EFFECT OF THE TIMING OF HIP TORQUE ON HEIGHT ACHIEVED IN HIGH DEGREE OF DIFFICULTY FORWARD SOMERSAULT DIVES ON THE 3m SPRINGBOARD

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INTRODUCTION: While there has been much research published on the kinematics and kinetics of forward dives from a springboard, very little has been done on the effect on the timing of hip flexion in forward dives. To gain maximum height, the diver must achieve a high vertical velocity at the initiation of flight by utilising the energy stored in the springboard (Miller & Munro, 1984). To do this the diver tries to minimise the energy absorbed by the muscles following landing from the hurdle and maximise the work done to store additional energy in the springboard whilst depressing the board (Sanders & Wilson, 1988). This is done by minimising eccentric action associated with flexion of the hip, knee and ankle joints after landing from the hurdle and maximising concentric work by extending during depression. Flexion of the hips during recoil of the springboard assists in generating angular momentum but reduces height achieved as the board is unweighted due to accelerating mass towards the board. Thus, hip flexion absorbs energy from the springboard. If the diver flexes late in the recoil phase then much of the springboard energy has already been used to increase vertical velocity and good height would be achieved. On the other hand, if the diver flexes early in the recoil phase then much of the energy would be absorbed and poor height would be achieved. Thus, it is hypothesised that the timing of hip flexion in high degree of difficulty forward somersault dives affects height achieved in the dive. The purpose of this study is to investigate the relationship between vertical velocity at take-off of high demand rotational dives, and the timing of hip torques prior to the take-off.

METHOD: Twenty-six divers competing in the United Kingdom leg of the 2001 FINA Diving Grand Prix were used in this study. The divers were international level of mixed nationality with 14 males performing a forward three and one half somersault dive in a pike position (107b), and 12 females performing a forward two and one half somersault dive in a pike position (105b). A video camera operating at 60 Hz recorded all dives in preliminaries and finals of their respective 3m-springboard event. Video footage was digitised from the 10 frames preceding touchdown from the hurdle to 10 frames following take-off to yield Vertical and horizontal velocity and angular displacement data. Kinetics about the hip, knee and ankle joints were calculated via a six segment 'top-down' model. Equations from Brown & Abani (1985) were included into a customised software program written in LabVIEW (National Instruments, USA). Data were then imported into Excel (Microsoft, USA) for statistical analysis.

CONCLUSION: This study will be the first to provide information on the effect of the timing of hip flexion on height achieved in high degree of difficulty forward 3m springboard dives. This information will increase understanding of diving biomechanics and assist strength and conditioning professionals to design programs with sound rationale for springboard divers.

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