

PROFILE OF STROKE RATE VARIATIONS DURING 100M SWIMMING EVENTS

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INTRODUCTION

Swimming velocity is the product of the stroke rate (SR) times the stroke length (SL), which can be described as the distance travelled by the swimmer during a single stroke cycle.

The urgency of performance analysis, the easy assessment of this variables, and their intrinsic importance, imposed a proliferation of research in this domain (Craig and Pendergast, 1979; Craig et al., 1985; Nelson et al., 1989). Among available studies, some of them pointed out the difficulty to establish a profile to the SR variation along a specific swimming event (Craig et al., 1985; Keskinen and Komi, 1993). Nevertheless, those studies were based on a single competition.

The purpose of this study was to evaluate the variations of the stroke rate, in the 100 m events, during a complete competitive season.

METHODS

Five female elite swimmers, which main characteristics are resumed in table 1, were studied during a complete short course season.

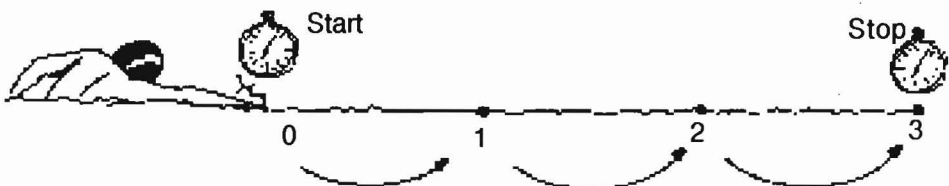
Table 1: Main characteristics of the sample

n	Aged (years)	Weight (Kg)	High (cm)
5	16.6±2.9	60.2±6.6	173.0±6.9

All 100 meters events were studied: (freestyle, backstroke, breaststroke and butterfly), using a video tape recorder .

The video tape records of the events were observed and the mean SR for each lap was determined using Seiko S101A watch with a frequency measuring function each 3 arm strokes, as we can see in figure 1.

Figure 1: Schematic representation of the measurement of SR.



RESULTS

Main results of the study are presented in Table 1.

Table 1: SR values for each lap in the different 100 m events studied.

Events	1st lap	2nd lap	3rd lap	4th lap
100m freestyle	50.71 ±4.42	46.59 ±4.28	45.75 ±3.87	44.99 ±4.29
100m backstroke	44.85 ±5.51	42.10 ±5.71	41.25 ±5.82	40.37 ±6.06
100m butterfly	51.84 ±4.02	49.76 ±3.62	49.52 ±3.91	49.14 ±4.16
100m breaststroke	45.18 ±4.0	43.88 ±3.98	42.58 ±3.96	42.81 ±4.33

Values are mean±SD

Despite none statistical significant difference were found between laps, SR values consistently decreased during the race for all events in the different styles, despite a slight increase in the final lap of the breaststroke event. This evidence is in accordance with Ungerechts and Niklas (1993) and Ungerechts and Thiesmann (1995) results. On the other hand, this results are in contrast with the findings of Letzelter and Freitag (1983). These could be due to different levels of the groups studied or since that work an evolution has taken place.

As SR values could be taken as an indicator of physiological background (Ungerechts and Niklas, 1993; Ungerechts and Thiesmann, 1995), probably because the reduction of the metabolic velocity by which the energy transfer is taken place. So, the degree of the decrease of SR values during the race, can be used to analyse the preparation status of swimmers.

CONCLUSION

SR values consistently decrease during 100 m events for all the competitive swimming techniques.

REFERENCES

- Craig Jr, A.B.; Pendergast, D.R. (1979) Relationships of stroke rate distance per stroke and velocity in competitive swimming. *Med Sci. Sports Exerc.* 11(3), 278 - 283
- Craig, A.B.; Skehan, P.L.; Pawelczyk, J.A.; Boomer, W.L. (1985). Velocity, stroke rate, and distance per stroke during elite swimming competition. *Medicine and Science in Sports and Exercise*, 6 (17), 625-634

Keskinen, K.L.; Komi, P.V. (1993). Stroking Characteristics of front crawl swimming during exercise. *J. of Applied Biomechanics*, 9, 219-226

Letzelter, H. Freitag, W. (1983) Stroke length and stroke frequency variations in men and women 100m freestyle swimming in : A.P. Hollander, P.A. Huijing, G. DeGroot (eds), *Biomechanics and Medicine in Swimming*, pp. 154-164. Human Kinetics Publishers. Champaign, Illinois

Nelson, R.; Brown, D.; Kennedy Jr, P.; Chengalur, S.N. (1989) Analysis of olympic swimmers in the 1988 Summer Games. Biomechanics Laboratory, Pensilvania State University

Ungerechts, B. E.; Thiesmann, M. (1995). Changes of stroke rate during swimming races. Abstracts of XVth Congress of the International Society of Biomechanics, Jyvaskyla

Ungerechts B.E.; Niklas, A. (1993) Changes of frequency and distances during swimming races. Abstracts of Xth Fina World Sports Medicine Congress, Kyoto