



Measuring physical literacy in Ukraine: development of a set of indicators by Delphi method

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Abstract

Introduction: This study aims to outline indicators of physical literacy for Ukrainian student youth, taking into account current international experience and concepts and meeting national specificities of the organization of physical education in higher educational institutions of Ukraine. **Methods:** 82 individuals were invited to participate in study (face-to-face meeting). The 2-round Delphi method as approach for facilitating group interaction aimed to structure communication process was used to generalize the knowledge and receiving the consensus of expert opinion. **Results:** The top five of the most important indicators of physical literacy were physical health, physical activity level, participation in fitness activities, ability to conduct morning hygienic gymnastics, physical training break, physical training, gymnastics before classes, individual training session, ability to perform preventive exercises in case of illness. The indicators identified by the experts can be grouped into three separate domains: functional, motivational, cognitive and behavioral. **Conclusion:** The selected indicators are contextually sensitive for the Ukrainian population. We prioritize approaches that have already been used in daily practice in Ukraine. The set of selected indicators demonstrates that they reflect the structural hierarchy of the “physical literacy” construction. The selected indicators, in particular, correspond to the goals of students’ education, they take into account the list of necessary knowledge, skills and abilities in accordance with the requirements of the Ukrainian program, consider motivation of students, awareness of active lifestyle and sufficient level of physical strain importance for health.

Keywords: physical literacy, physical education, students, Delphi method, university.

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INTRODUCTION

Knowledge, skills and abilities that are relevant for good health maintaining, high level of performance, interacting with others, regulating one's behavior provide the young person with tangible benefits as they are the basis of a productive and quality life. Accordingly, their development and formation is a crucial educational and disciplinary task.

Physical Education (PE) attracts the attention of researchers due to the various advantages that it offers to people, but it can be stated that its potential is not fully appreciated and used. There is no doubt that the impact on physical health is well-researched [1,2]; the effectiveness of preventing a number of chronic diseases, slowing down age-related changes has been proven [3,4], however, during the last ten years the data indicating benefits of physical training and sports for the mental and social health has been accumulated [5,6]. The experience of different countries of the world shows that PE helps in socialization, formation of positive behaviors, prevents risky situations, teaches how to set and achieve both short and long-term goals, etc [7]. The role of PE is significantly changing – it is a matter of developing a specific world view and establishing a certain level of personal literacy. The most famous definition of physical literacy today is the concept proposed by the Physical Literacy Association, according to which it is the motivation, confidence, physical competence, knowledge, and the importance of engagement in physical activity [8].

For the formation of modern views on PE in higher education institutions, increasing the importance of the subject among all participants of the educational process, overcoming the discrepancies that arise as a result of reforming school education, it is important to increase understanding the concept of physical literacy, form models and concepts based on effective mechanisms for managing the process of formation and development of physical literacy. Today, a holistic approach is of great interest, according to which it is possible to obtain a general concept of physical literacy, and not focus solely on the health-saving value of PE, the development of individual skills, success in competitions, etc [9,10].

Although the concept of physical literacy has long been developed by researchers and practitioners in the field of PE, sport and health [10,11–13], and in some countries the projects on physical literacy improvement of the population are implemented [14–16], there is no uniform approach to formulating a general concept, outlining and measuring physical literacy. This issue remains relevant to the field of physical culture and sports in Ukraine, where the concept of physical literacy is new. However, its development remains very important for the implementation of international project activities, measuring the effectiveness of national programs of PE for children and young people. It should be noted that the concept of physical literacy needs to be interpreted and clearly formulated, taking into account the diversity of cultures and their differences, the concept varies depending on the country, its unique traditions and history [8]. Such contextual sensitivity of the concept requires the elaboration of definitions, structure, and sensitive indicators, taking into account the peculiarities of the particular country.

We aimed to outline indicators of physical literacy for student youth, taking into account current international experience and concepts, meeting national specificities of young people's PE, taking into account the organization of PE in higher educational institutions of Ukraine, expected learning outcomes of students etc.

MATERIAL AND METHODS

Participants

For the purpose of this study, the participants (n = 88, 40.9% females) were selected based of their knowledge and area of expertise concerning theoretical values and practical aspects of PE. Our selection criteria were: (1) geographical constraints (persons who work and live in Ukraine); (2) work on position of teaching staff in high educational establishment (university, academy); (3) qualified in area of PE of students, youth sport, health promotion, physical activity, etc. Participants gave voluntary informed consent after being informed about all aspects of the study. The study was carried out in accordance with the Helsinki Declaration, approved by the local Ethics Committee.

Area of expertise was pedagogy (PE and coaching), children and youth sport, elite sport and high performance, physiotherapy (occupational therapy), curriculum design in PE. Experts were employed as faculty members at doctoral degree-granting universities (Ternopil Volodymyr Hnatiuk National Pedagogical University, National Pedagogical Dragomanov University, Vasyl Stefanyk Precarpathian National University, Lviv State University of Physical Culture, Ternopil National Economic University, Taras Shevchenko Regional Humanitarian Pedagogical Academy of Kremenets).

Creation of instrument and pilot study

During this stage a valid instrument for the Delphi process was created. It consists of (1) content development; (2) quantitative assessment; (3) analysis of results and instrument modification.

Firstly, the concept identification, physical literacy indicators generation and their potential measures were conducted. The study began with a systematic review according to issue of physical literacy appropriate for the Ukrainian context and relevant to all stakeholders in the area of high education, PE of students, youth sport, health promotion, physical activity. We did not aim at conducting a full systematic review, and analyzed papers addressing current work in physical literacy (1); Physical Education (2); physical/ motor activity (3); knowledge and values (4); pedagogical strategies (5). The database of the National Center for Biotechnology Information (PubMed) and Google Scholar were searched for approaches to measurement for young people. We included Ukrainian and international papers, indicators were also searched through Ministry of Education and Science of Ukraine guidelines for the high educational establishments. We selected all eligible indicators for of physical literacy, exclusion criteria were: not familiar in Ukraine/ there are no translations into Ukrainian; not suitable for young people. We prioritized indicators that were already used in practice in Ukraine.

Six persons (50% females) were randomly selected from the pool of participants and agreed to take part in pilot study. They met the previously described criteria for participants; also each participant had at least 5-year experience on the position of teaching staff in high educational establishments. The participants were asked to rate the content validity of the obtained indicators. We used 5-point Likert scale: indicator is valid and could potentially be included for assessment of certain domain of physical literacy – 5–4 points; neutral/ undecided – 3 points; lack content validity, item should be eliminated – 2–1 points. Also participants suggest revisions in the matter of inaccuracy in content. Inclusion criteria for issue/ measurement in final version: (1) >3 points due to evaluation process; (2) 83% of participants (five out of six) rank the item/ measurement >3 points; (3) 100% of participants agreed that indicator can be used for evaluation of physical literacy.

Procedures for Delphi study

The Delphi method is approach for facilitating group interaction aimed to structure communication process, to generalize the knowledge and receiving the consensus of expert opinion through a series (rounds) repetitive questionnaires interspersed with feedback [17,18]. The procedure was adapted from [17] and had 2 rounds.

Round one procedures.

In total, 82 individuals were invited to participate in study (face-to-face meeting). Qualitative and quantitative composition of the sample is shown in Table 1. Each participant needed to have at least 5-year experience in high educational establishment in the area of PE of students. The average of following two questions were scored for each indicator: 1) Is this indicator respond to physical literacy?; 2) Is this indicator relevant to evaluate physical literacy? For the evaluation of item's importance and relevance 5-point Likert scale was used (1 point – strongly disagree, 2 points – disagree, 3 points – no opinion, 4 points – agree, 5 points – strongly agree).

Round two procedures.

Participants received feedback (individual and group means for each item/ measure) and could compare individual responses with overall rating of group. Participants completed questionnaire once more, and with consideration of previous results reassessed ratings. Consensus criteria were: the indicator received mean rating ≥ 4 points on both scales; an agreement among 70% of the participants was defined.

Table 1. Expert data

Characteristic	n	[%]
<i>Scientific degree/ academic title</i>		
Without scientific degrees/ academic title	28	34.1
Candidate of Sciences/ Ph.D., Doctor of Science, Associate Professor, Professor	54	65.9
<i>Experience in the field of expertise</i>		
<10 years	23	28.1
>10 years	59	71.9

Indicator rankings

The participants were asked to place indicators in order of importance (which are most important for high levels of physical literacy achievement), from most important to unimportant.

RESULTS

According to scientific and methodological literature, physical literacy can be interpreted as a multifaceted conceptualization of the skills required to fully realize potentials through embodied experience. This is the set of properties of a person, which are acquired in the process of Physical Education, are manifested in vigorous activity aimed at comprehensive improvement of their physical "Self," leading a healthy lifestyle and so on. Based on the work of six experts, a set of indicators was obtained, which was used during the first and second rounds of the Delphi study (Table 2).

The top five of the most important indicators of physical literacy during the first round were physical health (4.75 ± 1.00 points), physical activity level (4.55 ± 1.00 points), participation in fitness activities (4.85 ± 0.70 points), ability to conduct morning hygienic gymnastics, physical training break, physical training, gymnastics before classes, individual training session (4.40 ± 0.94 points), ability to perform preventive exercises in case of illness (4.55 ± 1.00 points). According to the results of the second round, the student's ability to conduct morning hygienic gymnastics, physical training break, physical training, gymnastics before classes, individual training (4.45 ± 0.60 points), ability to play active games, dance (4.36 ± 0.76 points), ability to perform preventive exercises in case of illness (4.75 ± 0.67 points). The most important student knowledge that can serve as indicators of physical literacy were the knowledge on elementary ways to control their physical condition (4.25 ± 0.70 points), knowledge on safety methods during exercising and methods of providing first aid (4.25 ± 0.74 points), concept on activity mode of the day (4.20 ± 0.70 points), knowledge on exercises for the development of physical qualities and their effect on the body (4.25 ± 0.70 points).

The obtained indicators for which the consensus criteria were met were further grouped and analyzed by experts to establish their significance rating (Table 3). The majority of the surveyed experts (54.88%) consider that the main indicator of physical literacy of students is proper physical activity. Physical health and fitness are the next most important (53.66% people voted for the second rating place), and the high level of knowledge required by the PE program (42.68% of experts).

The main skills that indicate a high level of physical literacy are: the ability to independently perform morning hygienic gymnastics (64.3% of experts put this indicator in the first place), the ability to perform exercises to restore mental and physical performance (second place within priorities) exercises to form the correct posture (third place) (Table 4).

In the rating of theoretical knowledge, the experts highlight the elementary knowledge of students about determining the functional state of their body (53.66% of respondents put this indicator in the first place) (Table 5). The second ranking place took the knowledge of healthy lifestyles (day mode, diet, personal hygiene, etc.), knowledge on cold training, and the third - knowledge on basic techniques of providing first aid.

Table 2. Critical indicators related to physical literacy

Indicator	Round 1 agreement,		Round 2 agreement,	
	[%]	Mean \pm SD [points]	[%]	Mean \pm SD [points]
Physical health	97.56	4.75 \pm 1.00	100	4.70 \pm 0.50
Physical activity level	96.34	4.65 \pm 1.00	100	4.75 \pm 0.67
3000 m (male)/ 2000 m (female) run test	85.34	4.00 \pm 0.76	81.46	4.05 \pm 0.65
Pull-up bar /standing long jump	91.46	4.00 \pm 0.92	92.68	4.05 \pm 0.60
Push-up/ long jump, times	92.68	4.10 \pm 1.02	93.90	4.00 \pm 0.64
100 m running	95.12	4.45 \pm 1.04	98.78	4.55 \pm 0.60
4 \times 9 m shuttle running	90.24	4.10 \pm 0.91	96.34	4.30 \pm 0.72
Forward bend while sitting	87.80	4.45 \pm 0.76	95.12	4.50 \pm 0.69
Ability to prepare for physical exercises independently	70.73	3.90 \pm 1.02	73.17	4.00 \pm 0.86
Physical condition control ability	79.27	4.15 \pm 0.99	91.46	4.10 \pm 0.83
Knowledge of basic skills in preventing illnesses and injuries, first aid providing	85.37	4.20 \pm 0.91	91.46	4.10 \pm 0.77
Organization of various health and fitness events	89.02	3.70 \pm 1.34	95.12	3.95 \pm 1.19
Ability to choose exercises to restore mental and physical performance	84.15	4.05 \pm 0.83	87.80	4.05 \pm 0.69
Ability to organize sports or active games, fun, peer competitions	86.59	4.15 \pm 0.94	86.59	4.08 \pm 0.90
Ability to individual morning hygienic gymnastics, physical training, physical training breaks, gymnastics before classes, individual training session	79.27	4.40 \pm 0.94	85.37	4.45 \pm 0.60
Ability to play active games, dance	91.46	4.15 \pm 0.97	97.56	4.36 \pm 0.76
Ability to perform preventive exercises in case of illness	90.24	4.55 \pm 1.00	87.80	4.75 \pm 0.67
Knowledge of elementary ways to control personal physical condition	95.12	4.25 \pm 0.83	97.56	4.25 \pm 0.70
Knowledge on safety during exercising and how to provide first aid	97.56	4.15 \pm 0.88	100	4.25 \pm 0.74
Knowledge of the basics of Ukrainian sports terminology (names of exercises, procedures, activities, equipment and inventory)	81.71	4.05 \pm 0.80	87.80	4.00 \pm 0.97
Concept on activity mode of the day	91.46	4.25 \pm 0.91	91.46	4.20 \pm 0.70
Knowledge on rules of correct body and foot posture, vision preservation	85.37	4.00 \pm 0.80	89.02	4.10 \pm 0.60
Knowledge on means of mental and physical performance improvement	87.80	3.80 \pm 0.90	91.46	4.00 \pm 1.0
Knowledge on exercises for the development of physical qualities and their impact on the body	89.02	4.15 \pm 0.78	87.80	4.25 \pm 0.70
Knowledge on interesting facts about the history of sports and physical culture in Ukraine and abroad	82.93	3.90 \pm 1.02	85.37	4.00 \pm 0.86
Independent exercising	91.46	4.25 \pm 0.83	100	4.45 \pm 0.94
Attending PE classes at university	90.24	4.10 \pm 0.50	95.12	4.15 \pm 0.65
Attending sports section classes	96.34	4.25 \pm 0.45	97.56	4.45 \pm 0.70
Participation in fitness activities (performing morning hygienic gymnastics, participation in physical training, sports holidays, sports competitions, etc.)	92.68	4.80 \pm 0.70	96.34	4.85 \pm 0.80

Table 3. Priority indicators of physical literacy

Indicator	Number of experts who preferred the indicator [%] Indicator priority			
	1	2	3	4
Physical activity level	54.88	28.05	6.10	6.10
Physical health, physical fitness	9.76	53.66	24.39	6.10
Knowledge provided by the PE program	12.20	0.00	42.68	26.83
Ability to perform basic exercises in the section of the program on PE	6.10	12.20	17.07	46.34

Table 4. Basic skills for assessing students' physical literacy

Indicators	Number of experts who preferred the indicator [%] Indicator priority				
	1	2	3	4	5
Skill to perform independent morning gymnastics	64.63	17.07	10.98	7.32	0.00
Skill to perform exercises to restore mental and physical performance	20.73	51.22	13.41	9.76	4.88
Skill to know exercises to form the correct posture	8.54	15.85	54.88	9.76	10.98
Skill to organize active games independently	7.32	6.10	10.98	50.00	25.61
Skill to make physical training breaks independently	0.00	9.76	9.76	21.95	58.54

Table 5. Basic knowledge for assessing physical literacy

Indicators	Number of experts who preferred the indicator [%] Indicator priority						
	1	2	3	4	5	6	7
Elementary knowledge about determining the state of one's body	53.66	18.29	4.88	6.10	17.07	0.00	0.00
Knowledge about healthy lifestyles (diet, nutrition, personal hygiene)	18.29	52.44	4.88	0.00	6.10	6.10	12.20
Knowledge of basic first aid techniques	6.10	12.20	59.76	12.20	0.00	9.76	0.00
Knowledge on safety during exercise	15.85	0.00	6.10	40.24	15.85	9.76	12.20
Rules of behavior in the gym (on the court), in the water	0.00	17.07	0.00	17.07	35.37	24.39	6.10
Knowledge about cold training	0.00	0.00	18.29	14.63	17.07	36.59	13.41
Knowledge of Ukrainian national active games	6.10	0.00	6.10	9.76	10.98	13.41	53.66

DISCUSSION

The high level of competence in PE formation is considered critically important to raise competitive graduates of universities, healthy, able-bodied and active citizens [9,19]. In Australia, Kenya, the United Kingdom, and Singapore, this indicator is used to measure student learning and PE [19, 20], and in South Korea it is taken into account when analyzing fitness and health [21]. Due to the dynamics of decreased physical activity and deterioration of the level of physical fitness of young people, the interest in the concept of competence in PE and similar concept (physical literacy) has been increasing in recent years. In Ukraine, the implementation of education reform has only just begun, and today a competent approach is used within the framework of the New Ukrainian School concept for schoolchildren. The educational programs of the New Ukrainian School envisage increasing the literacy level of students in various fields, including PE.

The concept of *competence in Physical Education* and the similar concept of *physical literacy* is in the process of development and refinement [22]. Specialists identify competence in PE with physical fitness or the development of physical skills [15,23], a common term in the scientific literature is the term proposed by Whitehead [20,24–26]. Some scholars adhere to the definition of physical literacy developed in Canada [20,26] or Northern Ireland [23]. In Ukraine, the term *physical literacy* is practically not used, it is closest to the concept of *competence in Physical Education, physical culture of personality*.

The development of a high level of knowledge, skills and abilities in Physical Education is the main goal of the discipline, so finding out the essence and components of physical literacy could help teachers of Physical Education to prepare high quality training programs, conduct sports and wellness activities aimed at students' skills and abilities development in PE [27]. Particular relevance has the separation of individual components (domains) of physical literacy, to clarify their hierarchy, to build a coherent system of assessment.

According to the results of our research, we have selected a number of indicators for assessing the physical literacy of Ukrainian students. They cover components such as physical health and fitness,

knowledge and skills in the field of PE, participation in various forms of PE, which in turn determines the amount of physical activity. In our opinion, the indicators identified by the experts can be grouped into three separate domains: functional, motivational, cognitive and behavioral. Functional domain includes physical health and fitness, cognitive – a set of skills, abilities and knowledge, the behavioral domain includes self-exercise, attendance of PE classes, morning hygienic exercises, cold training procedures, etc.

It can be argued that there are very different techniques used for assessing physical literacy, often incompatible with each other [16,22,27-29], and therefore determining indicators of different order to form an assessment system remains a rather pressing question. However, one should pay attention to the Canadian Physical Literacy Assessment System (CAPL) as one of the few ways to cover virtually all aspects of the concept, including behavioral, physical, affective and cognitive [22]. Our results are similar to the CAPL concept. According to this concept, physical literacy should be defined as motivation, commitment to physical activity, physical competence, a set of knowledge necessary to make a student aware of responsibility for his or her health and exercise throughout all lifelong [20].

According to individual approaches to assessing physical literacy, scientists identify a separate domain "Attitude to Physical Education." We are convinced that the attitude to PE detection does not require a focus on subjective outcomes, as all students express a positive attitude. However, according to previous studies [29,30], despite the fact that Ukrainian students are aware of the importance of high/ necessary level of physical activity for health, most of them do not participate in any form of PE. Accordingly, a clearer characteristic of a student's attitude to PE is his or her active participation in organized forms of PE, or independent training of PE. For these reasons, we have not singled out motivation as a separate domain.

The Physical Health indicator requires more detailed analysis and development of the lower order indicator system. In our view, it is more appropriate to consider physical health as a subdomain of physical literacy. The indicator system in this case should be accessible and understandable to the Ukrainian consumer and provide for the assessment of the most critical indicators for the Ukrainian population. The majority of deaths in Ukraine (86%) are caused by non-communicable diseases, including diseases of the circulatory system, cancer, digestive diseases, and breathing diseases. Mortality rates from cardiovascular disease in Ukraine are the highest among European countries. According to the European Health Reports the main causes of mortality and morbidity of Ukrainians are high blood pressure and cholesterol, a high body mass index. Therefore, it is advisable to evaluate the body mass index, heart rate, blood pressure, recovery time after exercise and more. As an example of a rapid assessment system for the health of a Ukrainian student [30], one can propose a method developed by G.L. Apanasenko [32]. The scientist has found that the health assessment obtained by the express system has a high correlation coefficient with the maximum oxygen consumption ($r=0.806$), which reflects the state of mitochondrial energy function. Examination of this system by the criteria of sensitivity and specificity has proved that it is the most informative and in its diagnostic value has advantages over other methods. The advantages of this system of health assessment are the following: simplicity and speed of measurement, clarity and accessibility for Ukrainian researchers, and the method does not involve significant material costs. Express assessment of physical health according to G.L. Apanasenko provides for the calculation of the total score in points based on the index of body mass, lung capacity, hand dynamometry, heart rate and blood pressure, recovery time of heart rate after 20 squats in 30 seconds.

LIMITATION

The Delphi method is a method that helps to reach consensus when dealing with conflicting values, different experiences and approaches to resolving issues. The consensus in the Delphi method does not mean that the correct answer is necessarily found, but rather that experts are engaged in finding and generalizing modern approaches and knowledge. Accordingly, the resulting product requires further review, testing, validation, and even revision to bring it closer to the best international practices.

CONCLUSIONS

At present, little is known about the physical literacy of students of higher education institutions in Ukraine. However, modern approaches and tools are required to evaluate the effectiveness of the existing Physical Education program and the results of work, the dynamics of student achievement in Physical Education. Therefore, scientific research is dedicated to finding a unified approach to assessing student learning success in PE is socially important and relevant. Our study is the first conducted at the national level in Ukraine to identify the structure of physical literacy and indicators that can be used to further development of comprehensive assessment systems for physical literacy of student youth. The selected indicators are contextually sensitive for the Ukrainian population. We prioritize approaches that have already been used in daily practice in Ukraine. The set of selected indicators demonstrates that they reflect the structural hierarchy of the “physical literacy” construction. The selected indicators, in particular, correspond to the goals of students’ education, they take into account the list of necessary knowledge, skills and abilities in accordance with the requirements of the Ukrainian program, consider motivation of students, awareness of active lifestyle and sufficient level of physical strain importance for health. Further research shall consist of comprehensive assessment system development that will help assess the level of physical literacy of the Ukrainian student.

CONFLICT OF INTEREST

There are no conflicts of interest

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