Absorption of Impact Forces by Three Types of Equestrian Protective Vests

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Horseback riding is a high risk activity. Injury rates exceed that of automobile racing and American football with head and chest injuries accounting for 48 to 54% of rider injuries requiring hospitalization. Protective gear for riders is available, and in equestrian competitions riders are required to wear helmets and protective vests. However, little information on the protective qualities of these vests is available. **PURPOSE**: To assess the ability of three types of protective vests to absorb impact forces and reduce transmission of force to the torso. **METHODS:** Three different vests were impact tested by dropping a 67 N weight from a height of 1.77 m on the front and back of the vest. The three vests were a conventional dual density foam segmented panel vest (Conv), a Kan polyurethane "smart" foam vest (Kan), and an Airbag vest over a conventional vest (Air). The air bag was deployed 5 s before impact to assure maximum inflation upon impact. Each vest was fastened around a 330 N sandbag "torso" to obtain a "snug" fit leaving no or minimal spacing between the inside of the vest and the sandbag. The vest and sandbag was positioned on an AMTI force plate set to record at 2000 Hz., and an ultra-thin (<1 mm) pressure sensitive Tekscan sensor set to record at 200 Hz was placed between the vest and sandbag. From the force plate, peak impact force with the ground (GRFpeak) was determined. From the pressure sensor data, peak impact force to the torso (TORSOpeak) was determined. Five drops were performed for the three vests for both the front and back impact conditions. One-way ANOVAs were performed to determine significant differences between vests for the two conditions (front and back impacts). Alpha was set to 0.05. **RESULTS**: For back impacts, TORSOpeak was significantly greater for the Conv (1059 ± 40 N) as compared to the Kan (596 ± 44 N) or the Air (668 ± 148 N) vests. For front impacts, forces were similar between the Conv and Kan vests, but GRFpeak and TORSOpeak were significantly lower for the Air vest as compared to the either Conv or Kan. On average, the Air vest was 249 ± 31 N less for GRFpeak and 490 ± 191 N less for TORSOpeak. **CONCLUSION**: The Air and Kan vests absorb forces better than the Conv vest depending on impact type. The Air and Kan vests reduced the peak impact to the torso by at least 40% for back impacts and the Air vest performed best for front impacts.