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Original Article (Pages: 111-121)

The Relationship between Adolescents' Physical Literacy and Physical Activity Information Sources

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Abstract

Background: Physical literacy is crucial for promoting a healthy lifestyle. Adolescents learn about physical activity from diverse sources like the Internet, parents, physical education specialists, and friends. This study investigates the relationship between adolescents' physical literacy and their sources of information regarding physical activity.

Materials and Methods: In this cross-sectional study, 510 Iranian adolescents aged 16-18 years were randomly selected from high schools in Tehran during the 2021 academic year. Data were collected using a researcher-developed questionnaire that assessed both general characteristics and physical literacy. The physical literacy section of the questionnaire included 34 items spanning four dimensions: information acquisition, information comprehension, information assessment, and self-care skills. Data were analyzed using SPSS software (version 16.0).

Results: This study assessed physical literacy among 510 Iranian adolescents (50.2% girls, aged 16–18). Most (61.4%) spent 1–4 hours daily online, 58.6% were sports club members, and 42.4% used the Internet for physical activity information. Physical literacy scores showed 35.3% had insufficient literacy, 43.7% good, and 21% excellent. No significant gender ($p = 0.370$) or age differences ($p = 0.448$) were found in overall scores, though the self-care domain varied by age ($p= 0.012$). Adolescents guided by club coaches had higher scores than those relying on parents ($p = 0.008$). Significant differences were observed in the acquisition ($p = 0.004$), assessment ($p = 0.047$), and self-care ($p = 0.001$) domains but not comprehension ($p = 0.088$). Interestingly, non-members of sports clubs scored higher overall ($p = 0.001$), particularly in acquisition and self-care domains.

Conclusion: This study of 510 Iranian adolescents revealed that while most had good or excellent physical literacy, 35.3% had insufficient levels. Those who received information from club coaches scored higher, while non-sports club members had better overall scores. These findings emphasize the need for targeted interventions that utilize trusted sources like coaches and accessible platforms to enhance physical literacy and promote healthier lifestyles among adolescents.

Key Words: Adolescents, Information sources, Iran, Physical activity, Physical literacy.

*Please cite this article as: Alipour-Anbarani M, Ghaffari M, Montazeri A, Kavousi A, Ramezankhani A. The Relationship between Adolescents' Physical Literacy and Physical Activity Information Sources. Health Provid 2022; 2(2): 111-21. doi: **10.22034/HP.2023.418463.1042**

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Received date: Mar. 19, 2022; Accepted date: Nov. 22, 2022

1- INTRODUCTION

The concept of physical literacy was first introduced by Margaret Whitehead in 1993 and involves motivation, confidence, physical competence, and knowledge and understanding to engage in physical activity throughout life (1). Physical literacy serves as the foundation for acquiring cognitive, behavioral, and methodological skills that enhance the benefits of lifelong physical activity (2). Research indicates that the mean physical literacy score for adolescents is 63% for boys and 62% for girls, reflecting a moderate level of physical literacy; typically, girls have a lower mean score compared to boys (3, 4). Approximately one-fifth of the world's population, or about 1.2 billion people, are adolescents aged 10-19 (5). According to the 2016 census in Iran, adolescents aged 10-19 comprised a significant portion of the country's population, totaling 11.2 million (6).

Inadequate physical activity is a major risk factor for death worldwide. Approximately 2.3 million people die every year due to a lack of physical activity (7). In the last two decades, physical activity has decreased across all age groups. More than 80% of the world's adolescent population does not engage in sufficient physical activity (8). It is estimated that 80.3% of adolescents do not meet current physical activity guidelines (9). Researchers around the world have shown that economically disadvantaged girls and ethnic minorities are less physically active (10, 11). Physical activity decreases with age (12, 13). Active commuting to school and opportunities for active play are declining, while sedentary activities are on the rise (14).

Adolescents are less engaged in physical activity when they possess lower levels of physical literacy, which increases their risk of diseases associated with a sedentary lifestyle, such as obesity and diabetes (15, 16). Regular and adequate physical activity significantly reduces the risk of developing chronic diseases in adulthood (8, 17). The school years represent a critical period for establishing health in later life, as proper physical activity during these formative years plays a vital role in stabilizing health and holds substantial potential for enhancing well-being in this age group (17). Given the pivotal role of adolescents in public health, their contributions should be evaluated as foundational to future health outcomes (5). Adolescents seek information on physical activity from various sources, including the Internet, parents, physical education specialists (such as sports club coaches and school physical education teachers), and peers (18). Achieving better physical literacy necessitates collaboration among all stakeholders involved, including parents, managers and trainers of physical training, sports associations, and club leaders (19, 20).

Physical literacy advances through acquiring knowledge and information about the nature of physical activity and its relationship with health. Specialists are responsible for ensuring the development of adolescents, researching, and gathering new information in this field. Teachers working with older age groups often specialize in physical education. All specialized teachers of physical training should understand the importance and value of physical literacy and their role in training programs. Also, the people who have responsibility in clubs, sports classes, and leisure centers are highly influential, and their efforts can be important in adolescents continuing their physical activities, evaluating their competencies, trying new and appropriate activities, and learning new skills while developing their merits (20).

In the current era, information sources such as the Internet and mobile phones have transformed the world into a global village, making Internet usage widely

popular (21, 22). Today, mass media, including the Internet and virtual spaces, holds significant appeal for people, influencing their values, attitudes, and social/cultural identities. Virtual social networks can play a highly effective role in the development of both specialized and general education (23). Therefore, it is essential to leverage these media to encourage physical activity among individuals. This approach allows for the training of numerous people at a lower cost compared to traditional written media and face-to-face interventions (24). Additionally, these platforms can deliver information quickly and efficiently while positively impacting the audience's knowledge, literacy, and attitudes (25). The present study utilizes a physical literacy questionnaire designed for adolescents aged 16 to 18 years, tailored to Iranian culture and attitudes (18), with the aim of investigating the physical literacy of Iranian adolescents based on their sources of physical activity information.

2- MATERIALS AND METHODS

2-1. Study Design

In this cross-sectional study, 510 Iranian adolescents aged 16 to 18 years from high schools in Tehran, Iran, were selected through random sampling in 2021. The physical literacy of the adolescents was assessed based on their sources of physical activity information, which included the Internet, parents, physical education specialists (such as sports club coaches and school physical education teachers), and friends.

2-2. Participants and method

The study population consisted of Iranian adolescents aged 16 to 18 who were studying in high schools in Tehran. The research setting included high schools for both girls and boys in educational districts 1, 2, 4, and 6 of Tehran. The sample size was determined using the following formula:

$$n = \frac{Z^2_{1-\frac{\alpha}{2}}\, p(1-p)}{d^2}$$

Where p=0.50 (proportion of individuals with sufficient physical literacy), α=0.05, confidence level = 95%, and d=0.05 (margin of error). A total of 424 samples were considered, accounting for a 10% attrition rate.

To ensure proper coverage, Tehran was divided into five regions: northeast, northwest, southeast, southwest, and central. Four districts (1, 2, 4, and 6) were randomly selected from a total of 19 educational districts. Subsequently, one high school for girls and one high school for boys were randomly chosen from each selected district.

After visiting the chosen schools, the researcher introduced himself and provided a brief explanation of the research plan to the school principals. In coordination with the principals and their assistants, a class was randomly selected from each grade and field of study. All students in the selected classes participated in the study with their consent.

2-3. Data collection

The data collection tool was a valid and reliable questionnaire (18) consisting of two parts: personal characteristics, which included 12 items, and the physical literacy of adolescents, which comprised 34 items across four dimensions. Personal characteristics included age, gender, educational grade, field of study, parents' education, parents' occupation, sports club membership, and sources of information about physical activity.

The physical literacy section contained 34 items divided into four domains: information acquisition skills (8 items), information comprehension skills (11 items), information assessment skills (6 items), and self-care skills (9 items).

Responses were rated on a five-point Likert scale: never (1 point), rarely (2 points), sometimes (3 points), most of the time (4 points), and always (5 points) (18).

Based on the cut-off points of 50, 66, and 84, the physical literacy of adolescents was categorized into four levels: insufficient (scores from 0 to 50), not sufficient (50.1 to 66), good (66.1 to 84), and excellent (84.1 to 100) (26). Data were collected through self-report questionnaires. Due to the overlap of data collection with the COVID-19 pandemic, the method for completing the questionnaire varied; it was conducted in-person in some schools and online in others.

Data collection took place over two months, from April to May 2021. Out of 955 visits to the Press Line website, students completed 406 questionnaires online, while 126 questionnaires were filled out in person. After reviewing the 532 completed questionnaires, those with missing information were excluded from the research process. Ultimately, 510 questionnaires with complete information were included in the analysis. The number of completed questionnaires exceeded the sample size because additional questionnaires were sent to the Porsline system (https://porsline.ir/) for online completion.

2-4. Inclusion criteria

Participants were included in the study if they met the following criteria: they were aged 16 to 18, were students at the time of the study, actively participated in the research, had no physical disabilities, and provided informed consent to participate.

2-5. Exclusion criteria

The exclusion criteria included withdrawal from participation in the research and submission of incomplete questionnaires.

2-6. Validity and reliability of the tool

The psychometric properties of this tool have been examined in previous studies conducted in Iran, confirming its validity in terms of content, appearance, and cultural relevance. The reliability of the tool, as measured by Cronbach's alpha, was reported to be 0.93. Therefore, this tool is considered valid and reliable for use in Iran (18).

2-7. Data analysis

Normality was assessed using the Kolmogorov-Smirnov test. Descriptive statistics (frequency, mean, and standard deviation) and inferential statistics (independent t-test and one-way ANOVA) were employed to analyze the data. Statistical analysis was conducted using SPSS software version 16.0. A p-value of less than 0.05 was considered statistically significant.

2-8. Ethical considerations

This study, conducted as part of a PhD thesis in health education and health promotion and approved by Shahid Beheshti University of Medical Sciences (IR.SBMU.PHNS.REC.1398.125),
adhered to the ethical principles outlined in the Belmont Report (27), prioritizing the protection of human subjects. Respect for persons was ensured through voluntary participation, comprehensive informed consent, and the right to withdraw without penalty, thereby emphasizing individual autonomy.

Beneficence was addressed by employing validated assessments of adolescent physical literacy, aiming to maximize benefits while minimizing potential harm to participants. Justice was upheld through fair participant selection via random sampling across various districts of Tehran, ensuring an equitable distribution of research burdens and benefits. Furthermore, rigorous measures were implemented throughout the study to maintain participant confidentiality.

3- RESULTS

Out of the 510 Iranian adolescents aged 16 to 18 years participating in the study, 256 (50.2%) were girls. In terms of age distribution, 134 participants were 16 years old (26.3%), 207 were 17 years old (40.6%), and 169 were 18 years old (33.1%). Additionally, 313 adolescents (61.4%) reported spending between 1 and 4 hours per day using cyberspace. Furthermore, 58.6% of the adolescents were members of sports clubs, and 42.4% identified the Internet as their primary source for answers to questions about physical activity (**Table 1**).

According to the physical literacy scores, 6.7% of adolescents (34 students) had insufficient physical literacy, 28.6% (146 students) had not sufficient physical literacy, 43.7% (223 students) had good physical literacy, and 21% (107 students) had excellent physical literacy. The independent t-test indicated no significant difference between the mean physical literacy scores of male and female adolescents ($p = 0.370$). The mean physical literacy score for male adolescents was 72.32 ± 13.98, while for female adolescents it was 71.15 ± 15.42; however, this difference was not statistically significant ($p = 0.405$) (**Table 2**).

Table-1: General characteristics of the participants (n = 510).

Variables	Number	%
Gender		
Boy	254	49.8
Girl	256	50.2
Age (years)		
16	134	26.3
17	207	40.6
18	169	33.1
Academic year		
10	157	30.8
11	155	30.4
12	198	38.8
Field of study		
Vocational Training	103	20.2
Technical Training	96	18.8
Humanities	108	21.2
Experimental Sciences	111	21.8
Mathematics & Physics	92	18
Sports club membership		
No	211	41.4
Yes	299	58.6
Initial source of information		
Physical education teacher	60	11.8
Sports club coach	116	22.7
Parents	80	15.7
Friends	38	7.5
Internet	216	42.4
Daily cyberspace usage (hours)		
1-4	313	61.4
5-8	142	27.8
9-12	55	10.8

Table-2: Comparison of mean scores for adolescents' physical literacy and its dimensions based on the gender.

Domains of physical literacy	Girl		Boy		P-value
	Mean	SD	Mean	SD	
Acquisition	32.12	6.31	32.22	5.59	0.852
Comprehension	44.76	7.97	44.74	7.23	0.978
Assessment	23.18	4.60	23.55	4.08	0.341
Self-care	30.74	7.88	31.85	7.48	0.102
Total physical literacy score	71.15	15.42	72.32	13.98	0.370

SD: Standard deviation.

The one-way ANOVA test revealed no significant difference in the mean physical literacy scores among the different age groups of adolescents (p = 0.448). However, a significant difference was observed across different age groups specifically in the self-care domain (p=0.012). The mean physical literacy score for 18-year-old adolescents was higher (72.93 ± 14.40) compared to both 16- and 17-year-old adolescents, but this difference was not statistically significant (p = 0.448) (**Table 3**).

Table-3: Comparison of mean scores for adolescents' physical literacy and its dimensions based on age groups.

Age (year)	Dimensions of physical literacy								Total physical literacy score	
	Acquisition		Comprehension		Assessment		Self-care			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
16	31.78	6.06	44.05	7.99	23.41	4.43	31.08	7.58	70.99	15.00
17	32.36	6.21	45.13	7.54	23.19	4.50	30.31	7.91	71.32	14.82
18	32.16	5.56	44.84	7.36	23.54	4.12	32.66	7.36	72.93	14.40
P-value	0.761		0.438		0.733		0.012		0.448	

SD: Standard deviation.

The one-way ANOVA test revealed a significant difference in the mean scores of adolescents' physical literacy based on the source of information received (p = 0.004). Adolescents who referred to their club coach had higher physical literacy scores (75.52 ± 14.84). The post-hoc test further showed a significant difference in the mean physical literacy scores between adolescents who received information from their club coach and those who relied on their parents (p = 0.008). Additionally, the one-way ANOVA test indicated significant differences in the mean physical literacy scores across the domains of acquisition (p = 0.004), assessment (p=0.047), and self-care (p = 0.001), though no significant difference was found in the comprehension domain (p = 0.088) (**Table 4**).

The independent t-test revealed a significant difference in mean physical literacy scores based on sports club membership (p = 0.001). Interestingly, adolescents who were not members of a sports club had higher physical literacy scores (74.63 ± 14.58) compared to those who were members. Significant differences were also observed in the domains of acquisition (p = 0.011) and self-care (p = 0.001) concerning sports club membership (**Table 5**).

Table-4: Comparison of mean scores for adolescents' physical literacy and its dimensions based on the source of receiving physical activity information.

Source of receiving information	Dimensions of physical literacy								Total physical literacy score	
	Acquisition		Comprehension		Assessment		Self-care			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Physical training teacher	30.25	5.41	43.67	7.34	23.08	4.00	31.15	7.05	69.23	13.24
Club coach	32.64	6.09	45.43	7.72	24.28	4.14	34.35	6.92	75.52	14.84
Parents	30.99	6.00	43.50	7.36	22.49	4.55	29.82	7.15	68.36	13.98
Friends	31.32	5.71	43.03	7.82	22.68	4.16	30.61	7.37	68.85	14.81
Internet	33.03	5.89	45.45	7058	23.40	4.45	30.36	8.12	72.21	14.92
P-value	0.004		0.088		0.047		0.001		0.004	

SD: Standard deviation.

Table-5: Comparison of mean scores for adolescents' physical literacy and its dimensions based on sports club membership.

Club membership	Dimensions of physical literacy								Total physical literacy	
	Acquisition		Comprehension		Assessment		Self-care			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
No	32.97	5.62	45.51	7.66	2.78	4.15	33.25	7.21	74.63	14.58
Yes	31.60	6.13	44.21	7.52	23.07	4.47	29.92	7.74	69.73	14.51
P-value	0.011		0.058		0.070		0.001		0.001	

SD: Standard deviation.

4- DISCUSSION

This cross-sectional study investigated the relationship between the physical literacy of adolescents and their sources of information regarding physical activity. The participants comprised 510 Iranian students from selected high schools in Tehran, Iran. A one-way ANOVA revealed that adolescents who consulted their sports club coach for information exhibited significantly higher physical literacy compared to their peers (75.52±14.84, p=0.004).

In this study, 42.4% of adolescents identified the Internet as their primary source of physical activity information. This finding aligns with other research: one study reported that 75% of young people aged 15-24 use the Internet for information (28), and another indicated that over 80% of adolescents use it for health information (29). Given adolescents' widespread access to the Internet, it presents an avenue for enhancing physical literacy skills through targeted educational interventions. However, Ghanbari et al. (30) found that approximately 50% of adolescents cited their parents as their primary information source, a result that contrasts with the present study.

Similarly, Brown et al. reported that about 31% of students considered their parents as the main source of health information (31), which also differs from the current study's findings. Furthermore, our analysis revealed a significant association between adolescents' mean physical literacy and their source of physical activity information (p=0.004). Specifically, adolescents who obtained information from their sports club coach demonstrated higher physical literacy scores (75.52±14.84, p=0.003). This may be because club coaches possess specialized knowledge tailored to adolescents' needs, which the adolescents trust and apply practically. According to this study, 61.4% of adolescents reported spending between 1 and 4 hours per day using cyberspace.

A 2010 national study in the United States reported that children and adolescents aged 8-18 years spent over 7.5 hours daily in

cyberspace (32), and this figure approached 9 hours in 2015 for adolescents aged 13-18 (33). From 2015 to 2023, the percentage of U.S. teens constantly online almost doubled, going from 24% to 46%1. Saunders et al. observed that boys generally spend more time in cyberspace than girls. Consequently, adolescents' cyberspace usage has grown significantly in recent years, potentially becoming their most frequent daily activity besides sleeping (34).

In the present study, male adolescents showed a higher mean physical literacy score compared to female adolescents, although the difference was not statistically significant (p=0.370). Cultural and social norms, such as observing hijab and specific attire during physical activity in public spaces, might contribute to decreased physical activity among girls. Tremblay et al. (4) also found a higher mean physical literacy score for boys, which contrasts with the present study's non-significant difference. Conversely, Mirali et al. and Blanchard et al. (35, 36) reported that girls had higher mean physical literacy scores in knowledge and comprehension.

The findings of the current study indicated no significant relationship between the mean score of physical literacy and age groups (p = 0.448), which aligns with the results of Longmuir et al. (37). Additionally, the mean physical literacy score for the 18-year-old age group was higher than that of the other age groups, consistent with the findings of Blanchard et al. (35). In contrast, Tremblay et al. and Nikkho et al. reported a decrease in mean physical literacy scores with age, which does not align with the present study's results (4, 38).

However, among the various areas of physical literacy, only the self-care domain exhibited a significant difference across age groups (p = 0.008), with the mean self-care score for the 18-year-old age group being higher than that of the other groups. Studies by Rui-Si et al. and Nystrom et al. found that adolescents with a lower body mass index tend to have higher physical literacy scores (38, 39). Furthermore, research by Brown et al. and Rui-Si et al. demonstrated that adolescents who participate more in physical activities achieve better physical literacy scores. Adopting healthy habits and behaviors as part of self-care during adolescence supports a healthy lifestyle into adulthood, which is consistent with the findings of the present study (3, 39).

Self-care behaviors in adolescents are influenced by their physical literacy, highlighting the importance of incorporating physical literacy into prevention programs. Teaching physical literacy skills alongside effective educational interventions can be vital for encouraging physical activity and maintaining adolescents' health (39, 40).

In the present study, 58.6% of the participating adolescents reported being members of a sports club. A significant relationship was found between the mean score of adolescents' physical literacy and sports club membership (p = 0.001). Interestingly, adolescents who were not members of a sports club exhibited a higher mean physical literacy score (74.63±14.58).

Additionally, some adolescents may have temporarily identified as non-members due to circumstances such as the COVID-19 outbreak or exam periods at the time they completed the questionnaire. Given the critical role of high physical literacy in promoting increased physical activity and enhancing adolescent health, educational organizations should collaborate with municipalities to establish affordable sports clubs for adolescents (41, 42).

4-1. Study Limitations

This study faced several limitations:

1. Some students were initially reluctant to participate. To address this, we emphasized the importance and benefits of the project to encourage their involvement.

2. A lack of cooperation from some schools was encountered. This was mitigated by gaining an introduction from another school and coordinating with the education department of the relevant district.

3. The reliance on a self-report questionnaire to assess physical literacy made it challenging to compare observable differences between individuals.

5- CONCLUSION

This study of 510 Iranian adolescents aged 16 to 18 years found that while most demonstrated good (43.7%) or excellent (21%) physical literacy, 35.3% had insufficient or not sufficient levels. No significant differences were observed between genders or age groups, except in the self-care domain, which varied significantly by age. Adolescents who received information from club coaches had higher physical literacy scores than those relying on parents, while surprisingly, those not in sports clubs scored higher overall.

These findings highlight the need for targeted interventions to improve physical literacy among adolescents. Leveraging trusted sources like club coaches and engaging physical activity trainers in schools can help address gaps in physical literacy, particularly in self-care. Additionally, accessible platforms such as the Internet can play a vital role in disseminating information on physical activity. Future research should explore the factors influencing these trends and develop effective strategies to enhance adolescents' physical literacy and promote healthier lifestyles.

6- ACKNOWLEDGMENTS

The authors sincerely appreciate the invaluable contributions of health education and promotion specialists, physical education professionals, school principals, and the participating students for their assistance with this research, which formed part of the first author's doctoral dissertation on health education and health promotion. We also gratefully acknowledge the essential financial support provided by Shahid Beheshti University of Medical Sciences (IR.SBMU.PHNS.REC.1398.125), without which this research would not have been possible.

7- CONFLICT OF INTEREST: None.

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