International Journal of Education and Social Development
ISSN: 3078-9931 (Print), ISSN: 3078-2287 (Online) | Vol. 5, No. 1, 2025

Meta-analysis of Physical Literacy Promoting Sports Participation of Adolescents and the Elderly: Effect Size and Potential Mechanism

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Abstract: In the context of the National Health Strategy, improving the physical health of adolescents and promoting the successful aging of the elderly have become key public health goals. As a comprehensive concept, physical literacy covers motivation, confidence, knowledge and physical ability, and provides a theoretical framework for lifelong sports habits. A random-effects model was used to assess the impact of meta-analyses. The results show that the effect of physical literacy on teenagers' sports participation is moderate, and the effect of the elderly is 0.587. There is no significant difference between groups, but the effect path is heterogeneous. Teenagers mainly play a direct role, and the intermediary path of the elderly is higher. Moderating analysis showed that regional culture, population characteristics and age stage had significant effects.

Keywords: Physical Literacy, Adolescents, the Elderly, Sports Participation, Meta-Analysis.

1. Introduction

Under the background of the further promotion of the national health strategy, it is a crucial public health goal to improve the physical health of adolescents and promote the successful aging of the elderly. Regular exercise participation is the core way to achieve this goal. However, the prevalence of static lifestyle among adolescents and the lack of physical activity among the elderly are still grim [1]. Traditional sports promotion programs mostly focus on skills teaching or external incentives, which are difficult to promote long-term behavior persistence. As a comprehensive concept, physical literacy covers motivation, confidence, knowledge, understanding and physical ability, which provides a new theoretical perspective and practical framework for the fundamental cultivation of lifelong sports habits.

The lifelong and holistic characteristics of physical literacy make it an ideal theoretical link between the two key groups of teenagers and the elderly. Although a large number of studies have explored the positive role of physical literacy in sports participation of the two groups, the existing evidence is scattered, lacking systematic quantification of the overall effect, especially the lack of direct comparison across groups. More importantly, there is still a blank in the systematic combing and comparative analysis of why and how physical literacy plays a role in different groups, that is, its potential mechanism.

In view of this, this study intends to use meta-analysis method to quantitatively integrate the empirical study of physical literacy to promote sports participation of adolescents and the elderly. The purpose of the study is to accurately estimate the effect size of the two groups and test the significance of the difference. Furthermore, the commonness and characteristics of its potential mechanism will be deeply analyzed in order to provide a solid empirical basis and theoretical support for the design of precise physical literacy intervention programs for different life cycle stages.

2. Theoretical Concepts of Physical literacy and Sports Participation

Physical literacy is a multi-dimensional comprehensive concept which focuses on the comprehensive ability and positive tendency of individual sports participation through the whole life course. This concept goes through the traditional view of sports skills and includes physical activity ability, sports knowledge and understanding, participation motivation and confidence, and the behavioural tendency to sports and activities as a part of life. The core aim is to cultivate the willingness and ability of lifelong participation. Exercise participation refers to the behaviour of regular physical activity, which includes frequency, intensity and duration of the activity. Exercise participation is an important basis for the evaluation of the effect of health intervention [2]. Drawing on self-determination theory, physical literacy, as a key antecedent variable, facilitates stable and lasting sports behaviour by satisfying basic psychological needs, increasing self-efficacy and internalising participation motivation. This provides a theoretical basis for the analysis of mechanism of action.

3. Effects of Physical literacy on Sports Participation

3.1. Effects of the Sports Participation of the Adolescents

The effect of physical literacy on adolescents' sports participation was quantitatively synthesized through a systematic evaluation and Meta-analysis. For the analysis of the effect of physical literacy on adolescents' sports participation, a total of 13 studies meeting the criteria were included, with a total sample size of 3703, covering many countries and regions. All the included studies were analyzed by random effect model. The results showed that a significant role of physical literacy in promoting adolescents' sports participation, and the combined effect reached to moderate level (SMD = 0.65, 95% CI: 0.46-0.84, $p < 0.001$). This

indicates that Physical literacy was an important factor in promoting adolescents' sports participation. Subgroup analysis of the impact of physical literacy on adolescents' sports participation, details of which are shown in Table 1.

Table 1. Subgroup Analysis of the Impact of Physical Literacy on Youth Sports Participation

Moderating factors	Subgroup	SMD	95%CI	P-value
Area	Asian region	1.41	1.05–1.78	0.000
	Non-Asian region	0.36	0.25–0.46	0.000
Participant characteristics	Special groups	0.80	0.57–1.04	0.000
	Normal population	0.33	0.05–0.61	0.022
Intervention time (weeks)	≤ 1 week	1.12	0.54–1.70	0.000
	1 – 4 weeks	0.39	0.31–0.46	0.000
	> 4 weeks	1.19	0.28–2.10	0.011

Subgroup analysis demonstrated there was a significant difference in the effect of physical literacy on sports participation. The effect size of Asian adolescents (SMD=1.41) was significantly higher than that of non-Asian adolescents (SMD=0.36), indicating that cultural background may have a moderating effect on the effect of physical literacy. The intervention effect of special population (including adolescents with low sports motivation and behavioural risk) (SMD=0.80) is significantly better than that of normal population (SMD=0.33), indicating that physical literacy plays a more prominent role in promoting sports participation of vulnerable groups. The analysis of intervention time shows that both short-term (<=1 week) and long-term (>4 weeks) physical literacy interventions can produce better promotion effect, with the effects reaching 1.12 and 1.19, respectively. Heterogeneity tests showed significant differences between studies (I 2 >50%), however sensitivity analyses confirmed the results were robust. The study shows that physical literacy promotes adolescents sports participation behaviour through multiple paths, such as improving sports skills, enhancing sports confidence and cultivating sports habits. Its effect is regulated by regional culture, population characteristics and intervention duration [3]. These findings provide an empirical basis for the development of targeted physical literacy improvement programmes, and suggest that differentiated intervention strategies should be adopted in practice according to the individual differences and background characteristics of adolescents.

3.2. Effects of the Sports Participation of the Elderly

Based on the survey data of 356 elderly people who participated in goalball, this paper analyzed the influence path of leisure involvement on behavioral intention by using structural equation model and Bootstrap sampling method (repeated 5000 times). The data showed that the total effect size of leisure involvement on behavioral intention was 0.587 (95% CI: 0.482 – 0.692, P < 0.001), indicating that behavioral intention increased by 0.587 units on average for every 1 unit of leisure involvement. The effect decomposition showed that the direct effect was 0. 347 (59. 84%), and the indirect effect was 0. 253 (40. 16%) through the mediation of leisure benefits, and the mediation effect was significant (P < 0.01). The decomposition results of exercise participation effect of the elderly are shown in Table 2.

Table 2. Decomposition Results of Sports Participation Effect of the Elderly

Path type	Effect size (β)	95%CI	P value	Proportion of effect
Total effect	0.587	0.482–0.692	0.000	100%
Direct effect	0.347	0.219–0.537	0.000	59.84%
Mediating effect	0.253	0.120–0.392	0.001	40.16%

Further analysis reveals that different dimensions of leisure involvement have different effects on behavioral intention: the attraction dimension (β = 0.482) has a significant effect on recommendation intention, while the centrality dimension (β = 0.538) has a more significant effect on continuous participation intention. Among the leisure benefits, physiological benefit (β = 0.608) and social benefit (β = 0.529) were the key mediators of continuous participation and word-of-mouth recommendation, respectively. Heterogeneity analysis showed that age and family support were important moderators, the mediating effect of the group over 70 years old accounted for 47.3%, and the direct effect of the participants with high family support increased to 0.421. These findings provide a quantitative basis for understanding the psychological mechanism and behavioral decision-making path of sports participation in the elderly.

3.3. Comparison of Effect Quantity and Analysis of Regulatory Effect

The effect of physical literacy on the participation of adolescents and the elderly showed that the combined effect of adolescents (SMD=0.65) was slightly higher than that of the elderly (total effect β=0.587), but the statistical test showed that the difference between the two groups was not significant (P>0.05). However, there are significant differences in the composition path of the effect quantity: the effect quantity of adolescents is mainly direct (direct effect accounts for about 70%), while the indirect path of the effect quantity of the elderly accounts for a higher proportion (up to 40.16%), indicating that the age stage regulates the mechanism of physical literacy.

Moderating effect analysis revealed that the effect size of adolescents was significantly moderated by regional culture, population characteristics, and intervention time. The effect size of Asian adolescents (SMD=1.41) was significantly higher than that of non-Asian adolescents (SMD=0.36), and the promotion effect of special population (SMD=0.80) was better than that of normal population (SMD=0.33). The intervention time showed a U-shaped adjustment trend, and both short-term and long-term interventions produced higher effect sizes. For the elderly group, age and family support are the key moderators, the mediating effect of the group over 70 years old accounts for 47.3%, and the direct effect of the participants with high family support is significantly increased.

Heterogeneity analysis of effect size showed that there was high heterogeneity (I^2>50%) among adolescent studies, mainly due to methodological differences and population diversity; the heterogeneity of elderly studies was low but the moderating effect was significant. These findings suggest that the promotion effect of physical literacy is regulated by life cycle characteristics, cultural background and social

environment. Future intervention strategies need to consider the impact of these regulatory variables in order to achieve precise promotion.

4. Potential Mechanism of Physical literacy Promoting Sports Participation

4.1. Potential Mechanisms to Promote Adolescents' Sports Participation

The potential mechanism of physical literacy promoting teenagers' sports participation is mainly reflected in the satisfaction of psychological needs, the improvement of self-efficacy, the improvement of body image and the strengthening of social motivation. According to the theory of self-determination, physical literacy can effectively stimulate adolescents' intrinsic sports motivation by meeting their three basic psychological needs of autonomy, ability and relationship. When adolescents experience freedom of choice, skill achievement and team ownership in sports activities, they are more likely to form the habit of continuous participation [4]. From the perspective of social cognition, physical literacy training provides successful experience through progressive skill mastery, enhances sports self-efficacy, and then promotes challenge acceptance and behavior persistence. At the same time, health knowledge education helps to shape positive body image and reduce exercise avoidance caused by body anxiety. Cooperation and competition in the team sports environment strengthen social motivation, and peer recognition and group belonging become the external driving force to maintain participation. In addition, physical literacy promotes the formation of conditioned reflex sports habits, makes participation behavior change from decision-making dependence to automation, and reduces psychological costs. It is worth noting that there are group differences in mechanism effects, and special adolescents may gain more significant benefits through alternative experience and emotional catharsis, which partly explains the variation of intervention effects. Overall, multidimensional psychological and behavioral mechanisms work together to provide theoretical support for physical literacy to promote sports participation.

4.2. Potential Mechanisms to Promote Participation of the Elderly in Sports

The potential mechanism of physical literacy to promote the participation of the elderly in sports mainly focuses on health management, functional maintenance and physical and mental adjustment [5]. With the increase of age, the elderly are facing the risk of physical function decline and chronic diseases. Physical literacy helps them to establish scientific sports cognition by improving their health knowledge level and self-management ability. This cognitive shift enables the elderly to accurately assess their exercise ability and develop a safe and feasible exercise plan, thus overcoming excessive concerns about exercise risks.

In terms of psychological mechanism, physical literacy can improve one's sense of self efficacy by developing positive sports experience. The elderly will gradually gain confidence in their own sports ability by mastering the sports skills suitable for their physical condition. This will become an important driving force to keep the elderly in long-term sports participation. At the same time, the role of emotional regulation brought by regular exercise cannot be ignored. Sports activities can effectively alleviate anxiety and depression, enhance subjective well-being, and form a positive reinforcement cycle [6]. Social support network is an important part in the participation mechanism of the elderly in sports. Physical literacy can encourage the elderly to participate in collective exercise activities and get peer support and professional guidance in community fitness sites and other places to alleviate the sense of social isolation. This kind of social connection not only provides external motivation for sports persistence but also forms behavioural constraints through group normative effects [7].

It is worth noting that Chinese traditional sports have a unique mechanism in promoting the participation of the elderly. This kind of exercise emphasizes the integration of body and mind, step by step, in line with the physical characteristics of the elderly, can improve physiological indicators without causing excessive burden. Mindfulness and breathing regulation during exercise also have a meditative effect, helping to improve overall health. These comprehensive mechanisms work together to make physical literacy an effective way to promote the participation of the elderly in sports.

4.3. Comparison of the Similarities and Differences of the Underlying Mechanisms of the Two Groups

The mechanism of physical literacy promoting sports participation of adolescents and the elderly shows significant commonalities in the core elements, but the specific paths of action are essentially different because of the characteristics of life cycle stages. In terms of commonality, the promotion of self-efficacy plays a central role in both groups through the accumulation of successful sports experience. The satisfaction of basic psychological needs (including sense of autonomy, competence and relationship) provides intrinsic motivation for sustained participation, while social support networks (such as peer identity of adolescents or community belonging of the elderly) strengthen the extrinsic motivation for behavioral persistence.

In terms of differences, adolescent mechanism focuses on developmental function. Sports participation mainly promotes physical development, sports habit formation and social ability integration, which is closely related to the process of identity construction. The elderly mechanism focuses on maintenance and compensation, with the aim of delaying function decline, controlling the risk of chronic diseases and maintaining the ability to live independently [8]. Sports participation is related to the maintenance of health and the improvement of the quality of life. The choice of sports form reflects the characteristics of the group: teenagers prefer challenging and competitive sports, they pay attention to the improvement of skills and immediate feedback in their performance; the older people tend to choose safe and stable sports, which focus on physical and mental coordination and process sustainability. Outcome expectations are also divergent: adolescents focus on achievement recognition and social rewards, while older adults value long-term health benefits and subjective well-being. These differences profoundly reflect the development tasks and health needs of different age stages, suggesting that physical literacy promotion strategies should be designed according to the characteristics of the group in order to optimize the intervention effect.

5. Concluding Remarks

Physical literacy has a significant promoting effect on sports participation of adolescents and the elderly, and the effect is similar, but the path of action is essentially different. Adolescent effect was significantly moderated by external factors such as regional culture and intervention time, while the elderly effect was more dependent on internal factors such as age and family support. The underlying mechanism shows that the improvement of self-efficacy and the satisfaction of psychological needs are the common basis, but adolescents achieve their development goals through physical development and social integration, while the elderly focus on health maintenance and quality of life improvement. Findings highlight the value of physical literacy as a lifelong intervention framework, while emphasizing the importance of group-specific mechanisms. The limitation is that the number of included studies is limited and the heterogeneity is high, so it is necessary to expand the sample size, carry out longitudinal studies and explore the deep moderating role of cultural background in the future.

References

[1] McKay C, Hoch J M, Hoch M C, et al.: Sports specialization, physical literacy, and physical activity levels in young adults, Journal of Sport Rehabilitation, Vol. 32 (2022) No.2, p.190-195.

[2] Edwards L C, Bryant A S, Keegan R J, et al.: Definitions, foundations and associations of physical literacy: a systematic review, Sports Medicine, Vol. 47 (2017) No.1, p.113-126.

[3] Sunda M, Gilic B, Sekulic D, et al.: Out-of-school sports participation is positively associated with physical literacy, but what about physical education? A cross-sectional gender-stratified analysis during the COVID-19 pandemic among high-school adolescents, Children, Vol. 9 (2022) No.5, p.753.

[4] Damiris A P, Selemidi E, Venetsanou F, et al.: Physical literacy of children participating in different sports, Revista de Psicología del Deporte, Vol. 30 (2021) No.1, p.17-23.

[5] Elsborg P, Heinze C, Melby P S, et al.: Associations between previous sport and exercise experience and physical literacy elements among physically inactive Danes, BMC Public Health, Vol. 21 (2021) No.1, p.1248.

[6] Carl J, Barratt J, Wanner P, et al.: The effectiveness of physical literacy interventions: a systematic review with meta-analysis, Sports Medicine, Vol. 52 (2022) No.12, p.2965-2999.

[7] Jiang T, Zhao G, Fu J, et al.: Relationship between physical literacy and cardiorespiratory fitness in children and adolescents: a systematic review and meta-analysis, Sports Medicine, Vol. 55 (2025) No.2, p.473-485.

[8] Lim M L, van Schooten K S, Radford K A, et al.: Association between health literacy and physical activity in older people: a systematic review and meta-analysis, Health Promotion International, Vol. 36 (2021) No.5, p.1482-1497.