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Assessment of Cardiovascular Function Changes After One Year of Training Among Track and Field Specialization Students of the 54th Cohort at Hanoi University of Physical Education and Sports

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ABSTRACT: This study employed four indicators and two tests to evaluate the progression of cardiovascular function changes after one year of training among track and field specialization students of the 54th undergraduate cohort at Hanoi University of Physical Education and Sports. The results indicate that all indicators and evaluation tests show improvements in cardiovascular function, reflecting enhanced adaptation to physical activity.

KEYWORDS: Cardiovascular function; 54th cohort of track and field specialization students; Hanoi University of Physical Education and Sports…

1. INTRODUCTION

Currently, Hanoi University of Physical Education and Sports not only focuses on developing training programs to meet societal demands but also continuously improves students' physical fitness. Changes in physical condition are always accompanied by changes in physiological indicators of the body. Therefore, physiological indicators are commonly used as a basis for evaluating students' physical development.

Each physiological indicator carries specific significance, reflecting the response of body systems to physical activity. During exercise, the human body requires a high oxygen supply for cells. To meet this demand, the body undergoes functional reorganization, including structural and functional changes. The earliest changes in this process occur within the cardiovascular system.

Several authors have previously studied this issue, such as Menxicop V.V., Volcop N.I. (1997); Nguyễn Ngọc Cừ, Dương Nghiệp Chí (2000); Bùi Quang Hải et al. (2009); Lê Hữu Hưng, Nguyễn Thị Thanh Nhàn; Lưu Quang Hiệp, Vũ Chung Thuỷ, Đặng Văn Dũng (2008); Trần Tuấn Hiếu (2013). However, none have specifically evaluated cardiovascular function in track and field specialization students of the 54th cohort at Hanoi University of Physical Education and Sports.

For this reason, this study was conducted to evaluate cardiovascular function in these students, aiming to examine the effects of training and learning on their physical condition.

The research employed the following methods: document analysis and synthesis, medical examination, and statistical analysis.

2. RESEARCH RESULTS

2.1. Evaluation of Cardiovascular Function

The study used four indicators and two tests to assess cardiovascular function in the subjects, including: Resting heart rate, Systolic blood pressure, Diastolic blood pressure, Pulse pressure, Cardiac function index (HW), Harvard Step Test. The evaluation was conducted from January 2023 to January 2024, based on three measurement periods:

+ **First measurement:** January 2023
+ **Second measurement:** September 2023
+ **Third measurement:** January 2024

The results of evaluating Cardiovascular Function for the subjects are presented in table 1,2 and 3.

Table 1. Cardiovascular Function Results – First Measurement

No.	Indicator	Male		Female	
		N	$\overline{X} \pm \delta$	N	$\overline{X} \pm \delta$
1	Resting heart rate (beats/min)	12	74,2 ± 2,2	6	75,4 ± 3,2
2	Systolic blood pressure (mmHg)	12	118,8 ± 5,8	6	116,6 ± 3,6

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3	Diastolic blood pressure (mmHg)	12	77,8 ± 3,1	6	75,8 ± 4,1
4	Pulse pressure (mmHg)	12	41,0 ± 4,5	6	40,8 ± 3,9
5	Cardiac function index (HW)	12	8,9 ± 3,4	6	9,7 ± 3,5
6	Harvard Step Test	12	80	6	72

Table 1 indicates that:

- The resting heart rates of all study participants were within normal physiological ranges, appropriate for their age and sex (for individuals aged 18–21, the average heart rate is 71.04 ± 4.89 beats/min in males and 72.98 ± 3.05 beats/min in females).

- The values of systolic blood pressure, diastolic blood pressure, and pulse pressure of the participants were also within normal physiological limits for their age and sex (for individuals aged 18–21, systolic blood pressure averages 115 ± 10 mmHg in males and 110 ± 10 mmHg in females; diastolic blood pressure averages 72 ± 7 mmHg in males and 70 ± 7 mmHg in females).

- The cardiac function index (HW) in both male and female track and field specialization students of the 54th cohort ranged from 6 to 10 (6 < HW < 10), indicating a moderate level of heart rate recovery.

- The Harvard Step Test score averaged 80 in male students, corresponding to a good level of cardiovascular function, whereas in female students, the average score was 72, indicating a moderate level.

Table 2. Cardiovascular Function Results – Second Measurement

No.	Indicator	Male		Female	
		N	$\overline{X}$ ± б	N	$\overline{X}$ ± б
1	Resting heart rate (beats/min)	12	69,8 ± 3,1	6	71,4 ± 4,1
2	Systolic blood pressure (mmHg)	12	116,2 ± 5,5	6	112,8 ± 3,9
3	Diastolic blood pressure (mmHg)	12	73,5 ± 3,8	6	71,7 ± 4,4
4	Pulse pressure (mmHg)	12	42,4 ± 4,7	6	42,1 ± 4,2
5	Cardiac function index (HW)	12	7,4 ± 4,4	6	8,2 ± 4,6
6	Harvard Step Test	12	83	6	75

Table 2 shows that all cardiovascular indicators in both male and female track and field specialization students exhibited changes, with trends indicating improved cardiovascular adaptation to physical activity.

- Resting heart rate remained within normal physiological limits across all groups but showed a decreasing trend compared to the first measurement.

- - Both systolic and diastolic blood pressure values demonstrated a downward trend in all groups.

- Pulse pressure showed a slight increase compared to the values reported in Table 1

- The cardiac function index (HW) remained within the moderate range; however, it showed a decreasing trend, indicating more efficient heart rate recovery among the study participants.

- Harvard Step Test results:

+ In male students, the Harvard Test scores were within the good range and showed a slight increase compared to the first measurement, indicating an improvement in cardiovascular function.

+ In female students, the Harvard Test scores remained within the moderate range (70 < H < 80), but demonstrated an increasing trend, suggesting improved cardiovascular function in this group.

Table 3. Cardiovascular Function Results – Third Measurement

No.		Indicator	Male		Female	
			N	$\overline{X}$ ± б	N	$\overline{X}$ ± б
1		Resting heart rate (beats/min)	12	66,7 ± 3,6	6	68,4 ± 4,2
2		Systolic blood pressure (mmHg)	12	113,8 ± 4,8	6	111,2 ± 3,4
3		Diastolic blood pressure (mmHg)	12	69,6 ± 3,5	6	68,2 ± 4,2
4		Pulse pressure (mmHg)	12	43,6 ± 3,9	6	43,0 ± 3,8
5		Cardiac function index (HW)	12	6,1 ± 4,6	6	7,0 ± 4,4
6		Harvard Step Test	12	87	6	79

Table 3 shows that, when comparing the third measurement with the first and second measurements cardiovascular function continued to improve, with all indicators in both male and female track and field specialization students demonstrating enhanced adaptation to physical activity.

- Resting heart rate in both male and female students decreased compared to the second measurement, while still remaining within normal physiological limits.

- Systolic and diastolic blood pressure values in all groups continued to decline compared to the second measurement.

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- Pulse pressure showed a slight increase relative to the second measurement.

- Cardiac function index (HW):

+ In male students, the cardiac function index remained within the moderate range (6 < HW < 10) but showed a tendency to approach the good level.

+ In female students, the cardiac function index also remained within the moderate range; however, improvements in cardiovascular function were observed, particularly in enhanced heart rate recovery compared to the second measurement.

- Harvard Step Test:

+ In male students, the Harvard Test scores were within the good range and increased toward a value close to H = 90, indicating continued improvement in cardiovascular function and enhanced adaptation to physical activity.

+ In female students, the Harvard Test scores remained within the moderate range (70 < H < 80) but increased compared to the second measurement, approaching the threshold of H = 90. This indicates continued improvement in cardiovascular function among female students.

2.3. Changes in Cardiovascular Function Indicators After One Year of Training Among Track and Field Specialization Students of the 54th Cohort at Hanoi University of Physical Education and Sports

To evaluate the progression of changes in cardiovascular indicators, the study compared the results of cardiovascular function measurements across three time points and calculated the growth rates as well as the differences in observed mean values to assess changes in the test indices between measurement periods:

W_1: Growth rate of test indices between the first and second measurements

W_2: Growth rate of test indices between the second and third measurements

t_1: Difference in the observed mean values of test indices between the first and second measurements

t_2: Difference in the observed mean values of test indices between the second and third measurements

Table 4: Changes in Cardiovascular Function Indicators After One Year of Training

No.	Indicator	Gender	Result				Growth rate (%)						p
			N	First time	Second time	Third time	W1	| t1 |	W2	| t2 |	W1 + W2	| t1 |+| t2 |	
1	Resting heart rate (beats/min) Systolic blood pressure (mmHg)	Male	12	74,2 ± 2,2	69,8 ± 3,1	66,7 ± 3,6	6.2	2.1	4.5	1.8	10.7	3.9	< 0.05
		Female	6	75,4 ± 3,2	71,4 ± 4,1	68,4 ± 4,2	5.4	2.1	4.3	1.9	9.7	3.5	< 0.05
2	Diastolic blood pressure (mmHg) Pulse pressure (mmHg)	Male	12	118,8 ± 5,8	116,2 ± 5,5	113,8 ± 4,8	2.2	0.9	2.6	1.0	4.8	1.9	< 0.05
		Female	6	116,6 ± 3,6	112,8 ± 3,9	111,2 ± 3,4	2.4	2.0	2.3	1.8	4.7	2.9	< 0.05
3	Cardiac function index (HW)	Male	12	77,8 ± 3,1	73,5 ± 3,8	69,6 ± 3,5	5.3	2.4	5.9	2.5	11.1	4.6	< 0.05
		Female	6	75,8 ± 4,1	71,7 ± 4,4	68,2 ± 4,2	5.6	1.9	5.0	1.8	10.6	3.5	< 0.05
4	Resting heart rate (beats/min) Systolic blood pressure (mmHg)	Male	12	41,0 ± 4,5	42,4 ± 4,7	43,6 ± 3,9	3.4	0.6	2.8	0.6	6.1	1.2	< 0.05
		Female	6	40,8 ± 3,9	42,1 ± 4,2	43,0 ± 3,8	3.1	0.6	2.1	0.5	5.3	1.1	< 0.05
5	Diastolic blood pressure (mmHg) Pulse pressure (mmHg)	Male	12	8,9 ± 3,4	7,4 ± 4,4	6,1 ± 4,6	18,4	0.7	19.3	0.6	37.7	1.3	< 0.05
		Female	6	9,7 ± 3,5	8,2 ± 4,6	7,0 ± 4,4	16,8	0.7	15.8	0.5	32.5	1.2	< 0.05
6	Cardiac function index (HW)	Male	12	80	83	87	3.7	3	4.7	4	8.4	7.0	< 0.05
		Female	6	72	75	79	4.1	3	5.2	4	9.3	7.0	< 0.05

Table 4 shows that, after one year of training, all cardiovascular function indicators in both male and female track and field specialization students exhibited changes, with trends indicating enhanced cardiovascular adaptation. The specific changes in cardiovascular function indicators are as follows:

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- Heart rate: Across the three measurement periods, resting heart rate progressively decreased in both males and females. After one year of training, heart rate decreased by 9.7% in females (a reduction of 3.5 beats/min) and by 10.7% in males (a reduction of 3.9 beats/min).

- Blood pressure: Both systolic and diastolic blood pressure values decreased in males and females, while pulse pressure showed a slight increase.

- Systolic blood pressure decreased gradually across the measurements. After one year, the reduction was 4.8% in males (mean decrease of 1.9 mmHg) and 4.7% in females (mean decrease of 2.9 mmHg).

- Diastolic blood pressure also decreased progressively. After one year, the reduction was 11.1% in males (mean decrease of 4.6 mmHg) and 10.6% in females (mean decrease of 3.5 mmHg).

- Cardiac function index (HW): This indicator showed the most pronounced change in both males and females, reflecting the rate of heart rate recovery following exercise. The HW index decreased progressively in both groups. After one year of training, the change reached 37.7% in males and 32.5% in females.

- Harvard Step Test: The scores increased progressively in both males and females across the measurement periods. After one year of training, the Harvard Test score increased by 8.4% in males and 9.3% in females.

Overall, after one year of training, cardiovascular function in track and field specialization students improved, demonstrating enhanced adaptation to physical activity.

3. CONCLUSION

- The findings indicate that after one year of training, all six indicators used to assess cardiovascular function in 54th cohort track and field specialization students at Hanoi University of Physical Education and Sports showed changes in the direction of improved adaptation to physical activity.

- The greatest change was observed in the cardiac function index (HW), which decreased by 37.7% in males and 32.5% in females, indicating significant improvement in cardiovascular function. The smallest change was observed in systolic blood pressure, with reductions of 4.8% in males and 4.7% in females.

REFERENCES

1) Nguyen Ngoc Cu, Duong Nghiep Chi (2000), Training with metabolism and energy transformation in the body, Institute of Sports Science, Hanoi.
2) Bui Quang Hai et al. (2009), *Sports talent identification and selection*, Sports Publishing House, Hanoi.
3) Luu Quang Hiep, Nguyen Dai Duong, Vu Chung Thuy, Dang Van Dung (2008), " *A study on recovery characteristics of high-level male athletes in cyclic sports following physical exertion at different intensity zones* (Institutional research project). Bac Ninh Sports University.
4) Le Huu Hung, Vu Chung Thuy, Nguyen Thi Thanh Nhan (2010), *Therapeutic exercise*. Sports Publishing House.
5) Le Huu Hung, Nguyen Thi Thanh Nhan (2010), " *A study on recovery characteristics of high-level male athletes in cyclic sports following physical exertion at different intensity zones* (Institutional research project). Bac Ninh University of Physical Education and Sports, Hanoi.
6) Tran Tuan Hieu (2013), " *Development of criteria for evaluating recovery capacity in high-performance athletes after physical exertion* (Ministerial-level research project). Ministry of Culture, Sports and Tourism.
7) Menxicop V. V, Volcop N. I (1997), "Sports biochemistry" (translated by Le Quy Phuong, Vu Chung Thuy), Sports Publishing House, Hanoi.
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