

# PERFORMANCE OF PHYSICAL EXERCISE IN SEDENTARY PEOPLE'S AUTONOMY



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DESEMPENHO DO EXERCÍCIO FÍSICO NA AUTONOMIA DE PESSOAS SEDENTÁRIOS

DESEMPEÑO DEL EJERCICIO FÍSICO EN LA AUTONOMÍA DE PERSONAS SEDENTARIAS

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## ABSTRACT

**Introduction:** Sedentary people are more likely to be affected by obesity and cardiovascular diseases than regularly practicing physical activity. **Therefore, it is essential to investigate the effects of physical exercise on the health of sedentary people. Objective:** Study the physical exercise effects on physical activity and autonomy in sedentary people. **Methods:** Structural equations and mathematical statistics were used to analyze sedentary people's autonomy during physical exercise and the repercussions of the activity on the practitioners' physique. **Results:** Sedentary people increased confidence and self-esteem after participating in physical exercise. Their physical functions could be effectively improved after practicing physical exercises. **Conclusion:** Effective and realistic suggestions for improving exercise awareness were presented, considering the particular conditions of sedentary people. Physical exercise also helps sedentary people to develop exercise confidence by improving their overall self-efficacy level. **Evidence Level II; Therapeutic Studies – Investigating the results.**

**Keywords:** Exercise; Self efficacy; Sedentary behavior.

## RESUMO

**Introdução:** Pessoas sedentárias estão mais propensas a sofrer de obesidade e doenças cardiovasculares quando comparadas às pessoas que praticam atividades físicas regularmente. **Por isso, é de grande importância estudar os efeitos do exercício físico sobre a saúde das pessoas sedentárias. Objetivo:** Estudar os efeitos do exercício físico sobre a atividade física e a autonomia das pessoas sedentárias. **Métodos:** Equações estruturais e estatísticas matemáticas foram utilizadas para analisar a autonomia das pessoas sedentárias durante o exercício físico e as repercussões da atividade no físico dos praticantes. **Resultados:** As pessoas sedentárias tiveram um aumento de confiança e autoestima após participarem de exercícios físicos. **Suas funções físicas podem ser efetivamente melhoradas após a prática de exercícios físicos. Conclusão:** Foram apresentadas sugestões efetivas e realistas para melhorar a consciência do exercício físico, considerando as condições particulares das pessoas sedentárias. O exercício físico também ajuda as pessoas sedentárias a desenvolverem a confiança no exercício, melhorando o nível de autoeficácia geral. **Nível de evidência II; Estudos Terapêuticos - Investigação de Resultados.**

**Descritores:** Exercício Físico; Autoeficácia; Comportamento Sedentário.

## RESUMEN

**Introducción:** Las personas sedentarias tienen más probabilidades de padecer obesidad y enfermedades cardiovasculares en comparación con las personas que practican regularmente actividad física. **Por ello, es de gran importancia estudiar los efectos del ejercicio físico en la salud de las personas sedentarias. Objetivo:** Estudiar los efectos del ejercicio físico sobre la actividad física y la autonomía de las personas sedentarias. **Métodos:** Se utilizaron ecuaciones estructurales y estadísticas matemáticas para analizar la autonomía de las personas sedentarias durante el ejercicio físico y las repercusiones de la actividad en el físico de los practicantes. **Resultados:** Las personas sedentarias tuvieron un aumento de la confianza y la autoestima después de participar en el ejercicio físico. **Sus funciones físicas podrían mejorar eficazmente tras la práctica de ejercicios físicos. Conclusión:** Se presentaron sugerencias eficaces y realistas para mejorar la concienciación sobre el ejercicio físico, teniendo en cuenta las condiciones particulares de las personas sedentarias. El ejercicio físico también ayuda a las personas sedentarias a desarrollar la confianza en el ejercicio al mejorar su nivel de autoeficacia general. **Nivel de evidencia II; Estudios terapéuticos - Investigación de resultados.**

**Descriptor:** Ejercicio Físico; Autoeficacia; Conducta Sedentaria.



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## INTRODUCTION

Self-concept is the individual's overall perception and evaluation of all aspects of oneself. The physical self is the earliest part of the individual self-concept and runs through a person's entire life. The physical self is widely regarded as a multidimensional concept. Coordination is a key link in the improvement of an individual's physical ability. Individual

body activities can coordinate and cooperate in time and space and complete body movements reasonably and effectively.<sup>1</sup> At the same time, it is an important foundation for the formation of physical exercise capacity. Self-efficacy is the core concept in the social cognitive theory and social learning theory of American psychologist Bandura. It reflects "a kind of overall self-confidence of the individual in completing tasks in

different situations." It is an individual's stable personality characteristic, which directly affects the individual's thinking, motivation, and behavior. Many studies have shown that general self-efficacy can significantly affect an individual's performance level, work attitude, mood, adaptability, etc. And this research believes that since self-efficacy is an individual's expected cognition of completing tasks, physical exercise can enhance the physical fitness of young students. Then improve their coordination performance and affect their expectations of the goal and at the same time establish the confidence to complete the task. Based on the literature mentioned above, we propose the following research hypotheses: Hypothesis 1: Physical exercise is positively correlated with sedentary college students' physical coordination. Hypothesis 2: Physical exercise is positively related to the self-efficacy of sedentary college students. Hypothesis 3: The physical coordination of sedentary college students plays a mediating role between physical exercise and general self-efficacy.

## METHOD

### Research object

We use questionnaires to collect data in colleges and universities. Full-time sedentary college students are the subjects of the survey.<sup>2</sup> A total of 500 questionnaires were distributed, and a total of 453 questionnaires were returned. There were 421 valid questionnaires, and the response rate of valid questionnaires was 84.2%.

### Tools

#### Coordination measurement

The coordination uses the coordination subscale in the body self-description questionnaire (PSDQ) developed by Marsh et al. The scale includes 6 items. We use Likert's 6-point scoring. The higher the score, the higher the physical coordination. Principal component factor analysis was performed on the scale, and an effective factor was extracted.<sup>3</sup> The amount of variance explained is 69.97%. The load ranges from 0.78 to 0.89. The results show that the single factor model fits well. The Cronbach coefficient of this scale is 0.913. The above analysis proves that the measurement result is valid and credible.

#### Measurement of general self-efficacy

The one-dimensionality of the general self-efficacy structure is universally recognized and is not affected by cultural factors.<sup>4</sup> Therefore, this study uses the Chinese version of the general self-efficacy scale for measurement. A total of 10 projects. We use 4 points. The higher the score, the higher the level of general self-efficacy. The Cronbach coefficient of this scale is 0.889.

#### Measurement of physical exercise intensity

The physical exercise intensity adopts the International Physical Activity Questionnaire revised in 2005 by the International Physical Activity Measurement Working Group. The questionnaire is divided into long and short papers. This study selected the Chinese version of the short questionnaire to suit the Chinese cultural background.<sup>5</sup> In this study, the scale was used to measure the total energy equivalent (MET) consumed by subjects during vigorous exercise, moderate-intensity exercise, and walking on average each week.

### Positioning of the arc trajectory of the motion arm

Digital imaging equipment is used to realize the image sequence sampling of the arc trajectory of the movement arm. Define the frame difference of the distributed fusion sequence of the arc trajectory feature of the moving arm as  $g_i$ . The sampling rate of the target information contained in the saliency area is  $\nabla_x = [1, -1]$ . The block fusion feature quantity of the arc trajectory information of the motion arm is

$$\min F(x) = \sum_{i=1}^n g_i^T f_m(x) + \nabla_x \quad (1)$$

The high-frequency part  $(X_i - \bar{X})^2$  of the characteristic distribution of the arc trajectory of the movement arm. The energy function of the pixel distribution in the non-salient target area is:

$$\min_{x,k} \lambda = \left[ \sum_{i=1}^n (X_i - \bar{X})^2 \right]^T + \frac{x - \mu}{\sigma} k_i - \min F(x) \quad (2)$$

We use the structural similarity feature analysis method to calculate the constraint condition of the movement arm movement arc trajectory detection and positioning:  $\frac{x - \mu}{\sigma} \cdot k$  is the multiple color difference of the arc trajectory of the movement arm. According to the mathematical morphology theory, the feature decomposition of the arc trajectory of the moving arm and the edge contour detection is carried out. The motion sampling information of the motion arc trajectory of the motion arm is:

$$c(x, y) = \sum_w [I(\sqrt{a^2 + b^2}) - \min_{x,k} \lambda(\sqrt{er} + \sqrt{ey})^2] \quad (3)$$

$a^2 + b^2$  is the probability density function of the arc trajectory distribution of the motion arm.  $\sqrt{er} + \sqrt{ey}$  is the morphological filtering feature point of the arc trajectory of the movement arm.  $w$  represents the internal structure information of the arm motion decomposed by a multi-layer wavelet.<sup>6</sup> Based on the method of morphological marking, the arc trajectory tracking model of the movement arm is obtained:

$$\sum_{i=1}^n X_i = I + [I_x(\sqrt{a^2 + b^2}) - I_y c(x, y)] \quad (4)$$

$(I_x + I_y)$  is the color difference and uniform quantization function collected by the motion arc trajectory sequence of the movement arm, respectively.  $u^2 + t^2$  represents the construction of the image acquisition model of the arc trajectory of the movement arm.

## RESULTS

### Correlation analysis of main variables

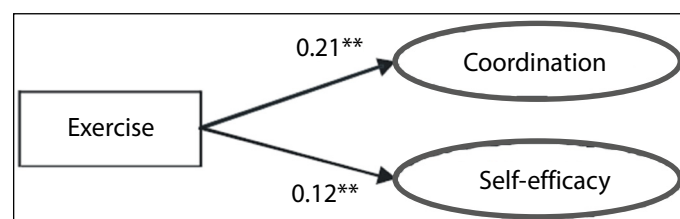
Table 1 shows the correlation coefficients between the variables in the overall sample. From Table 1, it can be found that physical exercise and coordination, and general self-efficacy have shown a significant positive correlation and have reached a significant level.

### The direct effect of physical exercise

We use AMOS16.0 statistical software to analyze the paths of physical exercise and coordination, and self-efficacy. The results are consistent with the correlation analysis. As shown in Figure 1, the direct effect of

**Table 1.** Correlation coefficients of main variables.

Variable	M	SD	1	2	3
1. Coordination (Co)	3.62	0.84	1.00		
2. General self-efficacy (Se)	2.60	0.53	0.39	1.00	
3. Physical exercise (Ps-MET)	2475.68	1688.04	0.20	0.12	1.00



**Figure 1.** The direct effect of physical exercise on coordination and self-efficacy.

physical exercise on coordination is 0.21 ( $P<0.01$ ). The direct effect of physical exercise on self-efficacy was 0.12 ( $P<0.01$ ). This shows that physical exercise has a significant positive impact on sedentary college students' coordination quality and general self-efficacy. Some fitting indexes of the model are shown in Table 2. It can be seen from Table 2 that each fitting index is better than the recommended value. This shows that the model has good goodness of fit. Research Hypothesis 1 and Hypothesis 2 are fully supported.

### The mediating role of coordination

We use AMOS16.0 statistical software to analyze three variables of physical exercise, coordination, and general self-efficacy. The purpose is to examine the mediating role of coordination between physical exercise and general self-efficacy. As shown in Figure 2, after introducing coordination variables between physical exercise and self-efficacy, the path coefficient from coordination to general self-efficacy is 0.41 ( $P<0.01$ ). The path coefficient from physical exercise to coordination is 0.21 ( $P<0.01$ ). The path coefficient from physical exercise to general self-efficacy decreased from 0.12 ( $P<0.01$ ) to 0.02 and was not significant. Some fitting indexes of the model are shown in Table 2. It can be seen from Table 2 that each fitting index is better than the recommended value. This shows that the model has good goodness of fit. This shows that coordination has a significant and complete mediating effect between physical exercise and general self-efficacy. Fully support research hypothesis 3.

**Table 2.** Fitting indicators of the model of direct effects of physical exercise on coordination and self-efficacy.

Fitness index	Recommended value	Ps→Se	Ps→Co	En mediation
$\chi^2$	-	24.54	16.86	105.28
P	-	0.788	0.206	0.392
$\chi^2/df$	<3	0.792	1.297	1.032
NFI	>0.90	0.986	0.924	0.97
CFI	>0.90	1	0.981	0.999
IFI	>0.90	1	0.981	0.999
GFI	>0.90	0.989	0.989	0.791
AGFI	>0.80	0.977	0.975	0.957
RMSEA	<0.80	0	0.027	0.009

## DISCUSSION

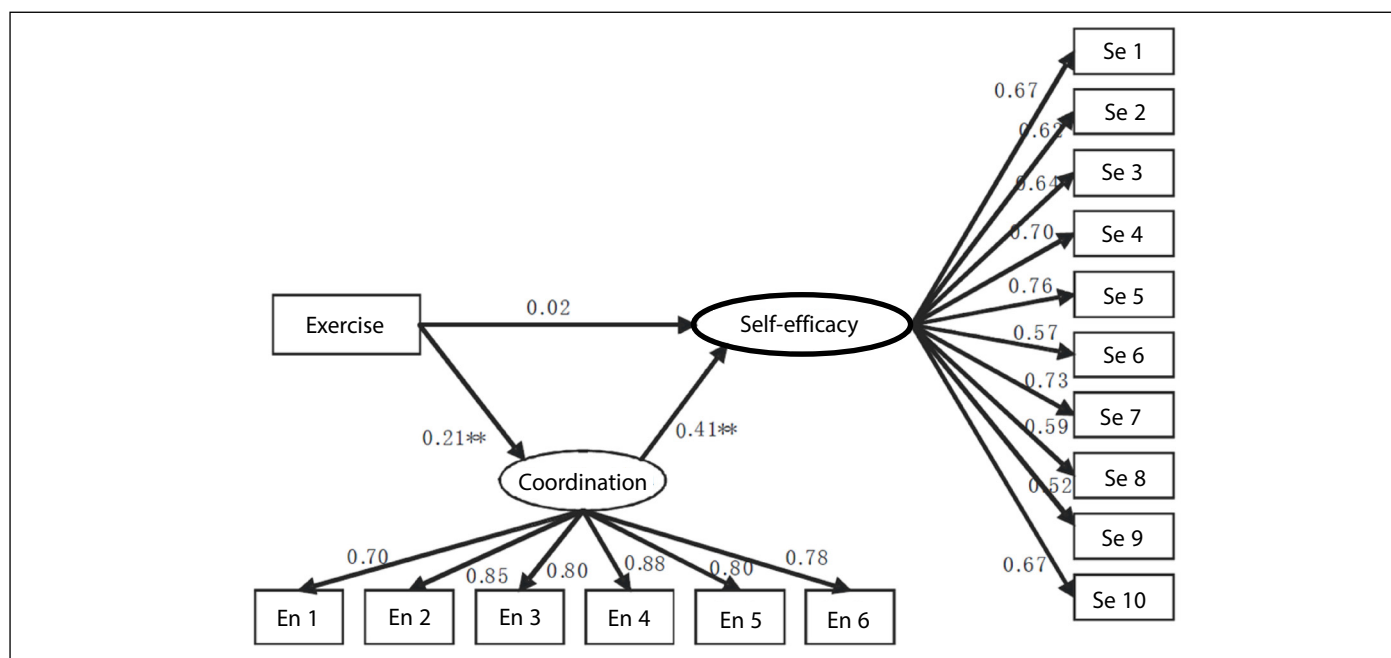
### Significant positive correlation between physical exercise and coordination

Physical exercise seems to be the activity most closely related to the physical self. So, whether physical exercise can promote people's self-concept and mental health is a topic of great interest. The literature concerning the influence of physical exercise on the physical self is often just a general statement that physical exercise can or cannot improve the physical self-concept.<sup>7</sup> There is no specific analysis of the different effects of physical exercise on the specific dimensions of the physical self. The analysis results of this study show that physical exercise has a significant effect on training and improving the self-coordination of sedentary college students. The greater the energy consumption of daily physical exercise, the higher the awareness of self-coordination. The two are positively correlated. Physical exercise can cultivate and improve sedentary college students' awareness of self-coordination and improve the overall level of the physical self.

### The mediating role of coordination between physical exercise and self-efficacy

The research results show that coordination has a significant and complete mediating effect between physical exercise and self-efficacy. The impact of physical exercise on their body and mind is often concentrated on improving physical fitness, enhancing physical pride, and the cognition of a healthy physique.<sup>8</sup> Individuals with physical selves tend to show strong confidence when completing tasks. Self-efficacy comes from four types of experience: previous successful experience, imitation or substitution, verbal and social persuasion, and physical and emotional states. The impact on individual self-efficacy is directly reflected in two aspects of past successful experience and physical and emotional state.

On the one hand, experience is an important prerequisite for the formation of self-efficacy. It provides individuals with judgment and behavioral information that constitutes self-efficacy. Coordination performance improves the individual's success rate in completing challenging motor tasks and increases the successful experience. This gains a positive sense of self-efficacy. This sense of efficacy will provide the individual



**Figure 2.** Coordinative mediation model.

with a guarantee of ability in future tasks. And this effect enables individuals to maintain self-confidence even in the face of failure. On the other hand, individuals can improve their expectations of completing tasks by enhancing their cognition of physical fitness and self-health.

## CONCLUSION

The individual's subjective perception of the physical and psychological state will affect the judgment of self-efficacy. Fatigue or pain can reduce self-efficacy. Coordination will improve the individual's sense of self-efficacy related to manual labor tasks and foster a sense of

accomplishment. Therefore, this will enhance the sense of competence in all aspects of life, study and work and thus improve self-efficacy.

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The author declare no potential conflict of interest related to this article

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