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Respiratory function recovery characteristics of high-level track and field athletes in large capacity exercising

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Abstract

Select 06 indicators to evaluate high-level track and field athletes' ability to recover in large capacity exercising with Kostex Metamax 3B machine system. On that basis, assess the recovery process of respiratory function of the study subjects in large capacity exercising at different times: Before exercising, while exercising, 10 minutes after exercising and and 24 hours after exercising.

Keywords: characteristic, recovery, function, track and field, athletes, exercise, capacity

Introduction

Exercising regularly will lead to adaptive changes that benefit the body, which is expressed specifically through body function indicators. Today, with the modern equipment system applied in sports, we are allowed to determine the exact training level and recovery ability of athletes after physical activities, as well as the effectiveness of the training and teaching work. This is also an important basis for training athletes.

In their studies, foreign authors have identified the pattern of recovery after physical activity, fatigue characteristics after an amount of exercise in different capacity areas, the time needed to end the recovery of various biochemical processes during the resting period after exercising muscles, as well as means and recovery methods for athletes after training and competition. However, in Vietnam, this work has not been paid attention to and researched by any author.

With the existing modern equipment system, we conduct the research: Recovery characteristics of the respiratory function of high-level track and field athletes in large capacity exercising.

Research methods

The research process uses methods

- Methods of analyzing and synthesizing documents
- Interview method
- Pedagogical testing method (Conducted on Kostex Metamax 3B system)
- Methods of statistical mathematics

The procedure of assessing the recovery process of high-level sports athletes in large capacity areas used a 3,000m running test.

After examining the body functions in a static state, the athletes' bodies are warmed up by doing general and professional warm-up exercises. The 3,000m running exercise is conducted when the body is warm, and the parameters of the athlete's body state are determined before exercising.

Research results and discussion

1. Select indicators to assess the respiratory function recovery ability of high-level track and field athletes in large capacity exercising.

Using methods of analyzing and synthesizing materials, interviewing methods, 06 indicators were selected to assess the respiratory function recovery ability of high-level track and field athletes in large capacity exercising including:

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- Respiratory frequency (times / minute)
- Vital capacity (liters)
- Sudden vital capacity (%)
- Relative VO₂ (ml / min / kg)
- Relative VCO₂ (ml / min / kg)
- Respiratory quotient

The research was conducted on 20 level-1 track and field athletes and grandmasters, including 10 male athletes aged 18-20 and 10 female athletes aged 16-17.

The exercise selected to represent a large capacity area: 3,000m running.

The data to assess the characteristics of the respiratory function recovery process of high-level track and field athletes in large capacity movement at different times: Before

athletes conduct training activities; 10 seconds after the athletes complete the exercise, 10 minutes after the exercise and 24 hours after the exercise.

2. Characteristics of respiratory function recovery of high-level track and field athletes in large capacity exercising.

2.1 Characteristics of indicators reflecting respiratory function of high-level sports athletes after starting in large capacity area

Before conducting the 3000m running test, after the athletes have completed the general and professional warm-ups, the research gathered results of the respiratory function evaluation statistics of the athletes after starting in large capacity area. Results are presented in Table 1.

Table 1: Respiratory function characteristics of high-level track and field athletes after starting in large capacity area

S. No.	Norms	Male (aged 18-20) (n=10)		Female (aged 16-17) (n=10)	
		\bar{x}	σ	\bar{x}	σ
1	Respiratory frequency (times/minute)	18.56	2.15	18.33	2.15
2	Vital capacity (litre)	3.55	0.31	3.44	0.36
3	Sudden vital capacity (%)	92.42	9.17	91.85	8.65
4	Relative VO ₂ (ml/min/kg)	8.18	3.35	8.20	3.27
5	Relative VCO ₂ (ml/min/kg)	6.87	3.94	6.97	3.42
6	Respiratory quotient	0.84	0.10	0.85	0.11

Table 1 shows that: At the point of after starting, after finishing the professional warm-up to conduct test in large capacity area, the respiratory function characteristics of the athletes have significant changes in the direction of becoming more adaptive to the exercising activity. Measured indicators tend to increase much higher than those measured in the period before starting.

The research process used the parameters measured after

starting as a highlight to evaluate the recovery process of athletes.

2.2 Respiratory function characteristics of high-level sports athletes while exercising in large capacity area

Respiratory function characteristics of high-level sports athletes while exercising in large capacity areas are presented in table 2.

Table 2: Respiratory function characteristics of high-level track and field athletes while exercising in large capacity area

No.	Norms	Male (aged 18-20) (n=10)			Female (aged 16-17) (n=10)		
		\bar{x}	σ	% change	\bar{x}	σ	% change
1	Respiratory frequency (times/minute)	58.47	5.75	211.01	59.13	5.91	222.59
2	Vital capacity (litre)	3.25	0.31	-7.67	3.16	0.32	-8.14
3	Sudden vital capacity (%)	86.73	8.62	-5.74	83.27	8.23	-9.34
4	Relative VO ₂ (ml/min/kg)	61.38	6.17	646.72	59.45	5.91	625.00
5	Relative VCO ₂ (ml/min/kg)	93.91	8.97	1243.51	89.77	8.89	1187.94
6	Respiratory quotient	1.53	0.15	80.00	1.51	0.14	77.65

Table 2 shows that: while exercising in large capacity area, the respiratory function characteristics of athletes have significant changes in specific test parameters:

- The respiratory frequency increases rapidly to increase oxygen supply during exercising activity. 10 seconds immediately after stopping, the respiratory frequency is approximately three times higher than the level after starting to repay oxygen while exercising.
- The measured vital capacity indicator also tends to decrease compared to the time after the warming-up.
- The measured sudden vital capacity indicator tends to decrease slightly compared to the time after warming-up.
- While exercising in large capacity area:
 - About anaerobic capacity: The calculated respiratory quotient while exercising is up to 1.53

- About aerobic capacity: While exercising in large capacity area, relative VO₂ measured is from 61.38 mm /min/kg. This is the largest measure of active areas and also the area where sports athletes achieve VO₂max.

2.3 Respiratory function characteristics of high-level sports athletes 10 minutes after exercising in large capacity area

The respiratory function characteristics were evaluated 10 minutes after exercising in large capacity area, at the same time, compared the results obtained with the examination results of respiratory function characteristics of athletes before conducting the test. The results are presented in table 3.

Table 3: Respiratory function characteristics of high-level track and field athlete 10 minutes after exercising in large capacity area

No.	Norms	Male (aged 18-20) (n=10)			Female (aged 16-17) (n=10)		
		\bar{x}	σ	% recover	\bar{x}	σ	% recover
1	Respiratory frequency (times/minute)	25.31	3.25	83.09	26.12	3.08	80.91
2	Vital capacity (litre)	3.56	0.38	103.33	3.45	0.34	103.57
3	Sudden vital capacity (%)	92.28	8.79	97.54	91.03	9.11	90.44
4	Relative VO ₂ (ml/min/kg)	37.32	4.02	45.23	36.33	4.06	45.11
5	Relative VCO ₂ (ml/min/kg)	33.21	4.11	69.73	32.70	4.12	68.93
6	Respiratory quotient	0.89	0.08	92.75	0.90	0.09	92.42

Table 3 shows that: 10 minutes after completing exercises in large capacity area, respiratory function of athletes has recovered relatively much. Specifically:

- Respiratory frequency recovered about 80% compared to the time after starting.
- Vital capacity indicator recovery exceeded the level after starting, this is consistent with the exercising pattern. The athletes were increasing respiratory efficiency to repay oxygen during the activity.
- The sudden vital capacity indicator recovered from 40 to 60%.
- Relative VO₂ and relative VCO₂ indicators decreased, in which the reduction of relative VCO₂ is faster than that

of relative VO₂, which led to a rapid decrease in respiratory quotient. The calculated level of respiratory quotient 10 minutes after exercising in the large capacity area reached approximately the calculated level after starting.

2.4 Characteristics of indicators reflecting respiratory function of high-level sports athletes 24 hours after exercising in large capacity area

24 hours after completing the test in large capacity area, the thesis collected statistical results of the respiratory function evaluation parameters of athletes. The results are presented in table 4.

Table 4: Respiratory function characteristics of high-level track and field athletes 24 hours after exercising in large capacity area

No.	Norms	Male (aged 18-20) (n=10)			Female (aged 16-17) (n=10)		
		\bar{x}	σ	% recover	\bar{x}	σ	% recover
1	Respiratory frequency (times/minute)	16.91	1.62	104.13	16.41	1.64	104.71
2	Vital capacity (litre)	3.32	0.31	23.33	3.20	0.31	14.29
3	Sudden vital capacity (%)	91.31	9.08	80.49	88.26	8.76	58.16
4	Relative VO ₂ (ml/min/kg)	5.73	5.63	104.61	5.72	0.57	104.84
5	Relative VCO ₂ (ml/min/kg)	4.87	0.47	102.30	4.80	0.45	102.61
6	Respiratory quotient	0.85	0.09	98.55	0.84	0.08	101.52

Table 4 shows that: 24 hours after exercising in large capacity area, the evaluation indicators of respiratory function of athletes completely recovered to the level before the time of setting up the test. Specifically, the measured indicators were all lower at the time before the test was conducted but higher than the high-level sports athletes' respiratory function evaluating time before exercising.

Thus, it can be seen that, 24 hours after exercising in large capacity area, the indicators of the respiratory function evaluation of track and field athletes completely recovered.

Conclusion

- After professional warm-up in large capacity area, the respiratory function characteristics of athletes have significant changes in the direction of becoming more adaptive to exercising activities. Measured indicators tend to increase much higher than those measured in the pre-exercising period.
- While exercising: Respiratory frequency slightly decrease. The respiratory frequency will increase rapidly, approximately three times higher than after warming-up, to compensate for the amount of oxygen during the process of carrying out exercising activities in large capacity area. The measured vital capacity indicator also tends to decrease compared to the time after the warm-up. However, the measured sudden vital capacity indicator tends to decrease slightly compared to the time after the warm-up.
- 10 minutes after completing the exercising activity in large capacity area, respiratory function of athletes has recovered relatively much.

- 24 hours after exercising in large capacity area, the respiratory function evaluation indicators of track and field athletes completely recovered.

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