Effect of sub-concussive impacts from soccer heading on ocular near point of convergence
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Context: Sub-concussion is an under recognized phenomenon resulting from low level head impacts that has the potential to cause neurological dysfunction. Soccer heading provides a safe and unique human model to study controlled head impacts. Measuring ocular near point of convergence (NPC) is an emerging sport concussion ocular motor assessment defined as the closest point in space an individual can see one target with binocular vision. Objective: We investigated the effect of sub-concussive impacts from soccer heading on NPC. We hypothesized that sub-concussive impacts from headers would not influence NPC scores. Design: Repeated measures. Setting: Sport concussion laboratory. Patients or Other Participants: Ten healthy young adult soccer players (8 male; 2 female; age = 21 ± 1.2yrs; height = 70.2 ± 3.6in; weight = 164 ± 20.9lbs; soccer experience = 14.9 ± 2.2yrs) with at least 5 years of soccer heading experience participated after signing an IRB approved consent form. Interventions: The independent variable was assessment time (pre- vs. 0-2hr post- vs. 24hr post-heading). At the beginning of the second test session (0-2hr post-test) subjects performed 10 standing frontal headers over 10 minutes. Soccer balls were projected from a JUGS machine at a speed of 25 mph. During the NPC assessment the participants were seated and a visual target was moved towards the participant’s face at 1cm/sec using an accommodative ruler. The participant signaled when they experienced diplopia (double vision) and the distance was recorded in centimeters. Inter-rater reliability was a Pearson r = .90. Data were analyzed using a one-way ANOVA and follow-up paired samples t-test using IBM SPSS Statistics Version 21 (p < .05). Main Outcome Measure: The dependent variable was NPC. Results: There was a statistically significant difference between assessment times, F(2,18) = 12.81; p < .001. Follow-up t-tests indicated that pretest NPC scores (8.12 ± 2.45cm) were significantly lower (better) than 0-2hr (10.50 ± 1.46cm; p = .017) and 24hr (11.45 ± 2.40cm; p = .008) post-test scores. Conclusions: This is the first study to assess the effect of controlled head impacts on ocular NPC. These findings suggest that mild frontal head impacts affect ocular motor function for up to 24 hours. Word Count: 356/450