着衣水泳に適した泳法の検討

－酸素摂取量および血中物質を指標として－

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The Effect on Oxygen Uptake and Blood Metabolites when Swimming with Clothes

by

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ABSTRACT

Ten moderately trained male swimmers volunteered to take part in the present study. They were divided into two groups: five swimmers swam the front crawl stroke (crawl stroke group) and a group of five swam the breaststroke (breaststroke group). All subjects swam wearing conventional swimsuits, typically used by competitive swimmers (swimsuit); they also wore training shirts, pants, and shoes (training clothes). Both groups would swim as fast as they could for 60 seconds, first wearing training clothes and then wearing swimsuits. The swimming speed, the stroke rates, the distance covered per stroke, the heart rate and oxygen intakes were measured during each swimming period. Peak ammonia and lactate concentrations in the blood were measured after each swimming exercise, wearing a swimsuit and training clothes. This study demonstrated that the average speed decreased considerably when the subjects wore training clothes compared to wearing swimsuits in both the crawl stroke and breaststroke groups. The average swimming speed wearing training clothes

decreased much more in the crawl stroke than in the breaststroke in comparison with wearing swimsuits. The stroke rate of swimmers wearing training clothes were lower than those wearing swimsuits in the crawl stroke, however, there was no significant stroke difference found in the breaststroke. The distance covered per stroke of those wearing training clothes was shorter than those wearing swimsuits in the crawl stroke and the breaststroke. Both the heart rate and the oxygen uptake during the swimming exercise were not significantly different between those subjects wearing training clothes and swimsuits in the crawl stroke and in the breaststroke. The peak blood ammonia and lactate concentrations after swimming with swimsuits were significantly higher than with training clothes in the crawl stroke. However, there were no significant differences in the blood ammonia and lactate concentrations between swimmers wearing training clothes and swimsuits in the breaststroke.

These findings demonstrated that the decrease of the average speed in the crawl stroke wearing training clothes might be due to the decrease in the stroke rate and distance per stroke. It could also be explained by the decrease of glycogen break down and the Purine nucleotide degradation.

要　旨

水泳は呼吸が制限され，そのうえ着衣泳では衣服が絡まったり，着衣により水泳中の抵抗が高まると推測される．本研究では，クロール，平泳ぎおよび立ち泳ぎにおいて，1分間の全力水着泳と着衣泳および，着衣泳と同じスピードを水着で泳いだ際の平均スピード，ストローク数，距離／ストローク，心拍数，酸素摂取量，血中乳酸，血中アンモニア濃度から着衣泳の身体への負担を明らかにした．クロールと平泳ぎともに着衣泳での平均スピードは水着泳に比べ有意に減少したが，クロールでの着衣泳の平均スピードの減少率は平泳ぎより大きかった．クロールにおいて，着衣泳でのストローク数／分は水着泳に比較し有意に減少したが，平泳ぎにおいては有意差は認められなかった．クロールと平泳ぎともに，着衣泳での距離／ストロークは水着泳に比べ有意に減少した．クロールにおいて，着衣泳での血中アンモニアと乳酸濃度は水着泳に比べ有意に低い値であった．しかし平泳ぎでの血中アンモニアと乳酸濃度は着衣泳と水着泳の間に有意差は認められなかった．クロールでの着衣泳の平均スピードの低下は抵抗の増大と出力の低下により，推進効率が減少したためと考えられる．さらにクロールにおいて，着衣泳での血中アンモニアと乳酸濃度の低下は，着衣泳では腕や脚の動作が制限されることにより，持っているエネルギーを十分利用できないことに起因しているものと考えられる．