THE ARM STROKE MOTION FROM CATCH TO PULL PHASE IN FRONT CRAWL SWIMMING

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INTRODUCTION

During the front crawl swimming, the propulsive force is known to be mainly generated by the arm stroke motion [1,2]. Thus, the arm stroke motion is improved effectively for swimming performance. In general, their observed distinctive differences between unskilled and skilled swimmers for the arm stroke motion. Especially, the differece between unskilled and skilled swimmer's arm stroke motion is elbow position from catch to pull phases. We reported that skilled swimmers are maintaining more high elbow position (high elbow technique) than unskilled swimmers [3]. However, it is not known exactly how the skilled swimmer is maintaining high elbow position. The present study, therefore, aims to illustrate the nature of shoulder joint motion of underwater stroke motion from catch to pull phases for unskilled and skilled swimmers.

METHODS

Five unskilled swimmers (the season's best time of 100-m = 120.74 ± 31.00 s) and Five skilled swimmers (the season's best time of 100-m = 54.76 ± 1.76 s) volunteered to participate in this study. All swimmers performed the full-exertion 25-m front crawl swimming in a 25-m pool. Two electrically synchronized video cameras were used to capture the right upper limb at 60 Hz during one stroke motion. A digitize system (DKH Inc., Frame-DIAS) was used to manually digitize the landmarks (finger tips, wrist, elbow, shoulder, waist, hip) of the right upper limb.

To assess the stroke motion, we calculated the angular velocity of shoulder joint from catch to pull phases. For calculating the absolute angular velocity of the upper arm was computed by determining the angular velocity of each axis of upper arm. The relative angular velocity vector of shoulder joint was calculated by subtracting its absolute angular velocity vector from that of the adjacent proximal segment. The angular velocity of the shoulder joint was defined as the angular velocity of the upper arm.

In the present study, stroke motions were analyzed for catch and pull phases, and the duration of their phases were normalized to 100 %.

RESULTS AND DISCUSSION

Figure 1 shows that the average changes of the angular velocities at the shoulder joint from catch to pull phases. The angular velocities of the shoulder adduction and horizontal abduction were a similar between the unskilled and skilled swimmers. On the other hand, the differences between the unskilled and skilled swimmers of the angular velocity of the shoulder joint were found the angular velocity of the shoulder internal rotation in the catch phase. It is likely that the skilled swimmers is increasing the shoulder inter rotation angular velocity in the catch phase to maintain a high elbow position. In contrast, the unskilled swimmers seems to be not able to maintain a high elbow position, because the shoulder inter rotation angular velocity in the catch phase is not increased.

CONCLUSIONS

The skilled swimmers were maintaining high elbow position by inducing the inter rotation angular velocity of the shoulder in catch phase. Therefore, to maintain high elbow position, the inter rotation motion of the shoulder in catch phase will be important.

REFERENCES

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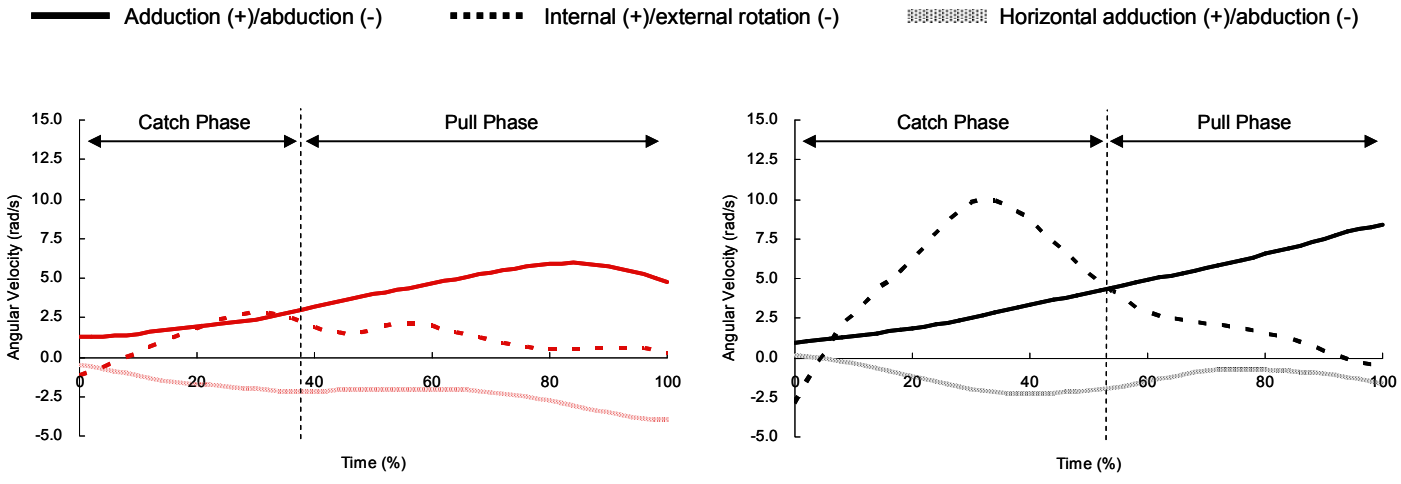

Figure 1: Average changes in angular velocities of the shoulder of full-exertion 25-m front crawl swimming (left: unskilled swimmers, right: skilled swimmers). In all graphs, time from down movement of hand until vertical point in hand and shoulder.