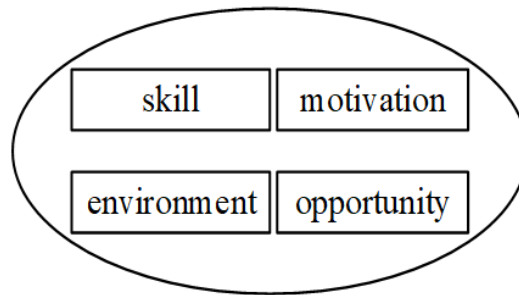
P=f(S，M，E，O)

Fig. 1. Key factors influencing performance
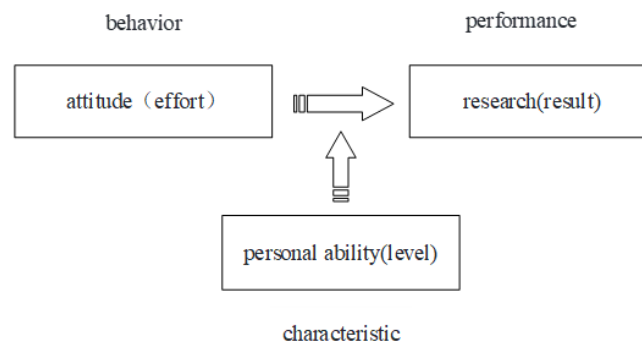

Fig 2. The relationship between attitude, ability, and results.

For studying the factors influencing individual research performance output, it is also important to understand the relationship between attitude, ability, and result. The relationship diagram is shown in **Figure 2**.

Based on the above, we can derive a theoretical model diagram illustrating the self-motivation of postgraduates and the production of scientific research performance results, as shown in **Figure 3.** Based on this, we make the following theoretical model.
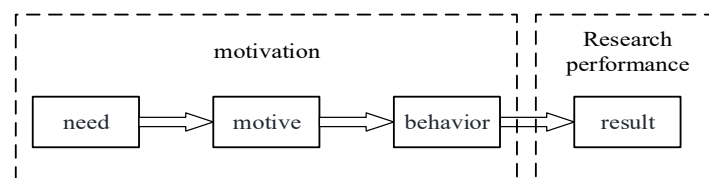

Fig. 3. The theoretical model between self-motivation and research performance

2.2 Research hypothesis

Through the study of Maslow's hierarchy of needs theory and other motivational theories,this article categorizes self-motivation factors into four aspects:achievement motivation, self-management,self-growth,and belief motivation.Research performance include sentific research,applications and awards.Achievement motivation encompasses three aspects: respect, achievement, and goal. Through the study of the Maslow's hierarchy of needs theory, when individuals, fulfilling their lower-level needs, they will seek affirmation of their self-worth. This includes fulfilling the desire for self-esteem and obtaining recognition from others[13]. The need for achievement is the desire to overcome challenging obstaclesand attain high standards. Postgraduates' research performance during their school period are mainly creative, and their innovation process is not easily controllable. They generally hold unique values and possess strong achievement motivation[14]. Individuals with high achievement motivation tend to be more effortful and persistent, and feedback is more effective for them when dealing with tasks. The willingness to work towards achieving a work goal is a major source of work motivation. Goals can instruct employees on what they should do, and research has shown that clear goals can enhance work performance. Therefore, this study makes the following hypotheses:

H1: Achievement motivation has a positive impact on scientific research.

H2: Achievement motivation has a positive impact on application and rewards.

The self-management motivation mentioned in this article mainly includes the following three aspects: intrinsic motivation, habitual motivation and normative motivation.Good habits can improve individuals' efficiency and quality, promote personal growth and progress. For individuals, norms provide clear behavioral guidelines and expectations, helping them enhance their work abilities and career development. Additionally, norms can effectively manage individuals research practices. Therefore, this article makes the following hypotheses:

H3: Self-management has a positive impact on scientific research.

H4: Self-management has a positive impact on application and rewards.

Self-growth motivation refers to a positive psychological stimulus that can ignite individuals' intrinsic motivation to pursue personal development and self-growth. In this article, growth motivation includes self-learning and team learning. Team learning refers that individuals voluntarily and actively participating in team members' learning activities to learn and grow together. It involves setting common goals, creating a positive learning environment, and facilitating collaborative learning to improve individual abilities.In the atmosphere of team learning, individuals are constantly influenced by their desire for achievement and aligning themselves with benchmarks within the team to practice self-management. Therefore, this article makes the following hypotheses:

H5: Self-growth has a positive impact on achievement motivation.

H6: Self-growth has a positive impact on self-management.

Belief is a driving force, a firm and unwavering idea, and an attitude that is established based on certain cognition. Beliefs motivate people to act and achieve personal goals according to their perceived right views and principles. As a future reserve of scientific and technological

talents, postgraduates need to adhere to their research fields, immerse themselves in deep-rooted studies, and this reliance on belief which is crucial. Therefore, the following hypothesis is made in this article:

H7: Belief motivation has a positive impact on self-management of postgraduates.

The data is analyzed using the SmartPLS software. SmartPLS is primarily used for causal predictive analysis and is typically employed in situations with high complexity but low theoretical information (Roldán&Sánchez-Franco, 2012)[15]. It is also recommended for use in non-normal distributed variables, non-experimental studies using data obtained from surveys, studies with small sample sizes, and theories that have not yet been developed reliably. SEM consists of two components (Henseler, Ringle, and Sarstedt, 2015; Henseler, Ringle, & Sinkovics, 2009) [16][17]: (a) the structural model or inner model, which represents the constructs (circles) or latent variables and the relationships between exogenous and endogenous variables; (b) the measurement model or outer model, which displays the constructs and observed variables (rectangles).

3 Research method

3.1 Research sample and data collection

The scale used in this study has been tested to ensure the validity and reliability of this research.The survey questionnaire in this study consists of three parts, including basic information, self-motivation scale, and research performance results scale.Basic information mainly includes age, gender, school, etc. The self-motivation scale consists of 21 questions, covering four aspects: belief motivation, achievement motivation, self-growth, and self-management. The research results scale consists of 30 questions, covering two dimensions, which are scientific research , application and awards.

3.2 Research tools

Exploratory factor analysis was conducted on the survey items of self-motivation and research performance results scales for postgraduates to assess the KMO value and Bartlett's sphericity test. The exploratory factor analysis results indicate that 21 items form stable 4 factors for self-management and 29 items form stable 6 factors for research achievement. These factors are named as the measurement indicators. After conducting the KMO sample test and Bartlett's test of sphericity, the factor loadings for each item in the self-motivation and research achievement exploratory factor analyses are all above 0.6, and they load well on their respective variable factors, reflecting a reasonable internal structure of the scales.Latent variables are variables that are not directly observed but inferred from other observed variables(Haenlein & Kaplan, 2004) [18].

4 Data analysis and results

4.1 Validity test of the scale

The reliability of the measurement model's internal consistency, as shown in **Table 1**, it was measured using Jöreskog's (1971)[19] composite reliability .Higher values usually indicate a higher level of reliability (Diamantopoulos, Sarstedt, Fuchs, Wilczynski, & Kaiser, 2012) [20].Another important measure of reliability is the relationship between each indicator and its underlying construct, which is assessed using Cronbach's alpha value.When Cronbach's alpha value is greater than 0.7, the construct is considered to have internal consistency (Barclay et al., 1995; Nunnally, 1994) [21][22].However, Cronbach's alpha does not precisely reflect composite reliability as it is based on unweighted items. In contrast, under composite reliability, the items are weighted based on the individual loadings of the construct indicators. Therefore, this form of reliability is considered to be more reliable than Cronbach's alpha (Hair et al., 2019) [23].As shown in Table 1, the Cronbach's alpha values for all latent variables are higher than 0.7, and the composite reliability is higher than 0.8, indicating high reliability.In addition, AVE represents the variance extracted from the indicators, and values greater than 0.5 can be considered as a good fit measure (Fornell & Larcker, 1981; Fornell, 1982) [24][25]. It is observed that all latent variables in the model meet this criterion.And the discriminant validity is shown in **Table 2**.

Table 1. Validity and reliability of constructs

Constructs	Cronbach's alpha	Composite reliability (rho_a)	Average variance extracted (AVE)	R-square
belief motivation	0.843	0.852	0.76	
application and awards	0.784	0.793	0.612	0.115
achievement motivation	0.851	0.861	0.527	0.147
scientific research	0.948	0.955	0.95	0.12
self-growth	0.836	0.851	0.67	
self-management	0.933	0.935	0.713	0.404

Table 2. Discriminant validity

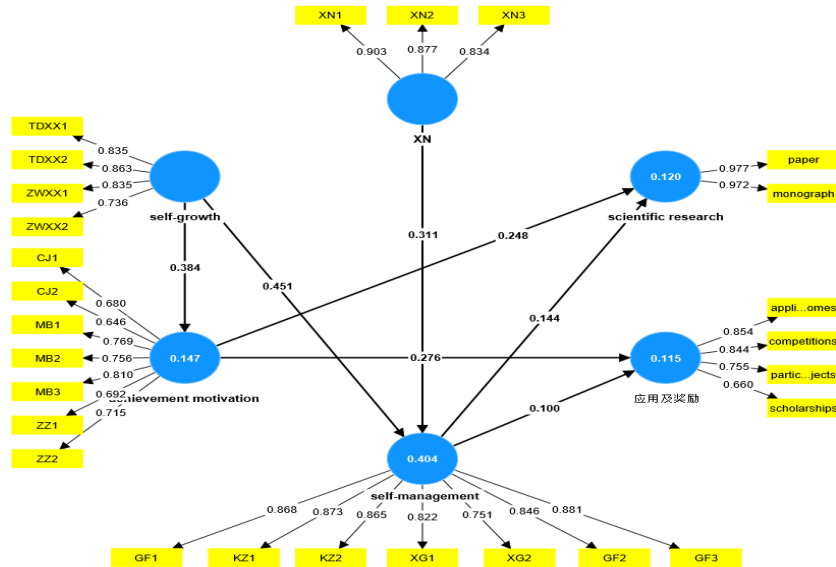| No.		1	2	3	4	5	6
1	belief motivation	0.872					
2	application and awards	0.08	0.782				
3	achievement motivation	0.332	0.329	0.726			
4	scientific research	-0.063	0.717	0.324	0.975		
5	self-growth	0.369	0.092	0.384	-0.039	0.819	
6	self-management	0.478	0.246	0.529	0.275	0.566	0.845

4.2 Model Hypothesis Verification

Fig. 4. Path coefficient analysis.

In this paper, the statistical measures used are SPSS26.0 and Smart-PLS 4. SPSS26.0 is used for pre-data processing and Smart-PLS 4 to construct a PLS-SEM model and conduct data analysis.The correlation coefficients between the individual variables are shown in the **Figure4.** above and original sample in the **Table 3.** below.

Table 3. SEM direct effects

Hypothesis Path	Original sample	Sample mean	Standard deviation	T statistics	P values	Final Remarks
belief motivation -> self-management	0.311	0.315	0.079	3.931	0.000	√
achievement motivation -> application and awards	0.276	0.28	0.062	4.48	0.000	√
achievement motivation -> scientific research	0.248	0.25	0.088	2.817	0.005	√
self-growth -> achievement motivation	0.384	0.393	0.081	4.711	0.000	√
self-growth -> self-management	0.451	0.453	0.065	6.913	0.000	√
self-management -> scientific research	0.1	0.101	0.048	2.076	0.038	√
self-management -> application and awards	0.144	0.142	0.052	2.74	0.006	√

In order to assess the statistical significance of the latent regression coefficients, SmartPLS software analyzed the importance of the relationships between variables. In most cases,

researchers choose a significance level of 5%, which means that the p-value must be less than 0.05 to make the considered relationship significant. However, in exploratory research, a significance level of 10% is often used (Hair et al. 2016)[26]. The p-values for each path in this study are shown in **Table 3**, and it can be seen.

5 Conclusions and prospect

5.1 Conclusions

The results of the model calculations in **Figure 4** show that achievement motivation on scientific research is 0.248 ($p \leq 5\%$), which is smaller than the application and rewards, which is 0.276 ($p \leq 5\%$). The impact index of self-management on scientific research, application and rewards was 0.1 and 0.144 ($P \leq 5\%$). From the figure above, it can be observed that self-growth is positively correlated with achievement motivation and self-management, with coefficients of 0.384 and 0.451 respectively ($p \leq 5\%$).At the same time, belief motivation also showed a positive correlation on self-management, with a coefficient of 0.311, which was less than the positive effect of self-growth on self-management.It can be seen that the above assumptions are valid.

5.2 Summary and Prospect

Firstly,from the perspective of technology-based enterprises,the establishment of selection criteria and assessment indicators for postgraduates can be expanded to evaluate them from multiple dimensions. Exploration of tools related to evaluating and assessing self-motivation psychology can better serve human resource recruiters in future campus recruitment processes.

Secondly, from the perspective of talent cultivation in schools, the process of educating students should not only focus on developing their professional knowledge and skills, but also prioritize the cultivation of their soft skills. ncreasing collaborations between schools and enterprises allows students to have practical experiences and develop practical skills.

Thirdly, from the perspective of individual students who want to enter the technology-based enterprises in the future, they should strengthen their professional skills, enhance their self-drive and improve their research performance during their school years.Students should establish detailed learning plans to clarify learning objectives and conduct supervision and evaluation within a certain time , in order to improve learning efficiency. Students also should participate in academic teams or societies, engage in discussions, research and practical activities related to the field, constantly improving professional skills and innovative thinking through exchanges.

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