EFFECT OF KINEMATIC VARIABLES ON ENTRY PHASE IN COMPETITIVE SWIMMING-START

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KEY WORDS: swimming−start, entry phase, angle of attack.

INTRODUCTION: Starting techniques are one of the most important factors for race performance in competitive swimming. Start phase (0-15m) is classified Block phase, Flight phase, Entry phase, Glide phase and Stroke phase. There are many study about effect of Kinematics and Kinetics variables on Block phase and Flight phase entry in competitive swimming start. However, there have been very few studies about the techniques of an Entry phase. The relationship between start techniques and performances of entry phase has not been clarified. Therefore, the purpose of this study was to investigate the effect of different entry methods on the performance of the entry phase.

METHOD: Seventeen college elite male swimmers performed two maximum effort competitive swimming start followed by 25m swim and 7m glide. The motions were recorded by synchronized two high speed video cameras (250 fps, HSV-500C3, NAC) and two CCD video cameras (60fps, YK-C13, Victor). The two-dimensional analysis method was used to calculate the kinematic variables. Such as entry velocity, projection angle (The angle between velocity vector of center of mass (CoM) and water surface), attitude angle (The angle between line from CoM to hand at entry and the water surface) and angle of attack (The angle between velocity vector of CoM and the line from CoM to hand at entry). A partial correlation analysis was conducted to describe a correlation between performance of start phase (0-15time) and kinematic variables. The control variable was a swim speed.

RESULTS AND DISCUSSION: There was a significant negative correlation between entry speed and the performance of 15m swim (r=-0.543) (Fig.1). The result indicates a swimmer needs to accelerate the CoM on the starting block to produce a fast entry speed. Also, there was a significant positive correlation between angle of attack and the performance of 15m swim (r=0.581) (Fig.2). Therefore, the high performance swimmers tended to enter with a small anglle of attack. These swimmers redused the orthogonal cross-sectional area of the body with smaller angle of attack. Consequentry, these swimmers might be able to prevent a rapid decrease of velocity in the entry phase.

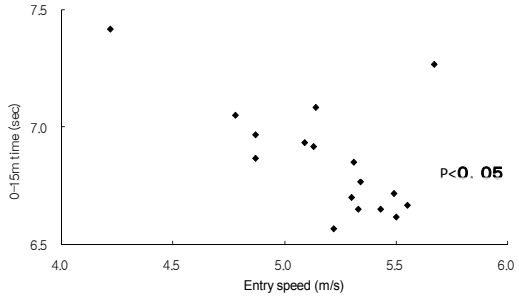

Fig.1 Relationships between 0-15m time and entry

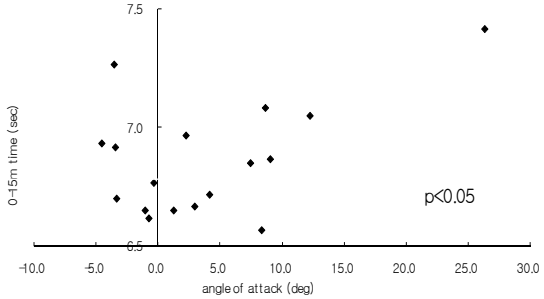

Fig.2 Relationships between 0-15m time and angle of attack

CONCLUSION: This study shows that the high performance swimmers produce a fast entry speed and enter with small angle of attack.