PRINCIPLES OF THE SPLASH CONTROL TECHNIQUE IN DIVING

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INTRODUCTION: "Splash control" is a key element of water entry technique in competitive diving. This process starts from the initial contact of a diver's body with the water surface until complete entry of the rest of the body into the water. The purpose of this study was to establish the most effective hand pattern and body posture that can achieve the best "splash control" to minimize water splash.

METHODS: Mechanical and theoretical analyses were performed on two aspects of the action. The impact processes using the projection of objects of various shapes into water was examined. Secondly, the motion of water flow during impact was studied. Computer simulations were then conducted, depicting the human body in the form of a wedge-shaped object. A customized computer program, using a finite element method, was developed to simulate and subsequently, compute the results of the impact under different conditions and using various inclinations of the wedge-shaped object.

RESULTS AND DISCUSSION: In general, water has the following physical characteristics: non-compressibility; low viscosity and non-uniform motion and it will gravitate towards the direction that has the lowest pressure. When a wedge-shaped object impacts the water surface with the sharp end, the fluid layer closest to the object's inclined surface, escapes in an upward direction. This action is not subject to compression from the surrounding water above the surface, being the easiest direction for water evasion along the surface. In this way, a water splash is formed. The splash height is proportional to the magnitudes of the impact speed and the impact force. However, when a rectangular object impacts with the water, the fluid moves in a downward direction under the pressure of a flat impact surface. During the impact, the water flow disperses circumferentially; no apparent splashes are formed due to the lack of an apparent escaping direction.

According to the theoretical analysis that has been described for this study, a set of simulation experiments was devised for the impact between the fluid and a wedged object with 12 different inclination angles, varying from 2.8 to 80 degrees. The results demonstrated that the fluid splash height was proportional to the inclination angle. The simulation was in agreement with the theoretical hypothesis, relating to the strong relationship between the shape of an impact object and the splash size, which states that a greater splash is associated with a wedged object and a smaller splash is associated with a rectangular object. These results were also confirmed by the technique commonly used by competitive divers using "splash control" with internally rotated palms and flexed shoulder joints instead of a wedge-like hand pattern at the time of the water entry. In addition, the size of the water splash is related to the mass and velocity of the impact object.

CONCLUSION: 1. When an object impacts the water surface, the wedged object causes significantly greater splash than the rectangular object. 2. The greater the angle of the wedge, the higher the fluid splash after the impact. 3. The splash height is related to the hand pattern at the time of a diver's water entry; namely a "splash control" technique with internally rotated palms and flexed shoulder joints, which can effectively minimize the splash size. 4. The splash height is directly proportional to the diver's body weight and the impact velocity, providing a criterion for athlete selections and weight controls.