THE STUDY OF TIME PERCEPTION IN ELITE SWIMMERS

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The purpose of this study was to compare the abilities of time perception in the elite swimmers from differing distance specializations. Specifically, we compared actual and predicted swimming times (in seconds) in sprint, middle and long distance freestyle swimmers at different distances (50M, 100M, 200M, 400M). The results showed that the absolute error value of long-distance specialized swimmers was highly related to the significant correlation of the best performance ($r = .89$, $p < .01$). Long-distance specialized swimmers had a better predictive ability and performance in time perception. This result may be related to routine training and pace-making ability.

KEY WORDS: swimming, time perception, absolute error.

INTRODUCTION: The international federation that governs swimming (FINA) has prescribed that neither pace-making regulators or any other similar equipment can be used in competitive swimming events. Therefore, swimmers cannot obtain any time information from the outside environment. Studies examining time perception in closed-loop sports such as gymnastics, swimming, and shooting indicate that experienced athletes are able to manipulate time, rhythm and accuracy of movements much more precisely when compared to less experienced athletes (Deschaumes-Molinaro, Dittmar.,& Vernet-Maury, 1991; Munroe, Giacobbi, Hall, & Weinberg, 2000; Calmels & Fournier, 2001). Therefore, researchers have suggested that time-related feedback (in seconds) and the training of the swimmers' inner clocks should be emphasized to enhance self-pacing ability during the course of swimming training (Maglisho, 2003). Therefore, this study aimed to compare the abilities of time perception in elite swimmers of different specializations to determine whether aany differences exist.

METHODS: Twenty-four Taiwanese elite swimmers participated in the study. The average age of the swimmers was 22.1 ± 2.9 years, average height of was 169 ± 6.0 cm, and the average weight was 63.0 ± 9.5 kg. The average training years of the swimmers was 11.1 ± 2.2 yrs. These participants were divided into three groups in terms of their long-distance; medium-distance, and sprint-distance specialties. The events which the long-distance swimmers participated in were mainly 800m and 1500m, while the medium-distance swimmers mainly participated in 200m and 400m events. The events the sprint-distance swimmers took part in were mainly 50m and 100m. The training context of the three different groups focused on "aerobic exercise," "the mixture of aerobic and anaerobic exercise," and "anaerobic exercise" respectively.

All of the participants performed four different race pace crawl stroke, which were set to be the 50 M race, the 100 M race, the 200 M race, and the 400 M race respectively. After finishing each event, participants were asked about their individual predictive time. The actual swimming time (in seconds) was observed by the use of a stopwatch. To determine whether there were differences in time perception between-group (sprint-distance, middle-distance and long-distance) and whether there was a difference between trial (50m, 100m, 200m, 400m).The 3 (specialty) X 4 (race pace) mixed design ANOVA was used on the actual time and predicted time. To determine the association between actual and predicted times Pearson's product moment correlations were performed. Data were pooled over trial distance for these analyses. All data were analysed SPSS V19.0.

RESULTS: The results showed that the absolute error value of long-distance specialized swimmers was highly related to the significant correlation of the best performance (r =. 89, p <.01), and the absolute error value of short-distance specialized swimmers was significantly larger than that of the long-distance specialized swimmers F (2,21) = 5.461. Short-distance specialized swimmers had a tendency to overestimate their swimming speed in their evaluation of 50-meter swimming performance.

Table 1
Actual Times in the Different Specialty Swimmers

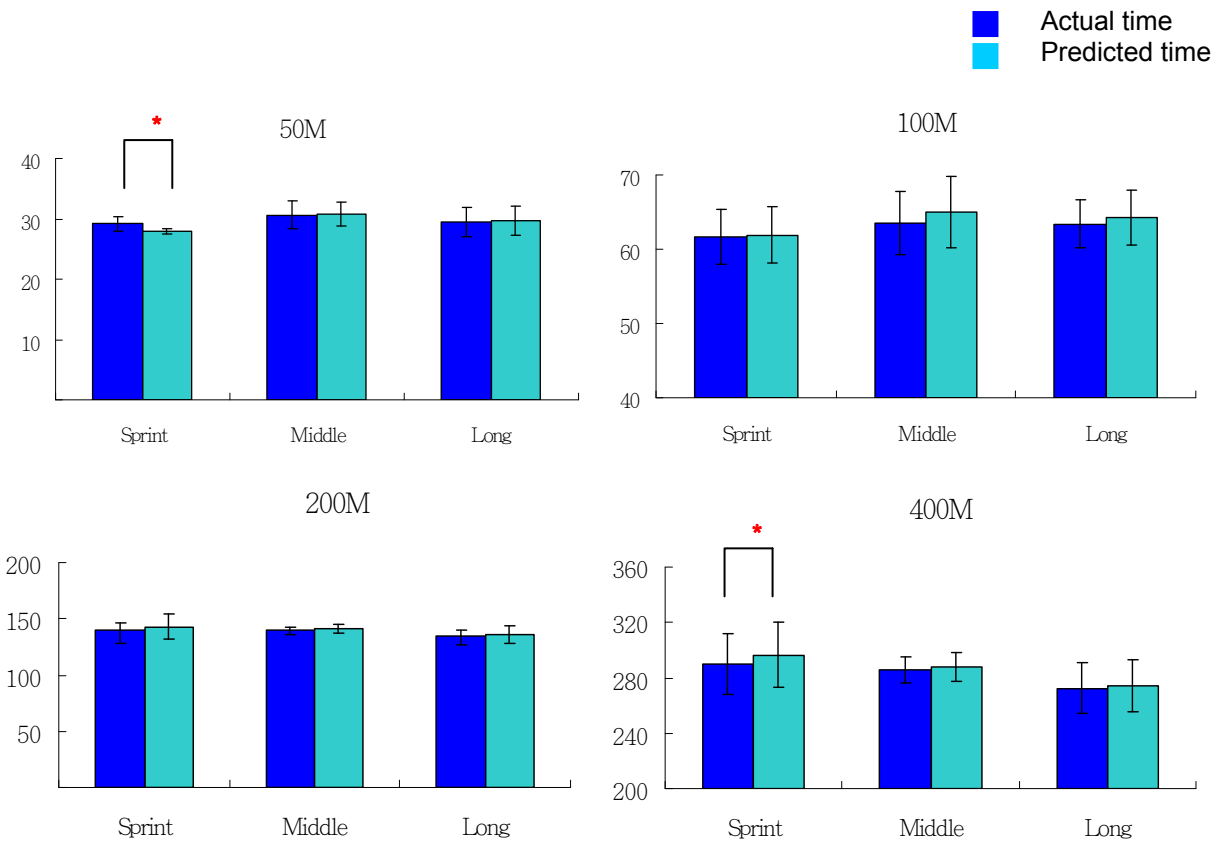
	Sprint-Distance (s)	Middle-Distance (s)	Long-Distance (s)
50M	29.16±1.14	30.62±2.37	29.41±2.46
100M	61.65±3.73	63.51±4.22	63.42±3.25
200M	139.37±6.86	139.52±3.48	134.13±5.69
400M	289.76±22.04	285.93±9.48	272.66±18.05

N=8 in each of these group

Table 2
The Absolute Error of Time Perception in the Different Specialty Swimmers

	Sprint-Distance (s)	Middle-Distance (s)	Long-Distance (s)
50M	1.21±1.12	0.41±0.27	0.20±0.22
100M	1.46±0.36	1.51±1.21	1.06±0.62
200M	3.89±4.39	2.39±1.50	1.86±2.46
400M	7.03±3.59	4.17±2.80	1.46±0.94

Note: N=8 in each of these groups



* p<.05

Figure 1: Actual and predicted times for the different groups.

Table 3 The comparison between actual and predicted time in Sprint-Distance 50M trial

Subject	Actual time	Predicted time	Difference
1	28.36	27.25	1.11
2	27.82	27.99	-0.17
3	30.61	27.80	2.81
4	28.66	27.98	0.68
5	28.59	28.77	-0.18
6	28.52	28.47	0.05
7	29.69	27.54	2.15
8	30.99	28.03	2.96

Table 4 The comparison between actual and predictrd time in Sprint-Distance 400M trial

	Actual time	Predicted time	Difference
1	300.09	308.64	-8.55
2	254.03	256.27	-2.24
3	275.35	280.00	-4.65
4	308.19	311.14	-2.95
5	296.59	299.30	-2.71
6	320.83	330.44	-9.61
7	294.19	306.68	-12.48
8	268.83	277.93	-9.10

CONCLUSION: Long-distance specialized swimmers had a better predictive ability and performance in time perception. This result may be related to routine training and pace-making ability. Coaches and teachers are advised to put more emphasis on the training of time perception. According to this result, the pacing ability of long-distance specialized swimmers can be enhanced, while the predictive ability of short-distance specialized swimmers can be performed much more precisely.

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