KINESIOLOGICAL FACTORS DETERMINING THE HEIGHT ACHIEVED DURING FLIGHT IN A SPRINGBOARD DIVE

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INTRODUCTION: Vertical velocity of the center of mass (COM) and body orientation described by joint angles at the instant of take-off have been suggested as among the most important factors contributing to maximum height of a dive after take-off from a spring-board (Miller, 1980; Sanders & Wilson,1988; Miller & Munro,1984). The present study examined several kinematic and kinetic variables proposed in the literature as potential predictors of diving performance and incorporated them in a model that used multiple regression techniques to predict those variables most directly related to the maximum height achieved during a spring-board dive. A secondary purpose of the study was to identify those variables that distinguish between the forward and backward group of dives using techniques of analysis of variance.

METHODS: Four (4) divers were filmed using high-speed cinematography (100Hz) while performing simple dives (½ somersault) from the 1m. spring-board. At the same time, the reaction forces between the diver's foot and the board were recorded (500 Hz) by placing four (4) strain gauges beneath the surface of the board. Nine (9) dives from the four (4) groups were analyzed in total, and kinematic and dynamic variables were derived from the digitized film.

RESULTS: The analysis confirmed that almost 90% of the variance in maximum height was explained by the vertical velocity of the COM and the amount of the board's downward deflection at the instant of take-off. The amount of hip flexion for the forward dives and knee flexion for the backward dives were also highly correlated with the height of the dive. On the other hand, the angle of take-off and the board's vertical velocity were not significant predictors of height. Forward and backward dives were significantly different ($p<.01$) in terms of the maximum height achieved, the vertical velocity of the COM at take-off, the vertical reaction forces applied on the diver's foot at the instant of take-off and the horizontal distance the COM traveled during the execution of the dive. Divers achieved greater height and entered the water further away from the board when performing a forward type of dive than when performing a dive from the backward group. In addition, they were capable of achieving higher vertical take-off velocities and applying greater force on the board when performing dives from the forward group as opposed to backward dives.

CONCLUSIONS: The results of the present study are discussed in terms of the possible coordination strategies a diver can use for creating the necessary conditions during the take-off phase that will guarantee the success of a dive.