THE SCIENCE OF SWIMMING

In 1932, Japanese and American Coaches Collaborated to Further the Knowledge of Swimming

In 1932, while everyone interested in swimming was marveling about the great team performance of the Japanese men at the Olympic Games in Los Angeles, Thomas K. Cureton, Jr., Professor of Applied Physics and Animal Mechanics, Director of Aquatics and Coach of Swimming at Springfield College, set out to find the science behind the Japanese success.

In the 1928 Games Japan was represented by only one outstanding swimmer, Tsuruta, winner of the breaststroke. Four years later, the Nipponese astounded the world by their unparalleled rise to the top in international swimming. They gathered 86 points to 33 for the Americans, who had a stronger team as a whole than in 1928. It was clear that their victory was not due to a weaker American team and a new record was made in every event but one, the backstroke. Japanese swimmers won first and second in every race but one, and in that, placed 3rd, 4th and 5th. A glance at the results shows that Japan presented a team of remarkable mass strength in the six men’s swimming events then on the Olympic program:

100 meters freestyle: 1st, 2nd and 5th (New Olympic Record)
800 meter relay: 1st (New World's and Olympic Record)
400 meters freestyle: 3rd, 4th and 5th (All under the old Olympic mark)
200 meters breaststroke: 1st, 2nd and 6th (New Olympic Record by both Tsuruta and Koike)
100 meters backstroke: 1st, 2nd and 3rd
1500 meters freestyle: 1st and 2nd (New Olympic Record by both Kitamura and Makino)

This remarkable result was obtained in spite of strenuous opposition. For instance, at Amsterdam, in 1928, the U.S. team set a new Olympic record for the 800 meter relay of 9:36.2. U.S. coach Bob Kiphuth had reason to be pleased when he found that in practice, the 1932 team could beat this old record by 15 seconds or more. However, the improvement was not good enough because the Japanese finished far ahead in 8:58.4, establishing an undreamed of record. What happened between 1928 and 1932 to produce this great victory?

Prior to the Olympic Games, Dartmouth College Coach Sidney Hazleton had collected data from tests and measurements on collegiate swimmers suggested by Cureton when the former had taken a course given by the latter at Springfield in the summer of 1930. After the Olympic Games, Cureton got Bob Kiphuth, the American Olympic coach, to collect the same data from 17 of the best American swimmers. Four of the Japanese swimmers were tested through the cooperation of Coach Ikka Ku Mataza and his assistant and trainer, Yanagiya, who had been a student at Springfield and was much interested in the swimming tests being conducted in the swimming coaching course. Professor LaPorte, of the University of Southern California, cooperated by permitting the tests at Los Angeles to be given in the U.S.C. pool.

Cureton collected data from observations and a battery of 25 different tests, covering four basic groups: 1) Mental Attitude; 2) Stroke Mechanics; 3) Organic Condition (heart, lungs, blood); and 4) Structural Aptitude. In the 25 tests the Japanese were found to be superior to American Olympic candidates in only seven items:

Pelvic Flexibility, 31.3%
Strength of the Arm Pull, 9.8%
Strength of the Lower Back, 10.1%
Strength of the Thigh Flexors, 7.4%
Heart Rate Lower After Exercise, 7.6%
Heart Time to Return to Standing Normal, 26.5%
Speed with Arms Alone (60 feet), 3.0%

The Japanese were inferior in these characteristics:
Height, 4.95%
Weight, 11.0%
Less Adipose Tissue (question as to inferiority), 54.4%
Nutrition, Weight, Height, 6.5%
Area Forearm and Hand Paddle, 14.4%
Area Foreleg and Foot, 10.8%
Length of Arms, 4.9%
Length of Legs, 12.2%
Chest Girth, 5.2%
Hip Girth, 2.0%

In some respects the Japanese succeeded in 1932 in spite of what would appear to be structural handicaps. Shozo Makino (right), at 5’4” and 117 lbs. was taller and heavier than teammate Kusuo Kitamura (left).
Buoyancy, 43.7%
Heavier Weight of Feet, 60.2%
Flexibility of Shoulders, 32.4%
Flexibility of Ankles, 10.0%
Vital Capacity, 22.4%
Higher Heart Beat, Standing, 3.0%
Higher Heart Beat, Lying, 19.1%
Slower Speed, Legs Alone, (60 feet), 2.3%
Slower Speed, Whole Stroke (60 feet) , 9%

Conclusions

Mental Attitude: The Japanese had superior financial backing and national interest which resulted in better organizational support. The Japanese had a superior unity of purpose and “winning for Japan” resulted in a higher quality of loyalty to purpose and seriousness for the requirements of training. Japanese swimmers were more open minded to the results of research in training and stroke mechanics and were willing to train longer and harder than American swimmers.

Stroke Mechanics: There were no distinct differences in the mechanical efficiency of Japanese and American swimmers.

Organic Condition: The Japanese swimmers were surprisingly stronger than the Americans in tests simulating the essential movements of swimming mechanics. Propelling force is obtained only through strength applied properly to the water. Having smaller bodies and having more strength to pull the lesser mass through the water, it is reasonable that the Japanese have a favorable combination that should be a factor in winning. The dry land training and calisthenics were in many ways unique, as they were derived classical swimming techniques.

The Japanese also seemed to have better endurance than other swimmers and this is the outstanding reason why they won so many races. Tests demonstrated the fact the Japanese had a lower heart rate after exercise and the rate returned to the standing normal quicker. The heart rate taken after a standard exercise seems to be the most significant for predicting the type of condition demanded for successful swimming competition. A close study into the Japanese food would undoubtedly throw some light upon the way that the Japanese obtain such a high quality of endurance. There are at least two controllable factors known to be related to developing endurance: 1) Oxygen deprivation – Resulting from exercising to the point where oxygen is reduced in the bodily tissues; and 2) Alkaline food – Eating food which burns predominantly with an alkaline ash and thus builds “alkaline buffers” which act to neutralize the acid products of severe muscular exercise. It is reported that the Japanese “mochi” food is highly alkaline after digestion. It is also reported that the average Japanese swimmer eats about four pounds of meat per year and the American about sixty. There are many references to the relationship between an alkaline diet and endurance. Some of the Springfield swimmers in an experiment have already improved their times remarkably by following a vegetable and fruit diet.

Structural Aptitude: In some respects the Japanese seem to have succeeded in spite of structural handicaps. Height, weight, chest girth, length of legs and length of arms. However, these factors are not as important as are strength and endurance.

For Cureton, diet stood out as one of the most interesting differences. A visit to Battle Creek, Michigan, lead to a discussion with Dr. Kellogg and subsequent studies that proved diet positively affected the endurance of swimmers.

“Nothing has impressed me more than the phenomenal improvement which was associated with this diet experiment.

“It lends emphasis to the fact that endurance is the greatest factor governing success among experienced swimmers with good stroke mechanics in all races of greater length than 50 yards.”

Cureton found that with a controlled diet, greater endurance allowed swimmers to train longer and harder which had an immediate impact on performance. It also gave the swimmers a psychological advantage.

“The effects of rigorous training have their most immediate effect in the physiological reactions of the body. In addition there are distinct relationships to mental courage. A competitor who has trained well is more apt to think that he ought to succeed.”

“Good condition reflects the kind of confidence which immediately shows itself by such competitors taking hard work with a better spirit, a minimum of grumbling and a desire to do even more than the assignment. It shows itself in an improved willingness to take time trials to determine improvement and to learn pace.”

“Those mental attitudes are characteristic of every champion. The opponents bring failure or a smaller degree of improvement. A competitor who has not trained is more apt to be frightened out of a victory in the fear of overdoing or through genuine distress being reached earlier in the race.”

Thomas Cureton, Jr.
The Father of the Science of Swimming

For 35 years, Thomas Cureton was the foremost lecturer and demonstrator on physical fitness in the United States, for 12 years at Springfield College in Massachusetts and then 28 years at the University of Illinois. He published over 1,000 papers, books, papers and monographs.

Cureton pioneered the fitness tests and research program that took swimming into a new dimension with scientific coaching techniques. He was the “starter” in tests and measurements and the first to try and show why the champions swam faster and how these principles could be applied to others. His disciples included Bob Kiphuth, Charles “Red” Silvia and James Counsilman.