

The influence of the ethno-territorial factor on the state of physical abilities development of students of Ukrainian educational institutions

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Abstract

Background and Study Aim

The development of motor skills depends on the process of physical development, as well as the ethno-territorial and cultural context. The study of inter-ethnic differences can provide information about how different lifestyles and contexts of physical activity can influence the process of motor competence development. This can be a real strategy for developing students' lagging basic motor skills. The purpose of the work is to investigate the ethno-territorial variability of the level of development of physical abilities of students studying at Ukrainian universities.

Material and Methods

Data were obtained from cross-sectional surveys from 2014 to 2019. Students of Ivano-Frankivsk National Medical University (Ukraine) (young men, n = 488, age 18–25) from different countries were recruited. Pedagogical testing was carried out using a battery of tests that were recommended by the State Tests of Physical Fitness of the Population of Ukraine and the European Sports Council (Evrofit Test Battery). Assessment of physical fitness of students was carried out on the basis of a combined percentage scale of multi-level gradation with a step of 1%. Experimental data were processed using the SPSS Statistics 17.0 program.

Results

In almost all countries (with the exception of India and Tunisia), from 41.2% to 70.0% of students are characterized by a low level of development of cardiorespiratory endurance and speed-power fitness (from 54.4% to 58.3%). More than 50.0% of students from Jordan and Egypt have a low level of speed and strength abilities and flexibility. It was found that students from India and Tunisia have the highest rates (endurance - 75.5–80.8%); from China and Tunisia (speed-power abilities - from 69.1% to 78.8%); from Tunisia (speed - 79.8%); from China and Tunisia (flexibility - 70%); test participants completed the test; from China (power capacity - 76.7%). Students from European countries showed mostly average and above average level of development of physical abilities.

Conclusions

The results of the study indicate the specificity of the development of motor skills of students from different countries, which is manifested in statistically significant differences in the results of test tasks. Students from different countries perform better on those tests that are closer to their known motor experience. This is due to the cultural environment, geographical factor, socio-economic status, as well as the content and goals of the physical education program.

Keywords: physical fitness, ethno-territorial factor, population, students.

Introduction¹

Recent studies show a decline in physical activity in society as a whole. Moreover, the most significant regression occurs among students who graduate from schools and those who enter universities [1, 2, 3]. As a result, there is a significant decrease in the level of physical development and physical abilities [4, 5]. It should be noted that in the scientific literature there are many studies of the motor

activity of student youth from different countries of the world [6, 7, 8, 9, 10] and also directions of its intensification [11].

As for foreign students, according to the studies of a number of scientists, their level of physical activity is low [12, 13, 14, 15]. According to a WHO study, physical inactivity among adults is highest in Eastern Mediterranean, America, Europe, and the Western Pacific region, and the lowest in Southeast Asia [16, 17]. In the study by Suminski et al. [18] is compared physical activity patterns among Asian, African American, White and Hispanic American

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students. The authors found that 46.7% of students were not engaged in intensive physical activity and 16.7% were physically inactive.

A small amount of research was devoted to the problem of analyzing differences in the level of development of individual physical qualities. In the study by Adeyemi-Walker et al. [19] black and white ethnic groups achieved significantly better mastery of motor skills compared to Asian children of the same age. Another study [20] also indicated differences in the level of mastery of motor skills between students from countries of Africa, Turkey, Iran, Ukraine and a number of European countries. Differences in the development of fundamental motor skills are also emphasized in the work of Bardid et al. [21].

Such differences in individual characteristics of the level of development of motor skills are explained by differences in physical development [22, 23], cultural environment [24, 25, 26, 27], geographical factor [28], socio-economic status [29, 30, 31], an opportunity to practice skills [18, 22, 32, 33, 34]. However, these studies are stochastic in nature, dispersed in time, and use different test instruments.

The aim of the work. To investigate ethno-territorial variability in the development of physical abilities of students studying at Ukrainian universities.

Materials and Methods

Participants

Students (young men, n = 488, aged 18–25) from 9 countries of the world participated in the study (Table 1). All students agreed to participate in the experiment. The research protocol was approved by the Biomedical Ethics Commission of the Ivano-Frankivsk National Medical University (Ukraine, protocols № 85177 dated 10.24.2014, № 89198 dated 10.22.2015, №92850 dated November 23, 2016, №96311 dated October 24, 2017 and №112/19 dated 12.24.2019).

Research Design

Datum was from cross-sectional surveys since 2014 through 2019 on the basis of Ivano-Frankivsk National Medical University (Ukraine) during 2014–2019. Pedagogical testing was carried out using a battery of tests that were recommended by the State Tests of Physical Fitness of the Population of Ukraine [35]. The structure of pedagogical testing is given in table 2.

The assessment of physical fitness of students is based on a combined percentage scale of multi-level gradation with a step of 1%. This scale is superimposed on a traditional 5-level rating scale based on benchmarks (reference points): a high level corresponds to a scale value of 100%,

Table 1. Distribution of study participants

Country	n
Poland	45
Bulgaria	62
Malaysia	34
India	41
Jordan	68
China	38
Egypt	26
Tunisia	35
Ukraine	49
Totals	488

Table 2. Structure of the pedagogical testing system

Abilities for testing	Assessing characteristics	Test content
General duration	Cardiorespiratory duration	Running, 1000 m (min., sec.)
Maximum strength	Speed strength	Standing Long Jump Test (Broad Jump), cm;
	Dynamic strength	Pull-Up Bars number
Speed	Running speed	Running, 30 m (s)
Agility		4x9 m Shuttle test, sec.;
Elasticity	Mobility of the spinal column	Seated Forward Bend, cm;

an average value of 70%, and a low value of 50%. For the comparability of the results, it is possible to interpret the calculated data in the generally accepted 5-level rating system (Fig. 1).

Statistical analysis

Student's t-tests for independent samples were used to assess differences in continuous variables between men in the different ethnic groups. Pearson's chi-square analyzes were used to identify differences in the proportion of participants from each group depending on fitness level. Based on the Kolmogorov-Smirnov test we considered the data normally distributed. Data are presented as mean and standard deviation (SD).

Results

The results of testing the level of development of physical abilities of students (young men) are presented in the table 3. It was found that the average values of general or cardiorespiratory endurance for students are mostly at above average,

average and below average levels. Although the frequency ratio of young men regarding the levels of general endurance is different (Fig. 2).

As can be seen from figure 2, that in almost all countries (with the exception of India and Tunisia) 41.2 - 70.0% of students are characterized by low indicators of cardiorespiratory or general endurance. This indicates a deficit in the development of this ability. For the representatives of India and Tunisia, the shares of such students are in the range of 19.2-24.5%.

The level of speed and strength training based on the results of standing long jump testing is presented in figure 3.

The values of the results of the speed-power fitness test show that the largest variations in the studied parameter are observed between representatives of Tunisia and China. Among these students, 20.2% to 30.9% of the participants failed the test. Students from Asian-African countries have the lowest results - from 54.4% to 58.3% of

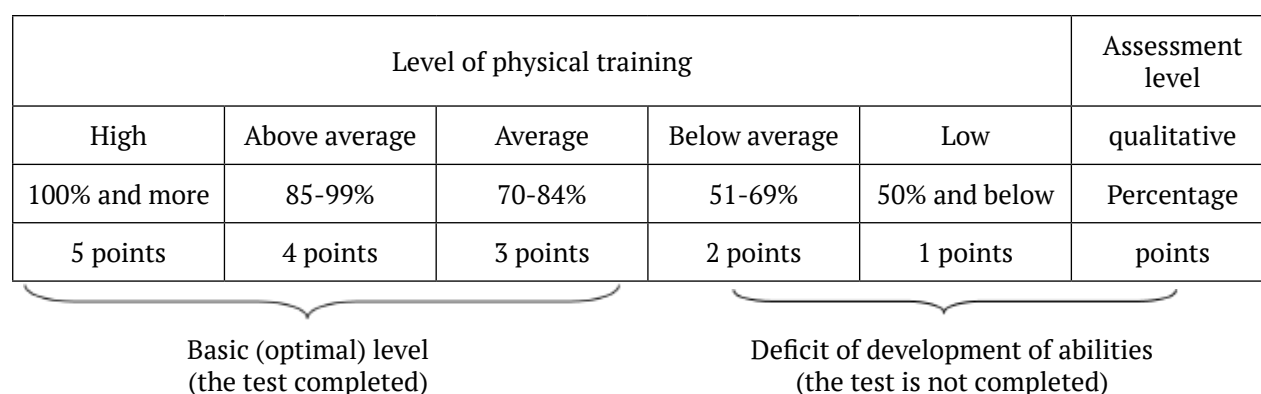


Figure 1. Structural diagram of the rating scale of physical fitness

Table 3. Indicators of physical fitness of students,

Country	Indicators					
	Running, 1000 m; min., sec	Standing Long Jump (Broad Jump), cm	Pull-Up Bars number	Running, 30 m; sec	4x9 m Shuttle test, sec.	Seated Forward Bend, cm
Poland	4.13(1.10)	220.2(22.4)	12.0(1.2)	5.21(0.82)	9.30(0.92)	11.2(3.7)
Bulgaria	4.12(1.02)	231.5(19.4) ¹	11.9(1.0)	5.05(0.40)	9.35(1.05)	10.8(4.2)
Ukraine	4.10(0.78)	230.2(20.2) ¹	12.4(0.8) ²	4.95(0.61)	9.04(0.89)	11.8(3.5)
Malaysia	4.25(1.03)	207.5(21.2) ¹²³	9.8(1.4) ¹²³	4.94(0.93)	10.02(0.81) ¹²³	11.0(3.8)
India	4.08(0.92)	214.6(16.5) ²³	10.0(1.6) ¹²³	5.25(0.79)	10.12(0.76) ¹²³	12.1(2.3) ²
China	4.27(1.12)	225.8(12.7) ⁴⁵	13.5(2.1) ¹²³⁴⁵	4.91(1.00)	9.04(0.52) ⁴⁵	12.3(2.1) ²
Jordan	4.35(1.32)	218.4(14.2) ²³⁴⁶	9.8(2.5) ¹²³⁶	5.63(0.89) ¹²³⁴⁵⁶	10.14(1.42) ¹²³⁶	10.1(3.6) ³⁵⁶
Egypt	4.35(0.82)	216.9(21.3) ²³	10.2(2.0) ¹²³⁶	5.71(1.05) ¹²³⁴⁶	10.71(0.53) ¹²³⁴⁵⁶⁷	10.4(4.0) ⁶
Tunisia	4.01(0.45)	226.4(19.2) ⁴⁵⁷	11.3(1.4) ¹²³⁴⁵⁶⁷⁸	4.78(0.98) ¹⁵⁷⁸	9.14(0.94) ⁴⁵⁷⁸	12.9(3.2) ¹²⁴⁷⁸

Note: statistically significant difference ($p < .05$) between data of students from: 1 – Poland and others; 2 – Bulgaria and others; 3 – Malaysia and others; 4 – India and others; 5 – Jordan and others; 6 – China and others; 7 – Egypt and others; 8 – Tunisia and others (based on t-test)

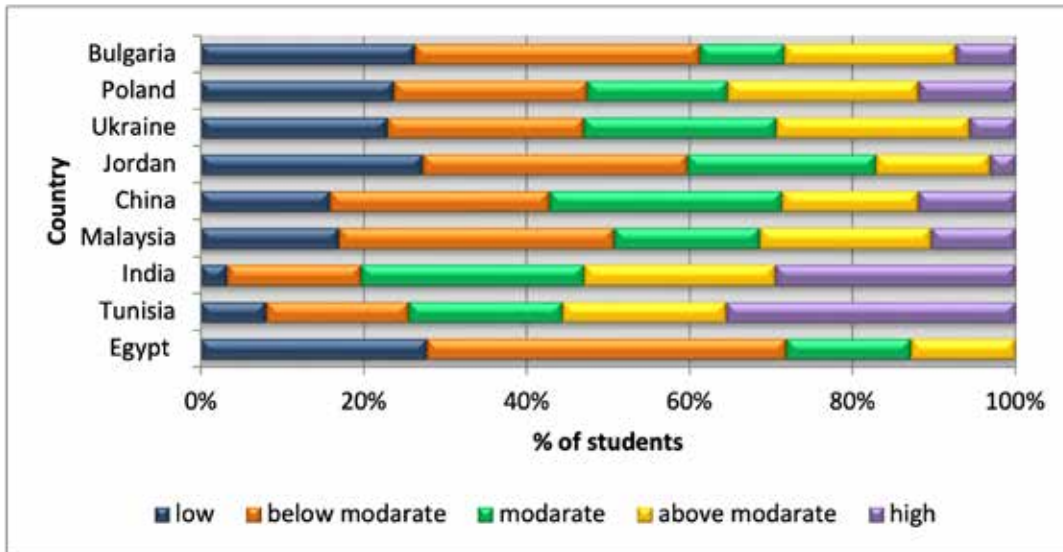


Figure 2. Distribution by levels of cardiorespiratory endurance of students

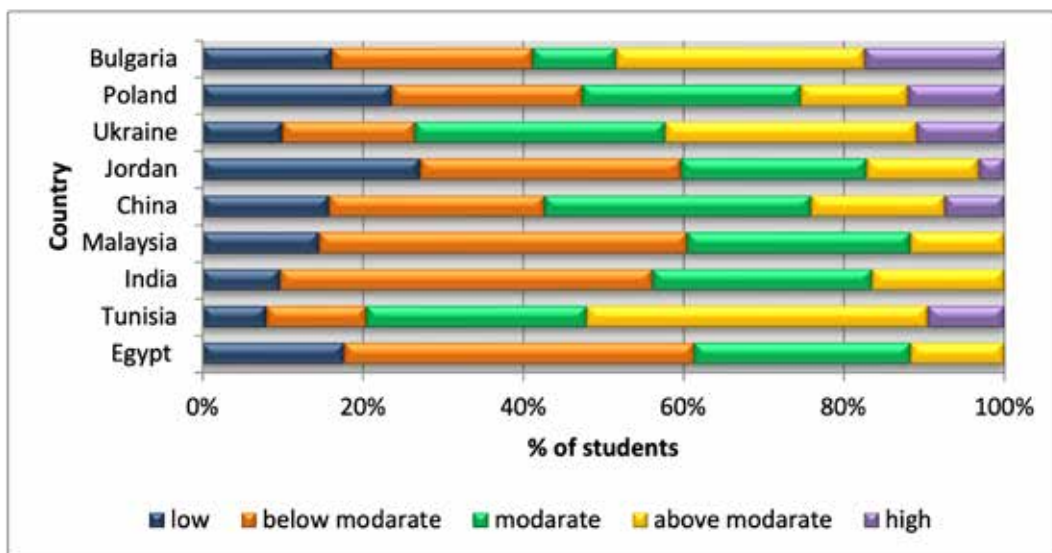


Figure 3. Distribution by levels of speed and strength training of students

students failed the test.

The representatives of Tunisia are characterized by the highest values of the indicator of speed abilities: 79.8% of the students completed the 30 m running test (Fig. 4). Students of Jordan, Malaysia and Egypt are characterized by the lowest values of the indicator of the formation of speed abilities: less than 50.0% of students completed the test.

The results of the distribution of students by levels of dexterity development are shown in figure 5.

As can be seen from figure 5, students of China and Tunisia have the highest indicators of the level of dexterity development - 78.7% and 73.8%, respectively. The lowest indicators are among students from Jordan and Egypt - 45.9% and 35.7%, respectively. It should be noted that the overall level of dexterity preparedness of students was relatively higher than speed, speed-strength preparedness and cardiorespiratory endurance.

The results of distribution according to the level of development of the stiffness of the vertebral column (flexibility) are shown in figure 6. The test results indicate significant individual fluctuations in the obtained indicators. The largest variations of the studied parameter are registered for young men of Asian countries.

Figure 6 shows that students from China and Tunisia had the highest scores - 70.7% and 68.8%, respectively, completed the test. Among students from Egypt and Jordan, there were only 38.5% and 43.9%, respectively.

The distribution of test participants according to the dynamic strength test turned out to be similar to all the previous ones (Fig. 7).

A comparison of the test results (Fig. 7) with the established norms shows that the results of this motor strength test are evaluated as following: high levels of development for representatives of China

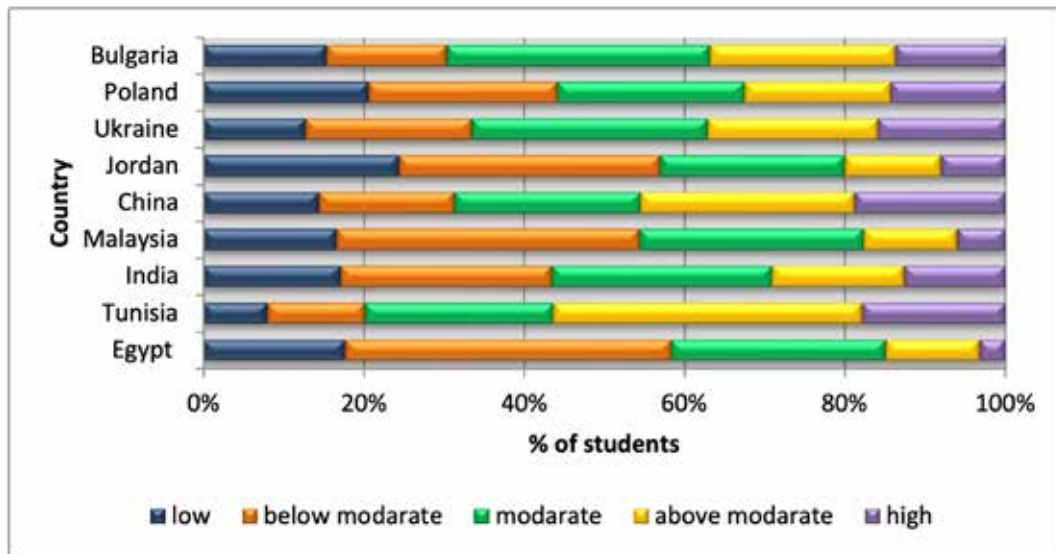


Figure 4. Distribution by levels of speed readiness of students

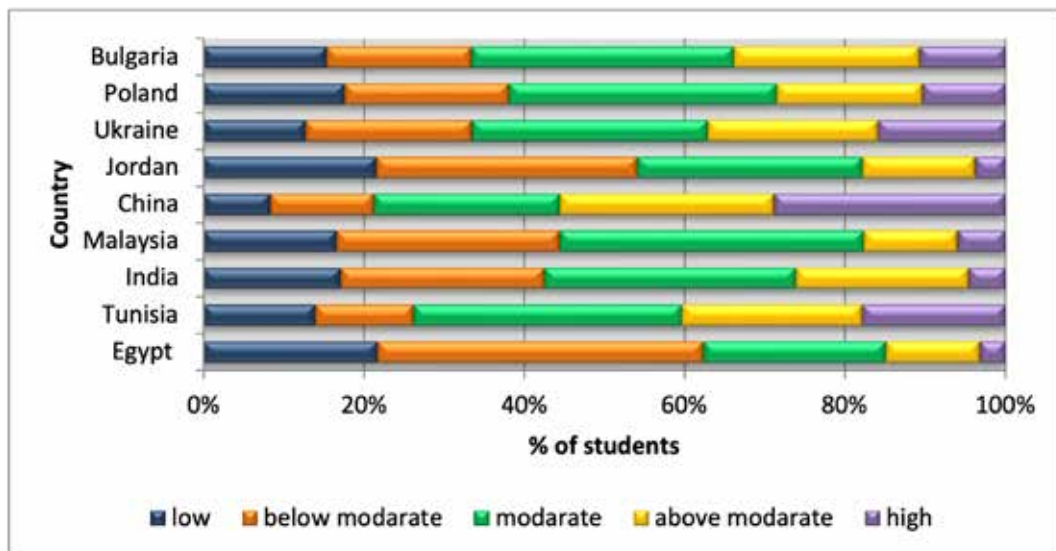


Figure 5. Distribution by levels of dexterity preparation of students

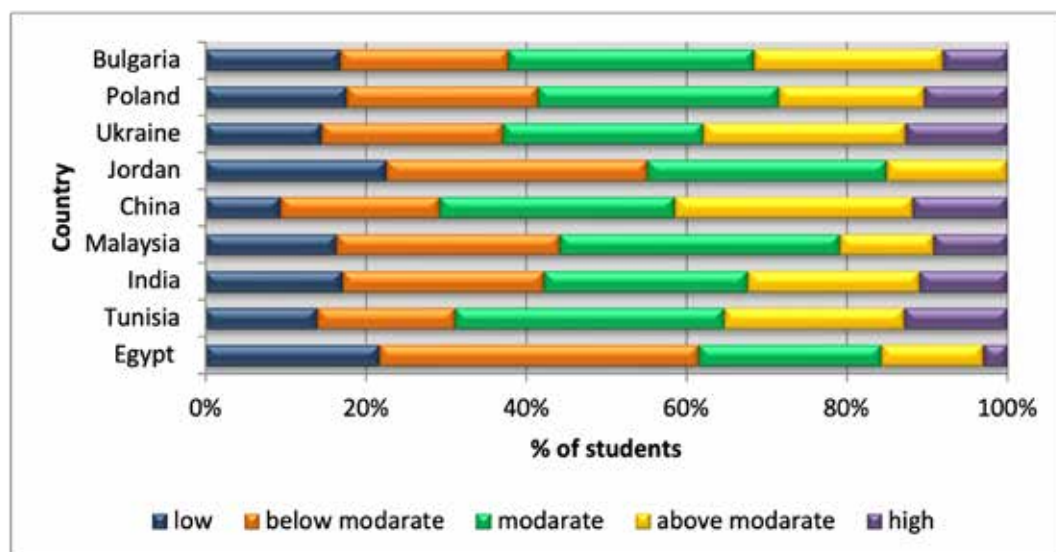


Figure 6. Distribution by levels of development of students' flexibility

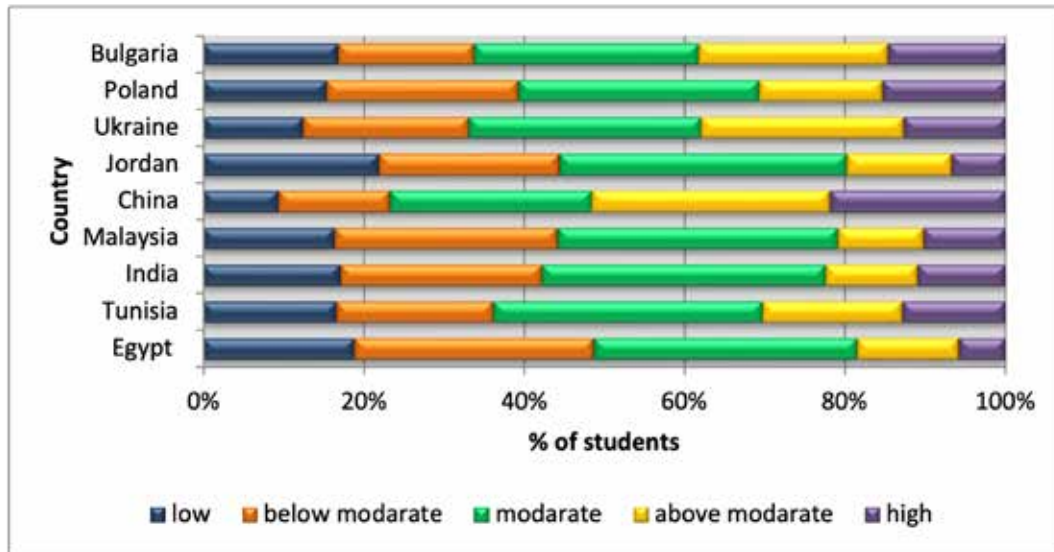


Figure 7. Distribution by levels of strength training of students

- 76.7% of students; average levels for students from European countries and Tunisia – from 63.8% to 66.9%; below the average for students in Jordan, Malaysia and Egypt – 55.6%, 55.8%, and 51.3%, respectively.

Discussion

We have established statistically significant differences in the levels of development of almost all physical abilities of students, except for cardiorespiratory endurance. It should be noted that in almost all countries (with the exception of India and Tunisia) from 41.2% to 70.0% of students are characterized by a low level of cardiorespiratory endurance development. This is in good agreement with the results of research by Gahche et al. [36]. The author announced that in 2012, in general, 42.2% of the studied contingent had a sufficient level of cardiorespiratory fitness. The authors also highlighted the lack of a statistically significant difference in the percentage of those who had an adequate level of cardiorespiratory fitness among non-Hispanic white, non-Hispanic black, and Latino youth. This is also consistent with our results. Similar data were obtained by Karimi et al. [37] and Monteiro de Almeida et al [38], who used Cooper’s test in their studies. However, in the study of Monteiro de Almeida et al. [38] based on $VO_{2\max}$ results it was found that representatives of South Asians have lower cardiorespiratory endurance than white Europeans and black Afro-Caribbeans in the UK. This ethnic difference in physical fitness is at least partially explained by ethnic differences in physical activity. However, endurance ensures versatile adaptation of internal organs, expansion of the reserves of the cardiovascular and respiratory systems, and ensures the tissue’s need for oxygen. Therefore, physical (somatic, i.e. bodily) health is judged by the level of endurance development [16, 18, 37, 38, 39, 40]. The

results obtained by us correlate well with data on the level of physical health of modern student youth [41].

According to our data, representatives of China and Tunisia demonstrated the highest rates of development of speed and strength abilities, where they performed the test from 69.1% to 78.8%. In studies conducted by Rouis et al. [42, 43], vertical jump height values of Afro-Caribbean participants were higher than Caucasians. This applied not only to adult men, but also had a place for preschoolers, junior high school students, and teenagers. Caia et al. [44] attributed this mainly to constitutional differences between ethnic populations, such as differences in body composition, musculotendinous properties, and muscle fiber types. The authors also emphasize that the use of vertical jump as a measure of muscle strength should be considered with caution when working with populations of different ethnic origins.

We obtained similar results when determining the level of speed formation. Thus, 79.8% of students from Tunisia complete this test. There is conflicting research regarding differences in sprinting speed by ethnicity. So, our data agreed with the results of studies by Babel et al. [45]. The authors showed that representatives of the North African region have better results in sprint running (30 m) and high jump than Europeans.

Regarding the results of flexibility testing, the highest results were demonstrated by representatives of India, China and Tunisia. Among representatives of Europe and other countries, these results were lower. These data are consistent with the results obtained by Walhain et al. [46] and De La Torre Susan [47]. It can be assumed that the differences in physical education programs in European and Asian countries are more related to sports practice. This has a significant impact on the results, as pointed out by Kemp et al. [48].

Regarding the development of dexterity, the highest results were demonstrated by representatives of China, Tunisia and Ukraine (9.04–9.14 s). Representatives of other countries demonstrated statistically lower results (9.30–10.71 s). The data are confirmed by the studies of Kuan et al. [49]. The authors compare the results between Chinese ethnic juniors and non-Chinese ethnic athletes. Analysis shows faster responses, higher accuracy, and better consistency among ethnic Chinese juniors. Our data are also consistent with the results of Lang et al. [50].

When testing strength qualities, we found that 76.7% of students from China completed the test with an average result of 13.5(2.1) times. Students from European countries showed mostly average and above average level of development of physical abilities. Students from Malaysia, Jordan, India and Egypt showed low and below average levels. Therefore, ethnicity is an important factor influencing muscle strength. However, the data obtained by us contradict the results obtained by other researchers. Thus, Woo et al. [51] showed that normal grip strength values are lower for Asian groups compared to European groups. The authors also noted that European standards should not be used as a reference standard for the Asian population. The study by Ong et al. [52] showed that subjects of Malay and Indian ethnicity had significantly lower hand dynamometry values than Chinese subjects. US and UK students had the highest mean wrist dynamometry scores. Students from Japan, Malaysia, Hong Kong, Singapore and Taiwan are ranked below. Another study reported ethnic differences in grip strength, where Aboriginal people had significantly lower grip strength compared to Malaysian Malays, Chinese and Indians [53]. Silva et al. [54] showed that dynamometry threshold values emphasize stratification by ethnicity [55]. We believe that the discrepancy in strength results between students in European countries and China can be explained by the use of different test tasks. But this approach needs a more detailed study.

According to other authors [56, 57, 58, 59], in Asian countries, physical activity is given a low priority due to the emphasis on the education of the mind, and not on the physical development of the body. Students spend most of their time studying,

leaving little time for recreational activities such as physical activity. Other Asian and African countries pay little attention to physical activity due to certain traditions [60], as well as the lack of a physical training system at various levels [61]. This was also indicated in the study conducted by UNESCO [62]. Significant differences between regions regarding levels of physical activity in and out of school are shown. These levels were generally highest in European countries and lowest in the Eastern Mediterranean region. We can say that physical education program with an orientation towards increasing physical activity will most likely affect the student's motor competence. In addition, the frequency of physical education lessons per week, the content and goals of the curriculum can also be factors that affect the motor competence of young people [63].

However, when moving to a country with a different culture, the situation may change. Thus, Afable-Munsuz et al. [64] found that Chinese students from the US showed significantly higher levels of physical activity participation than those living in Hong Kong. This fact also confirms our results about the higher level of development of motor abilities of students from China and Tunisia.

Conclusions

Our results indicate the specificity of the development of motor skills of students from different countries, which is manifested in statistically significant differences in the results of test tasks. Students from different countries perform better on those tests that are closer to their known motor experience. This is due to the cultural environment, geographical factor, socio-economic status, as well as the content and goals of the physical education program.

Further work is required to determine the peculiarities of fitness state versus ethnicity as a prescription of training programmes for university male students.

Conflict of interest

The authors state that there is no conflict of interest.

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