Impact Of Helmet Design And Work Setting On Time And Movement During Lacrosse Helmet Facemask Removal By Certified Athletic Trainers
Boergers R, Cabell L, Pinto-Zipp G, Sisto S: Seton Hall University South Orange, NJ

**Context:** The 2009 NATA Position Statement on Acute Management of the Cervical Spine-Injured Athlete, states that guidelines for management of the lacrosse athlete can not be made until there is evidence regarding ease and safety of facemask (FM) removal. Athletic trainer work setting and helmet design may influence removal time and head/neck movement. Knowledge of helmet design differences may help athletic trainers provide effective acute management of suspected cervical spine injured athletes. **Objective:** The purpose of this study was to assess the influence of work setting and helmet design on time and head/neck movement during the FM removal process. **Design:** 2 x 5 factorial design with random assignment of helmet type was used to assess the main and interactive effects of the independent variables [setting: (college, high school)] and [helmet: (Triumph, CPX, Pro7, XR, Venom)] on time and head/neck movement in 3 planes. **Setting:** University biomechanics lab. **Patients or Other Participants:** Twenty-four (12 high school, 12 college) certified athletic trainers (age 35.8 ± 8.9) with at least 1 year experience working with lacrosse athletes. **Interventions:** Subjects completed 1 trial of FM removal for each of the 5 different helmets worn by a human model. Three dimensional kinematic data of the head/neck relative to the trunk were collected using a Vicon motion capture system. The helmet was stabilized between the subject’s knees while removing the FM with an electric screwdriver. Helmet testing order was randomized to control for ordering effect. Separate 2 x 5 repeated measures ANOVA were used to evaluate main and interactive effects of work setting and helmet design on removal time and head/neck movement. Pairwise comparisons using a Bonferroni correction were used post hoc. **Main Outcome Measures:** The dependent variables were removal time (sec), and maximal head/neck movement (deg) in relationship to the trunk measured in three planes. **Results:** There was no significant main effect of work setting on any of the outcome measures. There was a significant main effect of helmet design on time. Mean removal times ranged from 31.09 – 79.02 sec. Four helmets (Triumph, CPX, XR, Venom) took significantly less time to remove than the Pro7 helmet. The Triumph, CPX, XR took significantly less time than Venom. The Triumph and CPX took significantly less time than the XR (p < .05). Significant differences existed between maximal movement in the sagittal plane (p <.05). Maximal sagittal plane movement in the Triumph helmet (7.08° ± 3.59°) was significantly more than the Pro7 (4.30° ± 2.39°). There were no significant differences between helmets for maximal frontal and transverse plane movement. There were no significant interactive effects on any of the outcomes. **Conclusion:** Helmet design affected time and maximal head/neck movement. Work setting did not affect outcome measures. **Word Count:** 450