Effect of Target Type on Ocular Near Point of Convergence in a Healthy, Active Collegiate Population
Phillips JM, Tierney RT: Department of Kinesiology, Temple University, Philadelphia, PA

Context: Measuring ocular Near Point of Convergence (NPC) has recently emerged as a concussion assessment tool in young athletes. A cut point of ≥5cm has been recommended as indicating ocular-motor dysfunction. There has been little investigation examining if clinically accessible target types (e.g., pen) affects NPC and no examination of NPC in a healthy, active collegiate population. Objective: Since NPC utilizes multiple brain pathways it could prove useful in the diagnosis of sport concussion. The purpose of this study was to determine if target type effects NPC in a physically active college population. Design: A cross-sectional repeated measures design. Setting: Laboratory setting. Participants: Thirty-nine subjects signed IRB-approved consent forms and participated in this study (males =13; females =26). All participants were between 18 and 30 years of age (23.6 ± 3.1yrs). Exclusionary criteria included not using corrective eyewear (e.g. contact lenses, glasses, etc.); any disease, disability, or other issue that affects the ocular system; recent (within 6 months), unresolved, or chronic brain injury. Interventions: The independent variable was target type (three different sized font letters [1.0M, 1.25M, 1.6M] in a reduced Snellen chart format, a drawn black line, and pen tip). Using a near point ruler (Burnell Vision Training Products, Mishawaka, IN), the NPC was measured for all subjects with the different targets. For each trial the target was moved toward the participant's face at eye level at a slow pace of about 1-2 cm/s. Each target was tested twice and all trials were randomized. NPC distance was determined one of two ways: either the participant stated when diplopia occurred, or the tester noted abnormal eye tracking. Data analysis included a repeated measures ANOVA and followed-up paired samples t-tests using IBM SPSS Statistics Version 21 (p<.05). Main Outcome Measures: NPC (cm) is the closest point in space where a person can see one target with binocular vision. Results: NPC ranged from 1.5 to 10cm in this population. The ANOVA identified statistically significant differences (F(4,152)=2.568, p=.040) between target types. The middle sized font (6.0±1.63cm) was significantly receded versus the line (5.6±1.59cm; t(2.344), p=.024) and pen (5.7±1.54cm; t(2.052), p=.047). There was also a difference between the largest sized font (6.0±1.66cm) and the line (t(2.317), p=.026). NPC for the three different font sizes were all approximately 6.0±1.41 to 1.66cm. Conclusion: Statistically significant differences in NPC existed between target types, however clinical significance of the difference (<.5cm) may be lacking. For the college aged physically active population, the measurement of NPC is not affected by target type. A cut point of 5cm indicating dysfunction may not be appropriate in this population as measurements ranged up to 10cm. Word Count: 433 / 450