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RFD-SF and Time to Peak Force for Grip Strength is not affected in College Aged Students with Multiple Concussions

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INTRODUCTION: Concussions are a brain injury caused by a collision of the brain against the skull. Known symptoms of a concussion are headaches, dizziness, nausea, and fatigue. Long term effects of multiple concussions include having mild cognitive impairment, memory loss, and increased risk of depression/anxiety. Iverson found multiple concussions to not have an affect on ImpACT test scoring in high school and college aged athletes. However, there was a drop in score regarding verbal memory composite, suggesting that there may be a lingering effect. Neural control of rapid movement decreases with age and disease and is measured via the rate of force development scaling factor (RFD-sf). The effects of multiple concussions on neural control of rapid movement are unknown. **PURPOSE:** The purpose of this study was to determine the effects of multiple concussions on the rate of force development scaling factor. **METHODS:** 39 volunteers (21 females, 18 males) participated in this study. 15 of the subjects did not have concussions (NONE), 12 have experienced 1-2 concussions (FEW), and 12 have had more than two concussions (MANY). Participants performed 2 to 3 sets of rapid grip force pulses to varying peak forces between 15% and 80% of MVC. Each set was one minute in length with at least one minute of rest in between. Force data was Butterworth filtered with a 50Hz cutoff. RFD was calculated with the slope of a central tendency 50ms moving window. Peak RFD and peak force were plotted with a best fit regression line. Slope (RFD-SF) and r^2 , were recorded from the best fit regression line and time to peak force (TtpkF) were recorded from the time-force curve. A one-way ANOVA was used to analyze the data. **RESULTS:** The mean and standard deviation for RFD-SF, r^2 , and TtpkF (ms) for each group is as follows: NONE - RFD-SF = 8.61 (1.96), $r^2 = 0.838$ (0.06), TtpkF = 0.122 (0.03); FEW - RFD-SF = 8.37 (2.11), $r^2 = 0.780$ (0.11), TtpkF = 0.125 (0.02); MANY - RFD-SF = 8.25 (1.66), $r^2 = 0.780$ (0.14), TtpkF = 0.131 (0.04). There were no significant differences between the groups for RFD-SF [F(2,36)=0.119, p=0.888]; r-squared [F(2,36)=1.250, p=0.299]; or time to peak force [F(2,36)=0.338, p=0.715]. **CONCLUSION:** RFD-SF and time to peak force in grip strength are not affected by multiple concussions in college aged students.