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## Physical developing characteristics of ethnic minority students age 11-14 in north central and central coastal region of Vietnam

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### Abstract

By scientific methods, the thesis has identified the physical developing characteristics of ethnic minority students who are growing up following the laws of natural biology, adulating and growing together with natural age. The data collected in the sample is highly dispersed in most of the indicators (11/13 objects), except for the vertical height and running 4x10m. Hormonal changes when girls start adulthood earlier but also end earlier than boys are the main factors promoting physical development at this stage. Weight is assessed in balanced growth with vertical height through BMI, according to FAO standards, boys aged 11–12 years old and girls aged 11 years are among the underweight category III, boys aged 13-14 and girls aged 12 are in the first stage of underweight, girls aged 13-14 reach normal. BMI by age in children (iFitness.vn), both boys and girls of all ages are in the average range. Physiological function is evaluated according to 3 criteria: Living capacity, single reflection, Complex reflection. Results also show that the functionality reached a low average.

Physical strength was assessed according to 7 tests reflecting all the qualities: speed, strength, flexibility, endurance and coordination. In general, physical qualities developed by age with uneven growth rates between ages. It's a difference between male and female children, expressing boys better than girls. the developing level in girls increase rapidly, clearly in ages 12 and 14, the remaining qualities are either slow or steady. For boys, strength increases rapidly after age 13 and is highest at age 14, the remaining qualities increase at ages 11-13, and reducing after.

**Keywords:** Development, physic, ethnic minority students, north central, central coastal region

### Introduction

Physical health is the quality of human body defined as any bodily movement produced by skeletal muscles that result in energy expenditure. It is a relatively stable characteristic of the body's morphology and function that is formed and developed by genetic innate and living conditions. Physical capacity is reflected in the body's physical factors, movement capacity and basic moving skills, adaptability, functional situation of the internal organs. The process of physical development takes place according to the specific biological rules, and is also under the influence of natural and social environmental factors.

Physical preparation for labors is an elaborate educating and reforming process, which is jointly implemented by the whole society with many sectors, in which the sports sector plays an important part. Therefore, if we want the physical preparing process for employees to reach effectively, the level of physical development reaches the best effect; we need to conduct a human's physical survey to evaluate rightly the physical development through each stage. at the same time, we do research the effect of influencing factors to find out the cause of limiting the developing process. This is a practical basis to select and identify the content of solutions to improve people's stature and physical health.

In the period of 2017 - 2019, Bac Ninh Sports University has been implementing the national science and technology topic "Research solutions and policies for physical development to contribute to improving the quality of the human resources of the Ethnic Minorities by 2030", code: CtDT.23.17/ 16-20. The topic is belonged to master Program: "Basic and urgent issues on ethnic minorities and ethnic policy in Vietnam by 2030", Code No. CTD / 16-20. Determining the physical developing characteristics of ethnic minority students aged 11-14 in

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the North Central and Central Coast regions of Vietnam is one of the important contents of the Program.

**Researching Methods**

The project uses cross-sectional research method. Age is determined by decimal age.

- Medical examination, including: Anthropology - using Martin's anthropometric method of measuring height, weight, BMI; Clinical examination - examination of respiratory function (Vital capacity) and nerve function (Single and Complex reflex).
- Pedagogical test: Evaluating the movement qualities through the tests: Hand-flexing force, Reciprocating lying on the back, running 30m with high starting, Flexible folding body, 4x10m shuttle running, Standby jumping, free running in 5 minutes.

**Evaluate BMI according FAO [4]:**

- BMI < 16: Underweight level III
- BMI = 25 – 29.99: Overweight level I
- BMI = 16 – 16.99: Underweight level II
- BMI = 30 – 39.99: Overweight level II
- BMI = 17 – 18.45: Underweight level I
- BMI > 40: Overweight level III
- BMI = 18.5 – 24.99: normal

**Evaluate BMI according ages (iFitness.vn)**

Evaluating level Age: 11 12 13 14

Under (thin) < 14.3 14.8 15.2 15.8

**Average (Normal)**

In the middle of thin and fat which corresponding risk of obesity similar to ages.

Risk of obesity > 21.0 21.8 22.6 23.4

Obesity > 24.0 25.2 26.3 27.2

Survey subjects are included 339 ethnic minority students (151 boys and 188 girls), of which: age 11 (38 boys, 47 girls); age 12 (38 boys, 50 girls), age 13 (35 boys, 45 girls), age 14 (40 boys, 46 girls) in 5 provinces: Nghe an, Quang Binh, Thua Thien - Hue, Quang Ngai and Ninh Thuan. The survey took place from November to December 2018.

**Results and Discussion**

**1. Morphological characteristics of ethnic minority students at 11-14 years old in the North Central and Central coastal region of Vietnam**

Body morphology not only reflects the individual characteristics (genes), characteristics of the race, but also is influenced by many factors such as nutrition, daily life regime, movement regime, natural environment and also the state of illness. Therefore, morphological characteristics are considered central criteria reflecting the level of physical development. Results of morphological characteristics are presented in Table 1.

**Table 1:** Morphological characteristics of ethnic minority students at 11-14 years old in the North Central and Central coastal region of Vietnam [5]

Age	Index	Male		Increasing level	Female		Increasing level
		$\bar{x}$	$\pm\sigma$		$\bar{x}$	$\pm\sigma$	
11	Height (cm)	137,35	7,84	7,54	136,56	5,23	5,92
	Weight (kg)	30,32	6,49	2,71	32,08	5,97	4, 27
	BMI index (kg/m <sup>2</sup> )	15,93	2,16	0,44	15,70	1,31	-0,34
12	Height (cm)	142,01	9,46	4,66	146,97	8,37	10,41
	Weight (kg)	32,65	7,81	2,33	37,92	7,77	5,84
	BMI index (kg/m <sup>2</sup> )	15,98	2,18	0,05	17,44	2,62	1,74
13	Height (cm)	151,37	7,12	9,36	151,48	5,69	4,51
	Weight (kg)	39,90	6,64	7,25	42,10	5,01	4,18
	BMI index (kg/m <sup>2</sup> )	17,33	2,04	1,35	18,74	2,38	1,3
14	Height (cm)	156,29	7,41	4,92	150,17	5,11	-1,31
	Weight (kg)	44,40	7,01	4,50	42,83	4,46	1,73
	BMI index (kg/m <sup>2</sup> )	18,16	1,71	0,83	18,98	1,62	0,24

The research shows that the morphological development of ethnic minority students complies with natural biological laws. The process of improvement and growth takes place in accordance with the increase of age; the data obtained in the study sample is highly dispersed at all ages, except the vertical height. The less dispersed height has shown that this index is higher dominated by genetic genes (high inheritance), the difference in weight and BMI has shown environmental factors, especially nutrition, create the big differences between individuals in the sample.

The vertical height between boy and girl is different, the male height increase averagely 6.5cm/year and increase the highest at the age of 13 (9.36cm); the female height increase averagely 5.0cm / year and highest at 12 years (10.41cm) and leveling off at age 14. Weight is assessed in balanced development for vertical height through BMI, according to the standards of FAO, boys aged 11–12 years and girls aged 11 years are among the underweight of group III, boys aged 13-14 and girls aged 12-14 are underweight Group I, girls aged 13-14 reach the normal level. Following BMI

(iFitness.vn), both boys and girls of all ages are in the average range. The results showed that, besides genetic factors and habitat factors such as nutrition, psychology, physical activity, economic and other natural conditions, hormonal changes in children. Girls start adulthood (puberty) earlier but also end earlier than boys, which is the main factor that promotes and regulates the physical developing characteristics of children in this period.

Compared with other studies in Vietnam from 2000 to now, the anthropometric indicators of ethnic minority students aged 11-14 years in the North Central and Central Coast regions of Vietnam are lower than those of the previous years, for example:

- The height: 11 years old male reached  $137.35 \pm 7.84$ cm, compared to 2014 (North Vietnam) was  $141.91 \pm 10.11$ cm [2], in 2001 was  $137.59 \pm 7.39$  [1] and 1975 was  $121.95 \pm 5.53$ cm [6]; 11-year-old female reached  $136.56 \pm 5.23$ cm, compared to 2014 was  $142.91 \pm 6.61$ cm, 2001 was  $139.44 \pm 7.32$ cm.
- The height: 14-year-old male reaches  $156.29 \pm 7.41$ cm,

compared to 2014 was  $158.13 \pm 8.01$ , 2001 was  $155.67 \pm 7.97$  and 1975 was  $137.51 \pm 8.05$ ; 14-year-old girls reached  $150.17 \pm 5.11$ cm, compared to 2014 was  $153.74 \pm 5.64$ cm, 2001 was  $151.28 \pm 5.53$ cm and 1975 was  $138.95 \pm 7.36$ cm

Thus, after 17 years (compared with 2001), even though the economy developed rapidly, whole society paid attention in ethnic policies, but ethnic minority children in the North Central and Coastal areas Central Vietnam has not caught up with the level of morphological development of children nationwide and is much lower than children in the Northern in 2014.

Comparing with other studies in Asia and Europe before the year 2003 [3], it shows the anthropometric indicators of ethnic minority students aged 11-14 years in the North Central and Central Coast regions of Vietnam are all lower, for example: 11-year-old children have a vertical height of 142.6cm for boy

and 144.9cm for girl in Japan, 143.0cm and 143.2cm in Germany; At the age of 14, the male vertical height is 162.7, females is 155.3cm in Japan, 160.4cm and 159.5cm in Germany.

The body development situation of ethnic minority children in the North Central and Central Coast regions of Vietnam is also worse than children in other regions nationwide, only higher than children in the Midlands and Northern Mountainous areas in our research. This is an issue that needs attention, especially from the perspective of nutrition and daily life.

**2. Physiological function of ethnic minority students at 11-14 years old in the North Central and Central coastal region of Vietnam**

Physiological functions are evaluated according to 3 criteria: Vital capacity, Single and Complex reflex. Results are presented in Table 2.

**Table 2:** Physiological function of ethnic minority students at 11-14 years old in the North Central and Central coastal region of Vietnam [5]

Age	Index	Male (n=60)		Increasing level /year	Female (n=60)		Increasing level /year
		$\bar{x}$	$\pm\sigma$		$\bar{x}$	$\pm\sigma$	
11	Vital capacity (ml)	1607,70	417,02	196,94	1459,10	304,74	174,43
	Single reflex (ms)	314,79	126,72	-45,30	337,28	101,78	-50,57
	Complex reflex (ms)	573,38	155,76	-94,57	662,75	189,60	-40,58
12	Vital capacity (ml)	1682,57	405,54	74,87	1750,36	435,37	291,26
	Single reflex (ms)	320,94	127,11	6,15	338,33	110,44	1,05
	Complex reflex (ms)	611,36	168,08	37,98	573,39	194,09	-89,36
13	Vital capacity (ml)	2177,56	328,47	494,99	1853,80	322,07	103,44
	Single reflex (ms)	321,38	105,06	0,44	379,55	126,79	41,22
	Complex reflex (ms)	476,35	302,87	-135,01	446,51	310,83	-126,88
14	Vital capacity (ml)	2147,23	453,64	-30,33	1992,82	271,96	139,02
	Single reflex (ms)	313,71	104,83	-7,67	357,58	97,92	-21,97
	Complex reflex (ms)	625,82	191,91	149,47	597,54	134,17	133,03

Research results at the Table 2 show that the physiological function development of ethnic minority students at ages 11-14 develops in accordance with natural biological laws. The process of improvement and growth is accompanied by an increase in age, uneven growth between ages; the data collected in the research sample has very high dispersion. This shows that habitat factors have large differences among individuals in the sample. This is a matter needs to be researched more deeply.

The increase in the living capacity index is happened all stages, strongest at female age 12 and male age 13. This is also a sensitive period to develop anaerobic endurance [3]. The added value of the index reflects the no large reflex rate, increasing and decreasing not so clear at the age of 12-14. This result is consistent with the law of natural biology

because the characteristics of the nerve are highly conservative, highly dependent on individual characteristics (genetic genes). This is also the sensitive period to develop the speed of movement (7-12 years old) [3]. Comparison with other studies shows that indicators reflecting the mental function of ethnic minority students at ages 11-14 in the North Central and Central coastal region of Vietnam are the similar equal value.

**3. Physical characteristics of ethnic minority students at 11-14 years old in North Central and the Central coastal region of Vietnam**

Physical strength was assessed according to 7 tests reflecting all the qualities: speed, strength, flexibility, endurance and coordination. The results are presented in Tables 3.

**Table 3:** Physical characteristics of ethnic minority students at 11-14 years old in North Central and the Central coastal region of Vietnam [5]

Age	Index	Male (n=20)		Increasing level	Female (n=20)		Increasing level
		$\bar{x}$	$\pm\sigma$		$\bar{x}$	$\pm\sigma$	
11	Hand-flexing force (kG)	17,09	3,58	3,29	16,53	3,66	4,09
	Reciprocating lying on the back (Time)	17,42	3,54	2,66	15,64	4,04	2,51
	Running 30m with high starting (second)	5,59	0,62	-0,15	6,06	0,58	0,24
	Flexible folding body (cm)	1,93	4,16	-2,34	3,59	4,74	-0,31
	4x10m shuttle running (second)	11,54	1,02	0,42	12,06	1,00	0,07
	Standby jumping (cm)	164,78	19,63	10,54	151,51	20,92	3,08
	Free running in 5 minutes (m)	779,14	138,53	-3,59	794,81	59,20	51,18
12	Hand-flexing force (kG)	21,86	7,28	4,77	20,24	5,10	3,71
	Reciprocating lying on the back (Time)	18,67	3,36	1,25	15,83	2,89	0,19
	Running 30m with high starting (second)	5,56	0,42	-0,03	6,08	1,43	0,02
	Flexible folding body (cm)	4,12	4,24	2,19	5,35	6,19	1,76

	4x10m shuttle running (second)	11,30	0,70	-0,24	11,53	0,99	-0,53
	Standby jumping (cm)	171,78	16,34	7,00	160,58	18,99	9,07
	Free running in 5 minutes (m)	852,88	68,74	73,74	805,45	80,08	10,64
13	Hand-flexing force (kG)	23,29	8,11	1,43	21,04	5,46	0,3
	Reciprocating lying on the back (Time)	18,64	3,32	-0,03	14,97	3,22	-0,86
	Running 30m with high starting (second)	5,73	1,09	0,17	5,82	0,51	-0,26
	Flexible folding body (cm)	4,24	5,32	0,12	7,04	6,63	1,69
	4x10m shuttle running (second)	11,20	0,95	0,10	11,94	0,89	0,41
	Standby jumping (cm)	189,35	16,13	17,57	166,05	22,62	5,47
	Free running in 5 minutes (m)	854,92	83,22	2,04	794,71	85,67	-10,74
14	Hand-flexing force (kG)	30,79	5,62	7,5	30,39	38,50	9,35
	Reciprocating lying on the back (Time)	15,91	3,78	-2,73	14,33	4,60	-0,64
	Running 30m with high starting (second)	5,78	1,20	0,05	6,03	0,69	0,21
	Flexible folding body (cm)	6,45	3,63	2,21	7,61	3,73	0,57
	4x10m shuttle running (second)	11,42	1,92	0,22	12,19	1,04	0,25
	Standby jumping (cm)	192,41	18,71	3,06	176,37	20,94	10,32
	Free running in 5 minutes (m)	876,10	92,57	21,18	840,60	89,52	45,89

The result in Table 3 shows that physical qualities develop, according to age, with uneven growing rate between ages. Between male and female children, there is a difference with male expression better than female in almost physical characteristics, except body flexibility in which 11-14 years old girls are better than same age boys.

This rule of physical development maintained throughout the age of 11-14 has demonstrated the positive effect of the sex hormones, in which testosterone plays a key role, affecting the entire development process of child's physical health, especially skeletal muscle. It is clear that the lower limb strength (standby jumping) in both boys and girls increased rapidly, the upper limb strength increased slowly at age 11-13, but increased faster at age 14 in both sexes.

Speed and ability of moving coordination increase stably after age 11. Endurance in boys and girls continues to increase irregularly through ages 11-13 and seem to growth rapidly at age 14.

This result is consistent with the rule of asynchronous development, because although the morphology increases rapidly, the functional capacity of the respiratory system, particularly the cardiovascular system, cannot follow, leading to reducing the endurance capacity of children (ages 12-13).

Compared with other studies, the physical qualities of ethnic minority students at 11-14 years old in North Central and the Central coastal region of Vietnam are now similar and lower than those which were researched throughout the country and in Northern Vietnam in 2001 <sup>[1]</sup> and 2008 - 2011 <sup>[2]</sup>. This result also shows that, when economic and social conditions are changing, the living standard is improved, leading to an increase in people's physical capacity. It illustrates the positive effects of the revolution for the people by the Communist Party and the State. However, after more than 15 years, the physical strength of ethnic minority students aged 11-14 in the North Central and Central Coast regions of Vietnam has not yet caught up with the growth of students nationwide in 2001- 2011.

## Conclusion

1. Results of research on physical development characteristics of ethnic minority students aged 11-14 years in the North Central and Central Coast regions of Vietnam show that the physical development process complies following the natural biological laws. The process of improvement and growth is accompanied by an increase in age, uneven growth between ages; the data collected in the research sample has very high dispersion (11/13 objects).

2. The level of physical development of ethnic minority

students aged 11-14 in the North Central and Central Coast regions of Viet Nam is uneven among ages (the highest increasing among girls aged 12-13 and boys between the ages of 13-14). There is a difference between boys and girls that boy are better than girls in most of the physical characteristics, except for body flexibility at all ages. Girls are also better than boys in vertical height and weight at the 11-13 years old. After more than 15 years, the physical strength of ethnic minority students aged 11-14 in the North Central and Central Coast regions of Vietnam has not yet caught up with the growth of students nationwide.

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