

# The Effects of Multi-year Altitude Training on the Biochemical Function and Specific Aerobic Capacity of the Elite Open Weight Woman Rowers

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**ABSTRACT: Objective:** This study was to discuss the influence of multi-year altitude training on the biochemical function and specific aerobic capacity of the Chinese national elite open weight woman athletes and to explore the law. **Method:** Organise tracking test of 12 Chinese rowing open weight woman Olympians' function state in the past 3 years' altitude training camp. **Result:** ① The lactate threshold power is lower during the altitude training than that on the sea level ( $P < 0.01$ ); compared with before altitude training camp, the lactate threshold power increased significantly after altitude training camp, ( $P < 0.01$ ); it was observed, with horizontal comparison of the past 3 times altitude training, that the lactate threshold power increased annually, and increased most in 2008 particularly. ② During the altitude training camps in the past 3 years, the body weight tended to decrease but there was no significant difference compared with on the sea level. The body fat percentage increased to the highest point in the latter part of the altitude training, while the lean body mass decreased to the lowest point in the same period, and increased again significantly after the altitude training camp ( $P < 0.05$ ). ③ During the altitude training camp, 6km Ergometer performance went down clearly; the best performance appeared in the 4<sup>th</sup> week of the altitude training camp. ④ With no clear difference in Hct index, for open weight woman athletes, the HB level had a negative correlation with 6km Ergometer performance (Pearson correlation is  $-0.952$ ,  $P < 0.05$ ); The 4<sup>th</sup> week of the altitude training camp saw the peak HB value and the best 6km Ergometer results. **Conclusion:** ① The study of the influence of altitude training on the lactate threshold power indicates that altitude training can significantly improve rowers' aerobic capacity. ② the environment of altitude led to a faster muscle decomposition, so during the altitude training, the body weight of open weight woman athletes dropped clearly. ③ In this study, after the altitude training, the Hb level had a negative correlation with 6km Ergometer performance and the aerobic capacity came to the highest level in the 4<sup>th</sup> week after the altitude training camp.

**KEYWORD:** Olympic Games; multi-year altitude training; rowing; lactate threshold power; aerobic capacity

## 1 INTRODUCTION

Before Beijing Olympic Games, China rowing team trained on altitude during every winters in multi-three-years. In the end, they got a gold medal and a silver medal in 2008 Olympic Games. This study was to discuss the influence of multi-year altitude training on the biochemical function and specific aerobic capacity of the Chinese national elite open weight woman athletes and to explore the law.

## 2 OBJECTS AND METHODS

### 2.1 Objects

Table 1 The basic circs of objects

	Age (year)	Height (m)	Weight (Kg)	Training Time (year)
Open weight female athletes (n=12)	22.8±3.6	1.83±0.02	77.6±3.8	7.1±3.0

### 2.2 Methods

Organise tracking test of 12 Chinese rowing open weight woman Olympians' function state in the past

3 years' altitude training camp (Huize in Yunnan, 2150 meters above sea level). The main indexes include Lactate threshold power, Body weight and fat%, 6km ergometer performance and Hb level during and after the altitude training.

### 3 RESULTS

#### 3.1 The lactate threshold power

The lactate threshold power is lower during the altitude training than that on the sea level ( $P<0.01$ ); compared with before altitude training camp, the lactate threshold power increased significantly after altitude training camp, ( $P<0.01$ ); it was observed, with horizontal comparison of the past 3 times altitude training, that the lactate threshold power increased annually, and increased most in 2008 particularly.

Table 2. The result of lactate threshold power

Test time	2006'	2007'	2008'	Average
Before altitude	262.6	267.4	276.9	269.0±7.3 a*,b,c*
During Altitude 1	219.9	233.7	236.9	230.1±9.0 a*,d*
During Altitude 2	236.7	238.5	258.4	244.5±12.1 b,e*
After altitude	274.6	279.7	292.3	282.2±9.1 c*,d*,e*

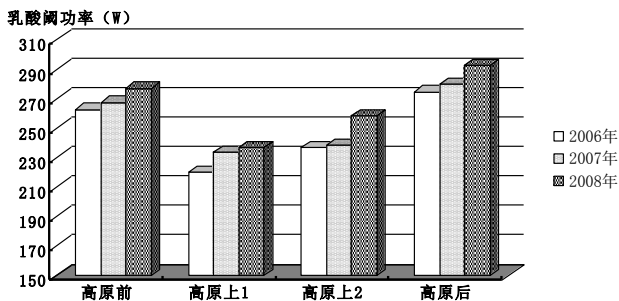


Figure 1. The result of lactate threshold power.

#### 3.2 The result of the body weight

During the altitude training camps in the past 3 years, the body weight tended to decrease but there was no significant difference compared with on the sea level. The body fat percentage increased to the highest point in the latter part of the altitude training, while the lean body mass decreased to the lowest point in the same period, and increased again significantly after the altitude training camp ( $P<0.05$ ).

Table 3. Results of body weight

Body weight	2006'	2007'	2008'	average
Before altitude	76.5	76.5	76.1	76.4±0.2
During Altitude 1	75.3	75.6	75.9	75.6±0.3
During Altitude 2	75.0	75.7	75.9	75.5±0.5
After altitude	76.9	76.5	76.4	76.6±0.3

Table 4. Results of body fat percentage

Fat%	2006'	2007'	2008'	Average
Before altitude	19.1	18.2	17.9	18.4±0.6
During Altitude 1	19.3	19.1	18.2	18.9±0.6
During Altitude 2	19.9	19.5	18.4	19.3±0.8
After altitude	19.5	18.0	17.8	18.5±0.9

Table 5. Results of lean body mass

Lean body mass (kg)	2006'	2007'	2008'	Average
Before altitude	61.9	62.3	62.5	62.2±0.3
During Altitude 1	60.8	61.2	62.1	61.4±0.7a
During Altitude 2	60.1	60.9	61.9	61.0±0.9b
After altitude	61.9	62.7	62.8	62.5±0.5a, b

#### 3.3 The result of 6km Ergometer performance

During the altitude training camp, 6km Ergometer performance went down clearly; the best performance appeared in the 4<sup>th</sup> week of the altitude training camp.

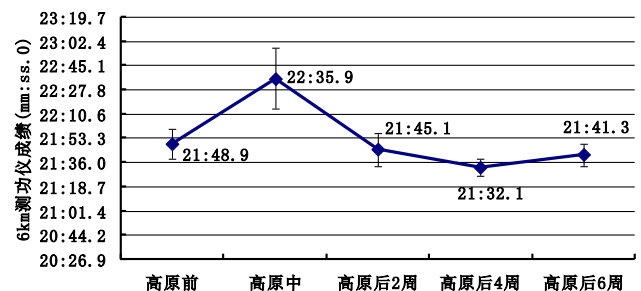


Figure 2. The result of 6km Ergometer performance .

#### 3.4 The correlation of 6km Ergometer performance and HB level

With no clear difference in Hct index, for open weight woman athletes, the HB level had a negative correlation with 6km Ergometer performance (Pearson correlation is -0.952,  $P<0.05$ ); The 4<sup>th</sup> week of the altitude training camp saw the peak HB value and the best 6km Ergometer results.

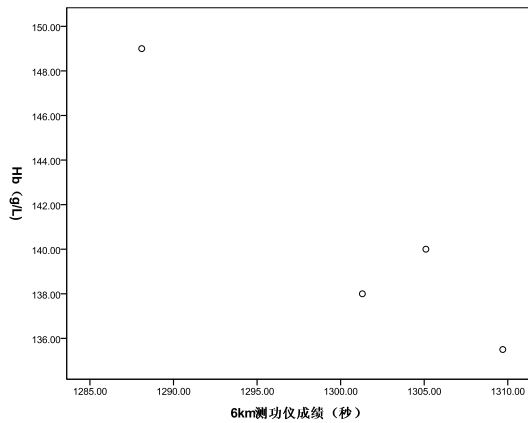


Figure 3. The correlation of 6km Ergometer performance and HB level (Pearson correlation is -0.952,  $P < 0.05$ )

## 4 CONCLUSION

- 4.1 *The study of the influence of altitude training on the lactate threshold power indicates that altitude training can significantly improve rowers' aerobic capacity.*
- 4.2 *The environment of altitude led to a faster muscle decomposition, so during the altitude training, the body weight of open weight woman athletes dropped clearly.*
- 4.3 *In this study, after the altitude training, the Hb level had a negative correlation with 6km Ergometer performance and the aerobic capacity came to the highest level in the 4<sup>th</sup> week after the altitude training camp.*

## 5 SUGGESTION

- 5.1 *During the altitude training, the lactate threshold power was lower than that on sea level, and the capacity of lactate tolerance decreased clearly. We should enhance the intensity monitoring during the altitude training, to avoid fatigue phenomenon.*
- 5.2 *During altitude training, the female rowers' lean body mass decreased significantly. When on plateau, special nutritional supplements and physical accumulation should be much more concerned about.*

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