World Academy of Science, Engineering and Technology
International Journal of Sport and Health Sciences
Vol:16, No:05, 2022

Impact Force Difference on Natural Grass Versus Synthetic Turf Football Fields

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Abstract : Introduction: In previous studies of high school sports, over 15% of concussions were attributed to contact with the playing surface. While artificial turf fields are increasing in popularity due to lower maintenance costs, artificial turf has been associated with more ankle and knee injuries, with inconclusive data on concussions. In this study, natural grass and artificial football fields were compared in terms of deceleration on fall impact. Methods: Accelerometers were placed on the forehead, apex of the head, and right ear of a Century Body Opponent Bag (BOB) manikin. A Riddell HITS football helmet was secured onto the head of the manikin over the accelerometers. This manikin was dropped onto natural grass (n = 10) and artificial turf (n = 9) high school football fields. The manikin was dropped from a stationary position at a height of 60 cm onto its front, back, and left side. Each of these drops was conducted 10 times at the 40-yard line, 20-yard line, and endzone. The net deceleration on impact was calculated as a net vector from each of the three accelerometers' x, y, and z vectors from the three different locations on the manikin's head (9 vector measurements per drop). Results: Mean values for the multiple drops were calculated for each accelerometer and drop type for each field. All accelerometers in forward and backward falls and one accelerometer in side falls showed significantly greater impact force on synthetic turf compared to the natural grass surfaces. Conclusion: Impact force was higher on synthetic fields for all drop types for at least one of the accelerometer locations. These findings suggest that concussion risk might be higher for athletes playing on artificial turf fields.

Keywords : concussion, football, biomechanics, sports
Conference Title : ICSMEHS 2022 : International Conference on Sports Medicine, Exercise and Health Science
Conference Location : Vancouver, Canada
Conference Dates : May 23-24, 2022