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Development of norm for Adolescent Physical Literacy Questionnaire (APLQ) in Tehran

Mostafa Mohammadzadeh, Mahmoud Sheikh, Davood Hoominian*

Department of Motor Behavior Department, Faculty of Sport Science, University of Tehran, Tehran, Iran. (Corresponding author: hominian@ut.ac.ir)

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Abstract

Introduction: Adolescents' physical literacy and physical activity influences their lifestyle behaviors and health-related readiness into adulthood. Lack of information about the state of physical literacy has led researchers to examine the state of physical literacy in adolescents in Tehran.

Martials and Methods: The method of the present study was descriptive and performed in the 12-18 years adolescent in Tehran. The sample were 836 adolescents who selected by multi-stage cluster sampling from different areas of the Tehran. Inclusion criteria included having physical health, not having certain diseases and movement problems or regular drug use. Subjects' physical literacy was assessed using the adolescents' physical literacy questionnaire (APLQ). This questionnaire with three dimensions examines adolescents' physical literacy and has an internal consistency coefficient (0.951) and retest reliability (0.981).

Results: The total mean scores of physical literacies in adolescents were 90.04 ± 17.12 and the desired norm was determined with a standard deviation of high and low (107.16-72.94). However, the mean scores for girls were about 85 and for boys 92, which shows a difference between the sexes and high ages.

Conclusion: The results showed that adolescents' physical literacy scores in all dimensions increase with age; Also, the scores were higher in boys than girls in all dimensions. Similar results have been reported for differences in gender and age in the Physical Literacy of Canadian children [12]. The norm presented in this study can be a basis for measuring and comparing the levels of physical literacy of adolescents in Tehran.

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1. Introduction

Physical literacy is a set of psychological (such as motivation and confidence), cognition (e.g. knowledge and understanding), and physical capacities (e.g. physical competency) to participate in physical activity for life [1, 2]. Researchers have identified physical literacy with greater participation in physical activity throughout life [3] and as a new way of enhance physical activity [4]. Most researchers acknowledge that physical literacy can be a tool for physical activity, sports success, and enjoyment of healthy living [1, 5]. The development of physical literacy in children and adolescents leads to increased physical activity and avoidance of sedentary and unhealthy lifestyle [6]. The lack of this development leads to physical activity and sedentary lifestyle,

Physical inactivity and sedentary lifestyle are a common threat to all developed countries and are considered as a serious threat to the health of generations [6]. On the other hand, children and adolescents need more physical activity than other age groups to be able to achieve proper physical growth and mental development, but research shows that the amount of physical activity decreases in adolescence [7]. Adolescents' participation in physical activity influences their lifestyle behaviors and health-related fitness into adulthood [8, 9], which can have long-term effects on life. Therefore, it seems necessary to study the physical literacy of adolescents as an important growing age group in order to identify the important factors affecting physical activity by recognizing its various aspects. In this regard, if the people have more information about their level of physical literacy, they can identify their strengths and weaknesses and try to develop it. This issue about the adolescents can be considered as a strategic issue and used by policy makers and custodial institutions such as education, parents and educators to identify the physical literacy status of adolescents to develop it comprehensively.

Despite several different studies in the field of physical literacy, in Iran, no study has been conducted to provide norms or describe the status of physical literacy in different societies, and this issue has not yet been recorded in the case of adolescents in other countries. This study is one of the first studies in describing and presenting the norm of physical literacy in adolescents, because the lack of information about the state of physical literacy in various dimensions and norms in adolescents. Lack of information in this field has led researchers to comprehensively review and describe the situation of physical literacy in adolescents in Tehran, to identify the shortcomings and strengths and weaknesses of this important and to answer the question that how is the adolescent's physical literacy in Tehran?

2. Materials and Methods

The method of this study was descriptive and its purpose was to present the norm and describe the different characteristics of physical literacy of adolescents aged 18-12 years in Tehran without applying variables to them.

The study papulation included adolescents aged 12 to 18 years in Tehran. The total number of this population in 2020 was equal to 524282 people, including 273841 first high school students (132591 girls, 141250 boys), and 250441 second high school students (125348 girls, 125093 boys). The sample of this study was 836

adolescent students who were selected by multi-stage cluster sampling from different areas of Tehran. Multi-stage cluster sampling was performed as follows: First, the total population of high school students in Tehran was calculated by referring to the General Department of Education in Tehran. Then, one of the northern (Region 1), eastern (Region 8), western (Region 2), southern (Region 20) and central (Region 12) geographical areas of Tehran was randomly selected as a sample area. Then, four schools were randomly selected from each region (for boys and girls) in the first and second high schools. After randomly selecting schools, referring to schools, students of different grades were randomly selected for sampling. Inclusion criteria included having physical health, not having certain diseases and movement problems or regular drug use. Exclusion criteria included being under 12 or over 18 years old, and not completing the research tests properly.

Subjects' physical literacy was assessed using the adolescents' physical literacy questionnaire (APLQ). Adolescent Physical Literacy Questionnaire is designed specifically for adolescents aged 12-18 years. This questionnaire examines adolescents' physical literacy with three dimensions of physical fitness and activity (Physical), knowledge and awareness (cognitive), and psychological and behavioral dimension. The physical literacy questionnaire has an internal consistency coefficient (0.951), retest reliability (0.981) and concurrent validity coefficient (0.792) [10].

First, administrative correspondence was done through the university with the General Directorate of Education of Tehran. After obtaining the necessary permits, and approval of the research (by the departments of management, security and Research), five urban areas in different geographical directions (north, east, west, south and center) of Tehran were randomly selected and determined. Then, by referring to the selected affiliated offices in districts 1, 2, 8, 12 and 20, in each region, four schools (two girls' schools and two boys' schools) in the first and second secondary schools were randomly selected. After that, by referring to the selected schools in each district, in coordination with the school officials, a questionnaire was provided to the students to proceed with the data collection. The questionnaire was available to students in the form of a paper questionnaire and in some schools as an online questionnaire (designed in Google forms). The data was obtained through it. Finally, 894 data items were collected (94 paper and 800 online form). After reviewing the collected data, items that did not meet the inclusion criteria were removed. Twenty-two questionnaires were discarded due to lack of inclusions. Also, 28 questionnaires were removed from the data due to incomplete and distorted data. Finally, 836 questionnaires remained for analysis.

This study has been approved by the Ethics Committee of the University of Tehran (IR.UT.SPORT.REC.1398.060). All study participants were aware of the objectives of the study and expressed their consent to participate in the study and participated in the study voluntarily. They were also assured that they leave the research at any stage, and be informed of the results of the study upon request. The researcher did not instill any mentality in the participants during the data collection. In this study, researchers sought to adhere to all ethical principles of human studies in the Helsinki Declaration [11].

Descriptive analysis of the data was performed using central statistics and dispersion indices such as mean and standard deviation, decimals, percentiles, tables and graphs. One-way analysis of variance was used to compare the effect of age and independent t-test was used to compare the gender. Significance level in calculations was considered 0.05 and for statistical calculations, Excell software version 2019 and SPSS version 24 were used.

3. Results

Table 1 shows the descriptive characteristics of the various variables measured in adolescents aged 12-18 years. Tables 2 and 3 show the descriptive statistics and normative percentages of the variables separately for the first and second high schools. Tables 4 and 5 show descriptive statistics and norm percentiles of variables by gender.

Table 1. Descriptive statistics of APLQ

Gender	n	Statistics	Age	Height	Weight	APLQ	Psychological	Cognitive	Physical
Boys	535	Mean	14.82	164.91	58.34	92.81	43.36	26.15	23.29
		S. D	1.52	10.96	13.131	16.21	7.69	5.08	5.35
		Norm		175.87-153.95	71.47-45.21	109.02-76.60	51.05- 35.67	31.23-21.17	28.64-17.94
Girls	301	Mean	15.18	157.32	52.57	85.12	40.65	24.13	20.33
		S. D	1.91	8.75	11.62	17.63	7.27	6.16	6.10
		Norm		166.07-148.57	64.19-40.95	103.20-67.94	47.92-33.38	30.29-17.98	26.43-14.23
Total	836	Mean	14.95	162.16	56.24	90.04	42.39	25.41	22.23
		S. D	1.683	10.84	12.90	17.12	7.64	5.57	5.80
		Norm		173.00-151.32	69.14-43.34	107.16-72.94	50.03-34.75	30.98-19.84	28.03-16.43
		Skewness	0.170	-0.055	0.983	-0.299	-0.514	-0.421	-0.117
		Kurtosis	-0.762	1.319	1.596	-0.519	0.222	-0.495	-0.528
		Minimum	12	100.00	30	39	11.00	8.00	7.00
		Maximum	18	198.00	125	125	55.00	35.00	35.00

Table 2. Percentages of first high school period APLQ scores

Percentages	Interpretation	Height	Weight	APLQ	Psychological	Cognitive	Physical
5	Very low	142.0000	38.45	57.00	29.0000	15.0000	12.0000
10		147.0000	40.00	65.00	32.0000	16.0000	13.0000
15	Low	149.0000	42.00	69.00	34.0000	18.0000	14.3500
20		150.0000	44.00	71.00	35.0000	19.0000	16.0000
25		152.0000	45.00	74.00	36.0000	20.0000	17.0000
30	Under average	155.0000	46.00	76.00	37.0000	21.0000	18.0000
35		155.0000	47.15	79.00	38.1500	23.0000	19.0000
40		157.0000	50.00	83.00	40.0000	24.0000	20.0000
45	Average	158.0500	50.00	86.00	41.0000	25.0000	20.0000
50		160.0000	52.00	89.00	42.0000	26.0000	21.0000
55		160.0000	53.95	91.00	43.9500	27.0000	22.0000

Percentages	Interpretation	Height	Weight	APLQ	Psychological	Cognitive	Physical
60		162.0000	55.00	94.40	45.0000	28.0000	23.0000
65	Upper average	164.8500	56.00	97.00	46.0000	28.0000	23.0000
70		165.0000	58.00	99.00	48.0000	29.0000	24.0000
75		167.0000	60.00	103.00	49.0000	30.0000	25.0000
80	High	170.0000	64.00	106.00	50.0000	30.2000	26.0000
85		175.0000	67.00	108.00	51.0000	31.0000	27.0000
90		178.0000	72.10	112.00	53.0000	32.0000	28.0000
95	Very high	182.0000	82.00	116.00	54.0000	34.0000	30.0000
100		195.0000	100.00	125.00	55.0000	35.0000	35.0000

Table 3. Percentages of second high school period APLQ scores

Percentages	Interpretation	Height	Weight	APLQ	Psychological	Cognitive	Physical
5	Very low	155.0000	43.45	68.00	31.0000	19.0000	14.4500
10		157.0000	47.00	73.00	33.9000	20.0000	17.0000
15		158.0000	49.00	76.35	37.0000	22.0000	18.0000
20	Low	159.0000	50.00	82.00	38.0000	23.0000	19.0000
25		160.0000	52.00	84.25	39.0000	24.0000	20.0000
30	Under average	160.0000	54.00	87.00	40.0000	24.0000	21.7000
35		160.0000	55.00	89.00	41.0000	25.0000	23.0000
40		162.0000	56.00	91.00	42.0000	25.0000	23.0000
45		163.0500	57.00	93.00	43.0000	26.0000	24.0000
50	Average	164.0000	59.00	95.00	44.0000	26.0000	25.0000
55		165.0000	60.00	96.95	44.0000	27.0000	25.0000
60	Upper average	166.0000	60.00	99.00	45.0000	27.0000	26.0000
65		167.0000	63.00	100.00	46.0000	28.0000	26.8500
70		168.0000	65.00	102.00	46.3000	29.0000	27.0000
75		170.0000	66.00	103.75	48.0000	30.0000	28.0000
80	High	170.0000	67.00	106.00	49.0000	30.0000	29.0000
85		172.0000	70.00	109.00	50.0000	31.0000	30.6500
90		175.0000	75.00	112.00	51.0000	32.0000	31.0000
95	Very high	179.5500	81.65	117.00	54.0000	34.0000	33.0000
100		198.0000	125.00	125.00	55.0000	35.0000	35.0000

Table 4. Percentages of girls APLQ scores

Percentages	Interpretation	Height	Weight	APLQ	Psychological	Cognitive	Physical
5	Very low	140.0000	39.00	55.00	28.1000	14.0000	11.0000
10		145.0000	40.00	63.00	32.0000	16.0000	13.0000
15		148.3000	41.00	67.00	33.3000	17.0000	14.0000
20	Low	150.0000	43.00	69.00	35.0000	18.4000	14.0000
25		151.0000	44.00	72.00	36.0000	20.0000	15.0000
30	Under average	155.0000	45.60	75.00	37.0000	20.0000	16.0000
35		156.0000	47.00	76.70	38.0000	22.0000	17.0000
40		157.0000	48.00	79.00	39.0000	23.0000	18.0000
45		158.0000	49.00	82.00	40.0000	24.0000	19.0000
50	Average	159.0000	50.00	85.00	41.0000	25.0000	20.0000
55		159.0000	52.00	87.10	42.0000	26.0000	21.0000
60	Upper average	160.0000	53.00	89.20	42.0000	26.0000	22.0000
65		160.0000	55.00	93.00	43.0000	27.0000	23.0000
70		162.0000	57.00	96.00	44.0000	28.0000	24.0000
75	High	163.0000	59.50	99.00	45.0000	29.0000	25.0000
80		164.6000	62.00	102.00	47.0000	30.0000	26.0000

Percentages	Interpretation	Height	Weight	APLQ	Psychological	Cognitive	Physical
85		166.0000	65.70	104.70	48.7000	31.0000	27.0000
90		168.0000	68.80	108.00	50.0000	32.0000	28.0000
95	Very high	170.0000	75.90	116.00	52.0000	34.0000	31.0000
100		180.0000	95.00	125.00	55.0000	35.0000	35.0000

Table 5. Percentages of boys APLQ scores

Percentages	Interpretation	Height	Weight	APLQ	Psychological	Cognitive	Physical
5	Very low	148.7500	40.00	65.00	30.0000	17.0000	14.0000
10		150.0000	45.00	71.00	33.0000	19.0000	17.0000
15		155.0000	45.00	74.00	35.0000	20.0000	18.0000
20	Low	155.0000	48.00	77.00	37.0000	21.0000	19.0000
25		158.0000	50.00	82.00	38.0000	23.0000	20.0000
30	Under average	160.0000	50.00	86.00	40.0000	24.0000	20.0000
35		160.0000	53.00	88.00	41.0000	25.0000	21.0000
40		162.0000	54.00	90.00	42.0000	25.0000	22.0000
45		163.0000	55.00	92.00	43.0000	26.0000	23.0000
50	Average	165.0000	56.00	95.00	44.0000	27.0000	23.0000
55		165.0000	58.00	97.00	45.0000	27.2500	24.0000
60	Upper average	166.0000	60.00	99.00	46.0000	28.0000	25.0000
65		168.0000	60.00	101.00	47.0000	29.0000	26.0000
70		170.0000	63.00	103.00	49.0000	29.0000	26.5000
75		172.0000	65.00	105.00	50.0000	30.0000	27.0000
80	High	175.0000	67.00	107.00	51.0000	31.0000	28.0000
85		176.0000	70.00	110.00	51.7500	32.0000	29.0000
90		180.0000	75.00	114.00	53.0000	32.0000	30.0000
95	Very high	183.0000	85.00	117.00	54.0000	33.0000	32.0000
100		198.0000	125.00	125.00	55.0000	35.0000	35.0000

Independent t-test was used to compare the physical literacy levels of adolescent girls and boys. The results of independent t-test showed that there was a significant difference between girls and boys in physical literacy scores (P<0.001, t(468)= 3.720; Table 6); Girls' scores (M=85.12±17.63) was lower than boys (M=92.81±16.21; Table 1). This difference in scores was also observed in the three dimensions of physical literacy.

Table 6. Results of independent t-test between girls and boys in AMCQ dimensions and scale

AMCQ dimensions	t	df	sig
Physical	7.270	834	0.001
Psychological	4.956	834	0.001
Cognitive	5.133	834	0.001
ALPQ	6.369	834	0.001

One-way analysis of variance at different ages was used to investigate the differences in age groups physical literacy. The results of analysis of variance test in the difference between age groups showed that the effect between groups is significant (P=0.001, $F_{(6,829)}$=28.752; Table 7). The results of Bonferroni post hoc test showed that there was a significant difference in physical literacy score between most age groups (P<0.05), but there was no significant difference between groups 14.15, 16 and 17 years (P<0.05). Also, there was no significant difference between groups 17 and 18 years old (P<0.05). Figure 1 Shows the physical literacy scores of sample people by age and gender.

Table 7. Results of analysis of variance in Physical literacy variable

	Sum of squares	df	Mean square	F	Sig.
Between groups	42172	6	7028.7	28.752	0.001
Within groups	202656	829	244.4		
Total	244828	835			

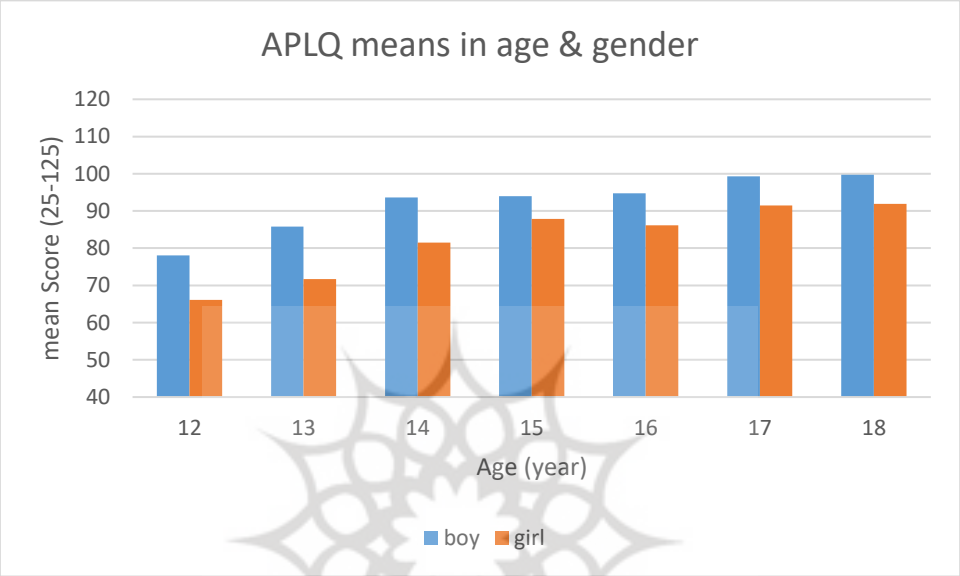

Figure 1. The mean scores of physical literacy by age and gender

4. Discussion

Physical literacy is one of the concepts related to active lifestyle, which has different positive effects and benefits at different ages, such as increased physical activity. The development of physical literacy affects various dimensions such as active lifestyle, physical activity, knowledge and motivation to participate in lifelong physical activity. The higher levels of physical literacy in the community may lead to the higher level of active lifestyle and physical activity. High levels of physical literacy in adolescents ensure active life in adulthood. Low levels of physical literacy in adolescents can raise concerns about physical activity and active lifestyle and the negative consequences of inactivity such as related diseases and obesity, and create overweight. Accurate physical literacy assessment is important to assess the status, formulate and design lifestyle and health promotion programs. No research has been reported in Iran and other countries regarding the mean and normal range of variables measured by adolescents' physical literacy.

5. Results

The average scores of physical literacy of adolescents was equal to 90.04±17.12. The desired norm was determined by a deviation of high and low standards (107.16-72.94). However, the mean scores were 85 for girls and 92 for boys, which shows a clear difference between the sexes. The mean observed was 89 for lower-age high school students and 95 for higher-age high school students. These scores were observed based

on the minimum and maximum scores obtained in the test, which are equal to 25 and 125, and show the distance between many of the minimum scores, The average score of the psychological dimension of adolescents' physical literacy questionnaire in Tehran was equal to 42.39±7.64. The desired norm is determined by a deviation of high and low standard (50.03-34.75). The mean scores were 40 for girls, 43 for boys, 42 for lower-age high school and 44 for higher-age high school students. The minimum and maximum scores obtained in this test were equal to 25 and 125. The average score of cognitive dimension of adolescents physical literacy questionnaire was equal to 25.041±5.57. The desired norm is determined by a deviation of high and low standard (30.98-19.84). The mean scores were 24 for girls, 26 for boys, 26 for lower-age high school and 26 for higher-age high school students. Also, the average score of the physical dimension of adolescents' physical literacy in Tehran was equal to 22.23±5.80. Meanwhile, the average scores for girls were 20, 23 for boys, 20 for the lower-age high school and 25 for the higher-age high school students. These scores indicate that adolescents' physical literacy scores in all dimensions increase with increasing level of school education. Also, physical literacy scores, regardless of age, are higher among boys than scores in girls, and this was observed in all dimensions.

Similar results were found for the difference between gender and age in the Physical Literacy Survey of Canadian children, with girls scoring lower than boys in most sections of the Physical Literacy Assessment in Canada, as well as older children had higher physical literacy scores than younger children [12]. However, the Canadian study was conducted on children aged 8-12 years using a CAPL tool designed specifically for children.

In the present study, the mean height of the subjects was 162.16±10.64 cm and its norm were in the range 173.00-151.32 with one standard deviation interval. The mean height of boys was 164.91, 10, 10.06 with the norm of 175.87-153.95. Also, the average weight of the subjects was 56.24±12.90 kg and its norm were in the range 69.14- 43.34 with one standard deviation interval. The mean weight of girls was 52.57, 11, 11.62 kg with norm 64.19-40.95, and the mean weight of boys was 58.34±13.13 kg with norm of 71.47-45.21. In a study done by Derakhshan (1998) on adolescents, similar results were obtained and the average scores of height and weight of girls were reported to be lower than boys [13]. These differences in the size of global norms and sources of human growth have also been confirmed [14].

The findings of the present study confirmed the gender difference: girls had lower scores in motivation and psychological dimension than boys [15]. The development of physical literacy, in addition to development of physical fitness, should be based on increase the motivation to participate and knowledge about physical activity; so, it can have long-term effects on people's lifestyles [16]. Research has shown that intrinsic motivation can affect physical activity and lifestyle through changes in goals and behaviors, and people with higher intrinsic motivation maintain their level of physical activity over time [17]. The current findings indicate the importance of paying more attention to the psychological aspects of physical literacy, such as the motivation to participate in physical activity in girls.

The studies have shown that boys have higher motor competence than girls. The reason for this difference is due to the

higher participation of boys in physical activity and sports compared to girls [18]. That was in line with the findings of the present study. The physical dimension of physical literacy in APLQ includes items in the field of physical fitness as well as daily and weekly physical activity. The superiority of boys in physical dimension scores can be due to differences in both areas of participation in activity and their higher physical fitness. These findings also point to more attention to the development of physical literacy in girls, which showed lower scores. Physical literacy emphasis on lifelong health and well-being [1] through physical activity, also increase and maintaining physical activity in life [20].

Thus, it is important to pay more attention to the development of physical competence, especially in girls [17]. This can be done through program-based physical education to develop participation in physical activity and physical literacy [19].

6. Conclusion

The purpose of this study was to prepare the norm of physical literacy of high school students in Tehran to be a criterion for evaluating the level of physical literacy and knowledge of different levels of physical literacy in adolescents. It is hoped that the norm presented in this study can be a basis for measuring and comparing the levels of physical literacy of adolescents in Tehran,

Conflict of interest

The authors declared no conflicts of interest.

Authors' contributions

All authors contributed to the original idea, study design.

Ethical considerations

The present study was approved by Ethics Committee of the Department of Physical Education and Sport Science, University of Tehran.

Data availability

The dataset generated and analyzed during the current study is available from the corresponding author on reasonable request.

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