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Research on the impact of physical activity on the perceived age discrimination among the elderly: The mediation effect of self-efficacy

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Abstract

With population aging accelerating, older adults face growing psychological challenges, including loneliness, low self-esteem, and perceived age discrimination. Age stereotypes not only harm mental well-being but also limit social participation. Physical activity, as a non-pharmacological intervention, may enhance self-efficacy and mitigate such negative effects. This study aims to explore the relationship between physical activity and perceived age discrimination among older adults in China, focusing on the mediating role of self-efficacy. A survey of 292 older adults was conducted using the Physical Activity Rating Scale (PARS-3), the General Self-Efficacy Scale (GSES), and the Perceived Age Discrimination Scale. Data were analyzed using SPSS 27.0. Physical activity negatively correlated with perceived age discrimination ($r = -0.180$, $p < 0.01$), and positively with self-efficacy ($r = 0.418$, $p < 0.01$). Self-efficacy was also negatively correlated with perceived age discrimination ($r = -0.476$, $p < 0.01$), and fully mediated the relationship. Physical activity reduces perceived age discrimination by enhancing self-efficacy. Promoting exercise may support elderly mental health and social integration.

Keywords

Physical activity, Perceived age discrimination, Self-efficacy, Elderly

1. Introduction

With the improvement of medical standards and the extension of average life expectancy, the trend of population aging in China is intensifying day by day. According to the "Statistical Bulletin on the National Economic and Social Development in 2023" released by the National Bureau of Statistics, by the end of 2023, the population aged 60 and above accounted for 21.1% of the national population, and the population aged 65 and above accounted for 15.4%. Compared with the year of the seventh national census (2020), they increased by 2.4% and 1.9% respectively; Compared with the sixth national census (2010), they increased by 7.84% and 6.53% respectively. It has exceeded the baseline for a moderately aging society set by the World Health Organization (WHO) (20%). It can be seen from this that the aging situation in China is extremely severe.

As China is accelerating its entry into an aging society, the elderly are facing numerous changes in their physiological, economic and social roles, and the resulting mental health problems are becoming increasingly prominent(Luo, 2024; Wang & Sun, 2022). Research shows that due to factors such as retirement, reduced social interaction, and declined physical functions, the elderly generally face psychological predicaments such as loneliness, damaged self-esteem, and a lack of social value (Mental Health of the Elderly, n.d.) (World Health Organization, 2023). Especially, perceiving discrimination and marginalization from society is more likely to trigger negative emotions such as depression and anxiety, seriously affecting their physical and mental

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health and quality of life (Kang & Kim, 2022; Xu et al., 2022). Therefore, how to improve the mental health level of the elderly through effective channels has become an important issue that urgently needs attention in the current society.

Physical activity, as a highly feasible and sustainable non-pharmaceutical intervention method, has a significant effect on enhancing the social belonging, self-esteem level and stress resistance ability of the elderly (de Oliveira et al., 2019), and these factors are regarded as important psychological resources affecting the perceived discrimination level (Fox, 1999). Although there are currently no studies on how physical activity can affect perceived age discrimination, Flynn et al. 's study in 2021 suggested that physical activity might weaken the relationship between perceived discrimination and depression(Flynn et al., 2021). Meanwhile, research has found that elderly people who frequently engage in physical activity have better effects on implicit cognitive reassessment. Implicit cognitive reassessment can promote rational decision-making and fear regression, improve arithmetic scores and estimated performance, reduce perceived stress, and enhance the emotional regulation status of individuals with depleted cognitive resources(Shui, 2021). The enhancement of these positive psychological resources helps the elderly reduce their recognition of social stereotypes, build a psychological buffer zone against age discrimination at the cognitive level, and lower their sensitivity to negative social evaluations(Brinkhof et al., 2023). Thus, when facing external evaluations, they reduce the tendency to attribute "age discrimination" to them. Based on this, this study proposes Hypothesis 1: Physical activity has a negative predictive effect on the perception of age discrimination among the elderly.

With the development of health psychology and sports science, the relationship between physical activity and self-efficacy has gradually become a research hotspot. In empirical studies over the past few decades, not only has it been found that the level of physical activity is significantly positively correlated with self-efficacy(Toros et al., 2023), but it has also been confirmed in multiple intervention studies that self-efficacy can in turn promote physical activity behavior(Zhao et al., 2023). Perceived age discrimination has certain negative impacts on the physical and mental health of the elderly, and self-efficacy is often regarded as a key psychological protective factor or buffer variable in the face of adverse situations(Crapolicchio et al., 2021; Xiong et al., 2025). At present, there is still a lack of empirical research on the direct association between "self-efficacy and perceived age discrimination". However, Steward and Hasche pointed out in their 2022 study that enhancing self-efficacy through physical activity can weaken self-perceived aging, and self-perceived aging is an important component of perceived age discrimination(Steward & Hasche, 2022). Meanwhile, the stereotype embodiment theory holds that internalizing negative age stereotypes among the elderly will increase their sensitivity to age discrimination and bring about negative physical and mental impacts. If the internalization process can be "blocked" or "buffered" through positive psychological resources such as self-efficacy, the elderly may be better able to resist or reconstruct external biases(Levy, 2009). Espinosa's research explored how emotional self-efficacy affects the relationship between perceived discrimination (based on race or ethnicity), ethnic identity, and psychotic experiences. The mechanism by which emotional self-efficacy buffers the impact of discrimination in the article suggests that if the elderly have a higher sense of self-efficacy, when confronted with the "age discrimination" signals in the social environment, one can exhibit less self-deprecation or withdrawal behavior, thereby alleviating the perception of age discrimination among the elderly(Espinosa et al., 2022). Fridberg proposed that high-intensity interval training (HIT) has the potential to challenge negative age stereotypes and age-discriminatory behaviors, and to enhance self-efficacy by supporting the elderly to engage in forms of exercise that they have never done for a long time or throughout their lives(Fridberg et al., 2025). Based on this, this study proposes Hypothesis: Physical activity indirectly reduces

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the perceived age discrimination degree among the elderly by enhancing their sense of self-efficacy.

2. Materials and methods

2.1. Subjects of survey

From April to June 2025, a questionnaire survey was conducted among urban elderly people in China. All the investigators had received standardized training and distributed digital questionnaires to the participants through the provided links or conducted on-site distribution of paper questionnaires. A total of 300 questionnaires were retrieved, among which 292 were valid, with an effective rate of 97.33%. Among the valid samples, 36.64% were male and 63.36% were female. In daily life, 92.81% of people take part in physical activity, while 7.19% do not. Inclusion criteria: (1) The subjects have read the informed consent form and voluntarily participated in this study; (2) The subjects have basic cognitive abilities and can understand the meaning of each item in the questionnaire. (3) Respondents completed the online questionnaire either independently or with the assistance of the investigators. Exclusion criteria: (1) Non-native speakers; (2) The questionnaire is incomplete or contains logical errors.

2.2. Research tools

2.2.1. Physical Activity Scale (PARS-3)

The exercise volume of Tai Chi was measured by using the Chinese version of the PARS-3 scale revised by scholars such as Liang Deqing. The scale consists of three items, namely exercise intensity, exercise duration and exercise frequency. The Chinese version of the PARS-3 scale is evaluated using the Likert 5-point scoring method. Exercise intensity and exercise frequency are respectively scored from 1 to 5 points from low to high, and exercise duration is respectively scored from 0 to 4 points from low to high. The calculation formula for the total exercise volume is to multiply the scores of the three factors. The higher the score, the greater the amount of exercise. The score range for physical activity is from 0 to 100 points. The classification criteria for quantifying physical activities are as follows: small physical activity is scored between 0 and 19 points, moderate physical activity is scored between 20 and 42 points, and large physical activity is scored between 43 and 100 points. The Cronbach α coefficient was 0.873, and the CITC values of each item all exceeded 0.74, indicating good internal consistency.

2.2.2. General Self-Efficacy Scale (GSES)

The General Self-Efficacy Scale (GSES) revised by Wang Caikang et al. was adopted. This scale is a single-dimensional scale consisting of 10 items. The test-takers selected "completely incorrect" to "completely correct" based on the situation. Each item was scored 1 to 4 points using the Liker 4-point scoring method. The higher the score, the higher the individual's self-confidence. The theoretical range of the total score of the scale is 10 to 40 points, and the average score of the questionnaire is the score of the test-taker. The Cronbach α coefficient of this scale reached 0.924, and the CITC values of each item ranged from 0.519 to 0.789, indicating excellent internal consistency.

2.2.3. Perceived Age Discrimination Scale

The survey questionnaire on the prevalence of age discrimination in Europe was adopted. The questionnaire consists of three items: ① Do you feel that someone is showing prejudice against you or being unfair to you because of your age? ② Do you feel that someone shows a lack of respect for you because of your age, such as looking down on you? ③ Has anyone treated you very badly because of your age, such as refusing to provide you with services? The Likert 5-level scoring method was adopted (" never, occasionally, sometimes, often, always "represent 0, 1, 2, 3, and 4 respectively). When the score was ≥1, it indicated that the test-taker had perceived age discrimination. The higher the score, the more severe the perceived age

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discrimination. The Cronbach α coefficient of this scale was 0.905, and the CITC value of each item exceeded 0.79. It also had excellent internal consistency(Vauclair et al., 2015).

2.3. Data processing and common method bias test

The correlation analysis, descriptive statistics and normality test were carried out on the data by SPSS27.0. For self-reported data, there may be an issue of common methodological bias, and therefore there is a need to assess whether there is common methodological bias between the variables involved in the study. Although the measurement tools in this study demonstrated good reliability and validity, we still examined the potential common method bias problem. Through the Harman single-factor test, the results showed that the first factor explained 46.17% of the total variance, slightly above the threshold of 40%, indicating that there might be a slight common method bias. However, considering the good reliability and validity indicators of each scale, this deviation is unlikely to have a substantial impact on the research results.

3. Result

3.1. Description and Pearson correlation analysis

Table 1 Description and related Analysis of physical activity, self-efficacy and perceived age discrimination

	M±SD	physical activity	self-efficacy	perceived age discrimination
physical activity	18.2±25.34	1		
self-efficacy	27.68±6.16	0.418**	1	
perceived age discrimination	6±3.37	-0.180**	-0.476**	1

**means $p < 0.01$; *means $p < 0.05$.

The results of Pearson correlation analysis indicated that there was a significant correlation among the three core variables involved in the study(table 1). Physical activity was significantly negatively correlated with perceived age discrimination ($r=-0.180$, $p<0.01$), indicating that the higher the physical activity level of the elderly, the lower the perceived degree of age discrimination. (2) Physical activity was significantly positively correlated with self-efficacy ($r=0.418$, $p<0.01$), indicating that participating in physical activity may help enhance the self-efficacy of the elderly. (3) Self-efficacy was significantly negatively correlated with perceived age discrimination ($r=-0.476$, $p<0.01$), and the degree of correlation was higher than that between physical activity and perceived age discrimination, suggesting that self-efficacy may play an important role in the process in which physical activity affects perceived age discrimination. These correlations provide a basis for the subsequent analysis of mediating effects.

3.2. Mediating Effect Test

By exploring the mediating role of self-efficacy in the influence of physical activity on perceived age discrimination (Table 2), the following main conclusions were drawn :(1) In Model 1, physical activity has a significant negative predictive effect on perceived age discrimination ($B=-0.180$, $t=-3.123$, $p=0.002$), and the coefficient of determination R^2 of the regression equation is 0.033. The adjusted R^2 was 0.029 and the F value was 9.754($p=0.002$), indicating that physical activity could explain 3.3% of the variation in perceived age discrimination. This result supports research hypothesis H1: Physical activity has a negative predictive effect on the perception of age discrimination among the elderly. (2) In Model 2, physical activity has a

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significant positive predictive effect on self-efficacy (B=0.418, t=7.844, p<0.001), the coefficient of determination R^2 of the regression equation is 0.175, the adjusted R^2 is 0.172, and the F value is 61.526(p<0.001) It indicates that physical activity can explain 17.5% of the variation in self-efficacy. (3) In Model 3, when physical activity and self-efficacy jointly predict perceived age discrimination, self-efficacy has a significant negative impact on perceived age discrimination (B=-0.486,P<0.001). This result verifies that self-efficacy is significantly negatively correlated with perceived age discrimination. After controlling self-efficacy as a mediating variable, it was concluded that the direct effect of physical activity on perceived age discrimination became insignificant (B=0.023, t=0.400, p=0.689). This result verified the research hypothesis H2: Physical activity indirectly reduces the degree of perceived age discrimination among the elderly by enhancing their sense of self-efficacy, and self-efficacy plays a completely mediating role in this relationship.

Table 2 Mediating Role of self-efficacy in the Impact of physical activity on perceived age Discrimination

Variable	Model 1 (Perceived Age Discrimination)		Model 2 (Self-efficacy)		Model 3 (Perceived Age Discrimination)	
	B	t	B	t	B	t
Physical activity	-0.180✳	-3.123	0.418✳✳✳	7.844	0.023	0.400
self-efficacy					0.486✳✳✳	-8.530
F	9.754		61.526		42.461	
R^2	0.033		0.175		0.227	
After adjustment R^2	0.029		0.172		0.222	

To further test the hypothetical results, the total effect, direct effect and indirect effect of physical activity on perceived age discrimination were examined. The results are shown in Table 3. The 95% confidence interval of the total effect calculated using the Bootstrap method is -0.039 to -0.009. This interval does not include the 0 value, and the total effect value is -0.180, indicating that the total effect is significant. This means that physical activity has a strong negative impact on perceived age discrimination. After controlling for self-efficacy, the direct effect value was 0.023, with a 95% confidence interval of -0.012 to 0.018, which included a 0 value. The effect indicated that the direct effect was not significant. The indirect effect value of physical activity on perceived age discrimination through self-efficacy is -0.203, with a 95% confidence interval ranging from -0.272 to -0.141, excluding 0, indicating a significant indirect effect. This means that the results can still support a negative relationship between physical

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activity and perceived age discrimination, although this relationship is achieved entirely indirectly through self-efficacy. That is to say, self-efficacy is the key psychological mechanism by which physical activity affects the perception of age discrimination. Therefore, in order to effectively reduce the elderly's perception of age discrimination, they should be encouraged to actively participate in physical activity and enhance their sense of self-efficacy through various channels. Through the dual effects of continuous participation in exercise behaviors and enhanced sense of efficacy, it can help the elderly build confidence in their own abilities, form a psychological mechanism to positively respond to external evaluations, thereby achieving a transformation from "passive perception of discrimination" to "active self-affirmation", and injecting lasting impetus into their mental health and social adaptation.

Table 3 Analysis of the total Effect of Physical activity on Perceived Age Discrimination

Effect Type	Effect Value	BootSE	P	Bootstrap95%C	
				Lower limit	upper limit
Total effect	-0.180	0.008	0.002	-0.039	-0.009
Direct effects	0.023	0.008	0.689	-0.012	0.018
Indirect effect	-0.203	0.034	0.427	-0.272	-0.141

This paper constructs a mediating model with physical activity as the independent variable, self-efficacy as the mediating variable, and perceived age discrimination as the dependent variable (as shown in Figure 1), aiming to deeply reveal the psychological mechanism by which physical activity affects the perceived age discrimination of the elderly. The empirical analysis results show that self-efficacy plays a completely mediating role in this relationship. That is, the direct effect of physical activity on perceived age discrimination is not significant, and its influence is mainly achieved indirectly by enhancing the self-efficacy of the elderly. This discovery indicates that the positive effects of physical activity do not directly act on an individual's perception of age discrimination, but rather improve their psychological response to external evaluations by enhancing their confidence and sense of control over their own abilities, thereby effectively reducing the perception of age discrimination.

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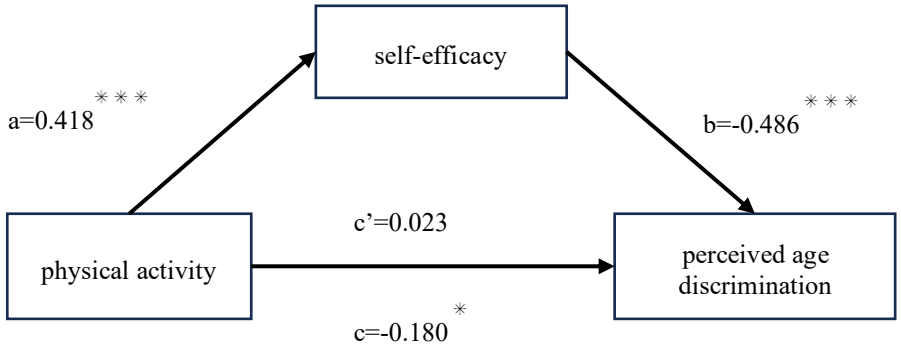

Figure 1 Simple mediating model diagram of self-efficacy in the impact of physical activity on perceived age discrimination

4. Discussion

4.1. Discussion on the relationship between physical activity and perceived age discrimination

The results of this study show that there is a significant negative correlation between physical activity and the perception of age discrimination among the elderly ($r=-0.180$, $p<0.01$), which means that the elderly with a higher level of physical activity tend to perceive the negative impact of age discrimination less. This result is basically consistent with the conclusions of existing studies. For instance, Steward and Hasche pointed out that the positive physical experiences gained through physical activity can significantly reduce the degree of internalizing age-ism in the elderly and help them resist age-related negative psychological responses (Steward & Hasche, 2022).

According to the stereotype embodiment theory(Levy, 2009), people's negative stereotypes about age can be internalized as negative self-perception, which further has adverse effects on physical and mental health. However, active participation in sports can alleviate sensitivity to negative information by improving self-perception. The positive physiological experiences (such as enhancing physical fitness and reducing physical pain) and positive psychological experiences (such as a sense of success and achievement) brought by physical activity can, to a certain extent, counteract the internalization of age-related negative evaluations by the elderly, thereby reducing the level of age discrimination they perceive.

Furthermore, although the degree of correlation ($r=-0.180$) in this study was significant, its intensity was relatively weak, suggesting that in future research, there might be other psychological or social variables further regulating or mediating this relationship, which is worthy of more in-depth exploration.

4.2. Discussion on the complete mediating role of self-efficacy in the relationship between physical activity and perceived age discrimination

This study further analyzed and found that self-efficacy played a fully mediating role in the relationship between physical activity and perceived age discrimination. This means that the direct effect of physical activity on perceived age discrimination is not significant, and its influence is almost entirely achieved by enhancing the self-efficacy of the elderly. This discovery is in line with the relevant viewpoints of the self-efficacy theory (Bandura, 1977) and the stereotype embodiment theory (Levy, 2009), emphasizing the important role of the psychological mechanism of self-efficacy in resisting the influence of age discrimination.

Specifically, physical activity helps the elderly gain a sense of success, enhance their sense of control over their bodies and self-efficacy, thereby strengthening their positive perception of

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their own abilities. This positive psychological transformation makes it easier for the elderly to adopt positive psychological defense mechanisms when facing possible age discrimination in the outside world, rather than internalizing it as self-denial or anxiety in a negative way. This is consistent with the research results of Steward and Hasche (2022), that is, self-efficacy is an important psychological pathway for physical activity to reduce negative age perception in the elderly.

In this study, the correlation coefficient between self-efficacy and perceived age discrimination (r=-0.476) was significantly higher than the direct relationship between physical activity and perceived age discrimination (r=-0.180), further highlighting the core position of self-efficacy in this regard. This also suggests that in actual intervention, special attention should be paid to enhancing the self-efficacy of the elderly. For instance, this can be achieved by increasing the experience of successful exercise, implementing psychological support programs, and creating a social environment conducive to enhancing self-efficacy, so as to maximize the positive effects of physical activity on the mental health of the elderly.

It should be noted that the complete mediating effect revealed in this study is based on a cross-sectional research design, and thus there are certain limitations in the explanation of causal relationships. Future research can further verify the dynamic mechanism of self-efficacy in this relationship through longitudinal design and further confirm the psychological protective effect of self-efficacy from a long-term perspective.

5. Conclusion

5.1. Research Conclusion

This study conducted an empirical analysis on the relationship among physical activity, self-efficacy and perceived age discrimination, and reached the following main conclusions:

(1) Physical activity was significantly negatively correlated with perceived age discrimination ($r = -0.180$, $p < 0.01$), indicating that the higher the degree of physical activity that the elderly participated in, the lower the degree of perceived age discrimination. This means that the positive experiences and social interaction activities brought by physical activity may, to a certain extent, help the elderly resist and alleviate the negative stereotypes about their age held by the outside world.

(2) Physical activity was significantly positively correlated with self-efficacy ($r = 0.418$, $p < 0.01$), revealing that physical activity can effectively enhance the self-efficacy of the elderly, that is, individuals' positive evaluation and sense of control over their own abilities. The achievement experience, physical function improvement and social interaction brought by sports activities may be important reasons for enhancing the self-efficacy of the elderly.

(3) There is a significant negative correlation between self-efficacy and perceived age discrimination ($r = -0.476$, $p < 0.01$), and the correlation intensity is significantly higher than that between physical activity and perceived age discrimination. This indicates that self-efficacy plays an important psychological mechanism role in the process of physical activity influencing perceived age discrimination.

(4) Further mediating effect analysis results show that self-efficacy plays a complete mediating role in the relationship between physical activity and perceived age discrimination. That is, the direct effect of physical activity on perceived age discrimination is not significant, and its role is mainly achieved indirectly through the improvement of self-efficacy. This indicates that enhancing the self-efficacy of the elderly is the core psychological path for physical activity to reduce the perception of age discrimination.

The above conclusion verifies from a psychological perspective the significance of physical activity for the mental health of the elderly, clarifies the mediating mechanism of self-efficacy

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in it, and provides empirical evidence for further improving the mental health of the elderly group.

5.2. Research Recommendations

Based on the above research conclusions, this study puts forward the following suggestions:

(1) Take physical activity as the entry point to promote the improvement of mental health among the elderly. Physical activity should be regarded as an important means to enhance the mental health and social adaptability of the elderly. Communities and elderly care institutions can customize diverse sports programs such as health exercises, brisk walking, Tai Chi, and rehabilitation training based on the physical characteristics and interests of the elderly to stimulate their participation motivation. Government departments can lower the threshold for the elderly to participate in sports activities by improving venues and facilities, providing financial and policy support, and further increase the popularity and sustainability of physical activity.

(2) Enhance self-efficacy through physical activity and indirectly reduce perceived age discrimination. Physical activity not only enhances physical fitness but also enables the elderly to strengthen their sense of self-efficacy by achieving exercise goals and accumulating a sense of accomplishment. The design of sports programs should focus on scientificity and moderate challenge to ensure that the elderly continuously receive positive feedback and confidence during exercise, thereby forming a stronger sense of self-control and reducing their sensitivity to age discrimination in society.

(3) Build a support system centered on physical activity and the cultivation of self-efficacy.

It is suggested that communities, families and volunteer organizations establish a social support system involving professional instructors, social workers and family members. This system should not only provide safe and convenient exercise conditions for the elderly, but also promote social interaction through team sports, collective activities and other forms. Such a supportive environment helps to strengthen the exercise habits of the elderly, enhance their sense of self-efficacy, and reduce feelings of loneliness and marginalization.

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