ESTIMATION OF HEAD IMPACT POWER ON SEPAK TAKRAW PLAYERS USING FINITE ELEMENT METHOD

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INTRODUCTION: Sepak Takraw is a popular sport in South-East Asia, where in this game, players maintain the takraw ball in air by using their feet, knee, chest and head to touch the ball. A preliminary study of head injuries in Sepak Takraw was conducted by developing an experimental method to measure the Head Impact Power (HIP) of Sepak Takraw balls [1]. Photogrametrics method was also used to investigate the HIP of the takraw balls on the players during the Sepak Takraw World Cup Championship in Malaysia in May 2009 [2]. The HIP results obtained suggests that the players may experience moderate neurological injuries and in order to mitigate this issue, the use of head pads was therefore suggested for the players. This paper highlights an estimation method by employing finite element (FE) analysis to examine HIP in Sepak Takraw.

METHODS: Data collection of this study was conducted and recorded at the KFC-Utusan Sepak Takraw 2011 in Kuala Lumpur. From the recordings, the takraw ball speeds before and after headings particularly at the front-forehead from services in the games were measured. The data for speed was subsequently used for the FE simulation of the ball heading model. Similarly, the contact time of headings were also measured. A comparison between FE simulations by means of Abaqus/CAE and the actual measurements were then made. The material properties of brain tissue used in this study replicates the suggestions made in [3]. The equation proposed by Newman et al. was used to compute the HIP [4].

RESULTS AND DISCUSSION: The present study reveals that the maximum average acceleration of the whole brain for front-forehead heading was 199.187 m/s^2 or 20.31 g at a contact time of 0.011 sec. This result indicates that the readings are still well below the border line of fatal injury according to Wayne State Concussion Tolerance Curve (WSTC) [5]. Furthermore, the experimental and simulation results of the contact time of front-forehead heading as well as the ball speed were found to be in good agreement with 93% and 95.01%, respectively. The maximum speed of takraw ball for front-forehead heading was found to be 15 m/s, whilst the computed HIP is 11.36 kW and the probability of concussion is 39 %.

CONCLUSION: It can be concluded that there is a possibility for sepk takraw players to experience mild traumatic brain injury (MTBI) caused by the collisions of the takraw balls on their heads. Therefore, this study further substantiates the need for the use of headbands to reduce the possibilities of MTBI later in life for active players due to repetitive collisions as suggested by Lipton for soccer players [6].

REFERENCES: