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TWENTY METRE BLIND SWIMMING: A TEST OF UNDERWATER WORK SYMMETRY

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ABSTRACT

The mechanical movements by swimmers were investigated to determine the amount of deviation that occured due to asymmetric limb forces. Five Bahraini National Junior Swimming Team members swam 20 metres wearing opaque goggles and the same distance wearing ordinary goggles. The mean deviation distance was 0.775 m. The correlation between deviation distance and best time over 50 metres was $R=0.95$ ($P<0.01$), suggesting that the test is a valid predictor for asymmetric forces. The results revealed that there were hidden forces causing a loss of energy and efficiency.

The mechanical movement by a swimmer during the underwater phase of a stroke is the most important factor in determining the speed of propulsion. The importance of this movement requires that a continual evaluation of an individual's swimming style be conducted to develop and refine these movements. Two of the most effective methods of evaluating underwater work are with an underwater camera[1] and observation from below the water level through special glass windows. Each of these methods are very expensive and are not available in many swimming training centres.

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It is assumed that any asymmetry of limb movement either in the direction or magnitude of the exerted force will be directly reflected on the direction of the movement of the whole body. For the body to be propelled most efficiently, it must proceed in a straight line without the effect of diverting forces. The swimmer subconciously corrects any deviation as a result of asymmetric limb movement using the black lines at the bottom of the pool. This results in the coach having difficulty in identifying any diversion in the underwater work because of the almost automatic response by the swimmer. Since vision is the main factor in supplying the swimmer with feed-back to correct deviations[2], preventing him from having a visual reference will eliminate most of the correcting actions and give the coach a chance to notice any asymmetrical deviations during a measured swim performance.

This paper will describe a simple method for evaluating the underwater work performance of swimmers.

METHODS

Five Bahraini National Junior Swimming Team members were the subjects for this study. The evaluations were conducted during normal team practice periods. The design of the study was explained to each swimmer and informed consent was obtained.

Each subject swam approximately 20 metres while wearing opaque goggles with the following kinematic parameters recorded: 1) time, 2) deviation distance, 3) actual swimming distance, 4) average speed and 5) number of strokes.

The subjects repeated the same distance with ordinary goggles and the time was recorded. The data was analysed using descriptive statistics.

RESULTS

The descriptive data of the subjects are listed in table 1.

TABLE I
SUBJECT DATA — NATIONAL JUNIOR SWIMMERS

Variable	*Mean*	*S.D.*	*C.V.*	*Range*
Age (years)	13.5	1.64	2.7	12-16
Height (cm)	158.5	8.49	72.0	151.0-171.0
Weight (kg)	46.2	9.88	97.7	38.5-62.5

The deviation mean distance is 0.775 m for the swimmers during the blind swim with opaque goggles. If this deviation is projected through 50 metres, the deviation can reach approximately 2 metres (193.75 cm) Table II.

TABLE II
DEVIATION DATA

	Mean	*S.D.*
Time (min)	10.72	0.230
Deviation distance (metres)	0.775	0.125
Actual swimming distance (metres)	20.015	0.005
Average speed (metre/sec)	1.870	0.050
Number of strokes (count)	20.000	2.000
Angle of deviation (degrees)	2.220	0.360
Rate of deviation per stroke (number)	0.039	0.003

The correlation coefficient between the deviation distance and the swimmers best time in the 50 metre swimming dash was found to be significant, $R=0.95$ ($P<0.01$). The correlation coefficient between the test and retest was also significant, $R=0.96$ ($P<0.01$).

DISCUSSION

It is assumed that propelling the body in a straight line will involve unseen correcting processes which will consume energy that could be more effectively used in propelling the body in the desired direction and in a shorter period of time. In an actual situation the swimmer moves in a straight line which suggests that the swimmer uses additional effort to compensate for asymmetric stroke deviation. It is hypothesised that if a coach could identify the source of deviation, he could save the swimmers energy and employ it for a more effective result.

The results revealed that there were hidden forces causing a loss of energy and efficiency. Preventing the swimmer from using his vision allowed the deficiences of the mechanics of the stroke to be reflected by the deviation from a straight line. The lack of feedback during the asymmetry of limb movement clearly shows the need for a simple, effective method of determining the cause of the deviation. Once the coach determines the existance of deviation forces, the exact cause may be identified by an elimination process; i.e. the test can be administered with the legs immobilised, then the arms etc. From this procedure a more precise determination of the deviation can be made.

The correlation coefficients between deviation distance and fastest elapsed time suggest that the test is a valid predicting instrument for deviations in the stroke performance for the free-style distance of 50 metres. The feasibility of the test is enhanced by the lack of sophisticated equipment, i.e. only a measuring tape and scoring sheet are required to administer the test.

CONCLUSION

It was concluded that the greater deviation distance would result in an increased time for covering swimming distances which in an actual situation would also result in greater energy expenditure. The correlation coefficient of the test-retest was R=0.95, suggesting that this method of testing is reliable. The objectivity of the test is enhanced by the simple tools needed to score the results and deviation distances.

Due to the simplicity of administration and analysis of results, the test is recommended as a tool for coaches in evaluating the performance of young swimmers. It is recommended that more comprehensive studies dealing with the applications of the test be conducted on larger samples to enable the creation of deviation tables for rapid assessment by coaches for mechanical errors in swimming.

REFERENCES

1. Councilman JE. The science of swimming. New Jersey: Prentice Hall Inc, 1968; 183
2. Schmidt RA. Motor control and learning. Illinois: Human Kinetics Publishers, 1982;194.