THE EFFECT OF AGING ON STROKE PARAMETERS IN SWIMMING

[1,2] Bryan Morrison, [2]Richard Hinrichs and [2]Bethany Larsen
[1]Valparaiso University, Department of Physical Education
[2]Arizona State University, Department of Kinesiology; email: Bryan.Morrison@valpo.edu

INTRODUCTION

Recent studies have shown that swimming performance can be maintained through 35 years of age, but then linearly slows 9% for men and 5% for women per decade to age ~70 when women begin to slow at a greater rate than men [1]. They attribute this decline to a reduction in physiological functional capacity, which is the ability to perform the physical tasks of daily life and ease with which these tasks can be performed. Wilmore and Costill describe these changes more specifically as cardiorespiratory endurance, muscular strength, muscular endurance, flexibility, and body composition. These changes are likely to affect both the stroke rate (SR) and stroke length (SL). Hay [2] demonstrated that the changes in SR and SL with increased velocity for many activities including walking, running, and swimming are similar. Recently the relationship between running performance and age was investigated by Korhonen and colleagues [3] who reported similar declines of 5 % per decade in sprinters. They discovered that this was caused by a reduction in step length and no reduction in step rate. In longer races step rate was greater and step length was lower at the self-selected running velocity and was due to a significantly lower propulsive force. Swimmers appear to behave differently than runners. This can be seen at swim meets when the older swimmers tend to have a reduced SR during their races.

This leads to questions of why the SL-SR relationship with velocity is different for individuals and why it changes with age. If we are to train older swimmers to their potential, we have to determine what are the most important stroke techniques. Typically, journal and magazine articles are based on data from elite twenty-year-olds. This may or may not apply to older swimmers as they age and their bodies change. This research hopes to demonstrate the need for age-specific research in the SR-SL relationship and aging in swimming.

METHODS

Two masters national swim meets were videotaped and analyzed. This gave 695 men and 276 women ranging in age from 19 to 88. The videotaping procedure involved setting up a 60 Hz camera in such a way as to be unobstructed throughout the races of interest. The second length of a short course 100-yard freestyle was used for analyses. This videotape was time coded to allow accurate frame specific times. Velocity was determined by measuring the time for the 15 yards between the flags from the time code on the videotape. The SR was determined from the elapsed time for three stroke cycles (first water contact of the right hand to the next water contact of the right hand). SL was then be computed by dividing the velocity by the SR.

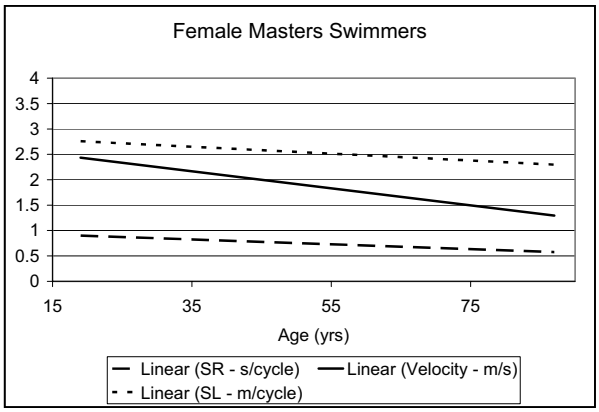

Figure 1: The best fit lines for velocity, SR, and DPS of female masters swimmers.

RESULTS AND DISCUSSION

Velocity decreased as expected at a rate of 5.2 %/decade and 6.1 %/decade for men and women (Figure 1), respectively. This was due to a decrease in men of 9.6 %/decade and in women of 12.1 %/decade in SR. The SL declined slightly in both men and women to help increase the velocity reduction per decade. The SL for women declined 2.4 %/decade and the men declined 1.5 %/ decade.

CONCLUSIONS

The reduction in velocity seen by men and women masters swimmers can mainly be associated with a reduction in SR. The SL reduced slightly in both. However, the women were more affected by a reduction in SL. This demonstrates the need to promote tempo training with aging to help slow this velocity loss.

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