Abstract

Several baseball and softball physical properties relate directly or indirectly to the risk of head injury, namely size, weight, hardness, and liveliness. Rule book specifications for the official game balls in baseball and Softball specify the size and weight. Ball liveliness is sometimes specified. This study has evaluated the effects of ball hardness and liveliness on the risk of head injury in impact studies with humanoid head models, rigid head forms, and actual cadaver impact tests. The Severity Index (SI) and Head Injury Criteria (HIC) were both measured over a wide range of ball hardness and impact speeds. The risk of head injury was determined using the Prasad-Mertz risk curves. The results reveal a very strong relationship between ball hardness and head injury risk, ranging from 80% risk at 28.6 m/s (60 mph) for popular hard baseballs and softballs, down to 1% risk for softer balls now being used in some youth league programs. The cadaver impact tests confirmed that the humanoid head model and Severity Index injury criteria are well suited for the prediction of head injury risk for highly focal (concentrated in small area) blows from baseballs and softballs to the side of the unprotected head. Field test injury statistics show that the use of softer type baseballs in youth league play can reduce the incidence of ball impact injuries by about 70%.

Keywords:

head injury, baseball injury, baseball standards, injury standards, baseball injury standards, ball impact injuries

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Committee/Subcommittee: F08.26

DOI: 10.1520/STP12816S

However, heading does put the player at risk in the sense of having their head make contact with a number of different objects—somebody.
else’s foot or head, or a goal post—so we need to put that caveat in there.” The tables on the following page summarize studies presented at the workshop, and are not a comprehensive summary of all studies relevant to head injury in soccer. Helmets Are Not Designed to Prevent Concussion. Today’s helmets are designed to meet standards for reducing the risk of serious and fatal brain injury and these standards are limited to reducing injury caused by a linear acceleration, or a ‘straight on’ blow to the head. Topics covered include: causes of head injuries in soccer; how to detect a concussion. The risk of head injury was determined using the Prasad-Mertz risk curves. The results reveal a very strong relationship between ball hardness and head injury risk, ranging from 80% risk at 28.6 m/s (60 mph) for popular hard baseballs and softballs, down to 1% risk for softer balls now being used in some youth league programs. The cadaver impact tests confirmed that the humanoid head model and Severity Index injury criteria are well suited for the prediction of head injury risk for highly focal (concentrated in small area) blows from baseballs and softballs to the side of the unprotected head. Helmet safety standards. Risk of head injury. Voluntary lower limits. Next generation helmets. Could you please direct me to information relevant to how your design mitigates angular forces? I’m a clinician and not an engineer but my understanding of deceleration and the HIC is that they are all about linear forces, which are associated with motorcycle and bike crash related TBI much less frequently than angular forces.