LONGITUDINAL EFFECT OF CONCUSSION ON GAIT BALANCE CONTROL, 1-YEAR FOLLOW UP: A PILOT STUDY

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INTRODUCTION
Recent investigations have reported gait balance impairment from 28 days up to two months in adults and adolescents, respectively [1,2]. In a retrospective study, gait impairments were demonstrated up to five years post-injury [3]. Therefore, the purpose of this study was to prospectively and longitudinally demonstrate continued recovery in concussion patients up to 1-year post-injury.

METHODS
Twenty-one young adults (age 21.5±4.5) diagnosed by a health care professional as suffering concussion reported to the lab within 72 hours of injury and returned two months post-injury. Concussed subjects were matched with healthy control subjects (n=20) by age, sex, height, and mass. Control subjects were tested in a similar timeline. Five concussion subjects returned for a 1-year follow up assessment using the same protocol.

Subjects walked at a self-selected speed while performing a continuous auditory Stroop test (dual-task). The Stroop test consisted of a recorded voice saying the word “high” or “low” in a high or low pitch four times; subjects were instructed to respond by stating the pitch of each word as they walked.

29 retro-reflective markers were placed on bony landmarks and whole body movement was recorded using a ten camera motion analysis system (Motion Analysis Corp., Santa Rosa, CA) at a sampling rate of 60 Hz. Whole body COM position was calculated with a 13-link model [4]. Four dependent variables were examined during the gait cycle under the dual-task condition: peak anterior (Av) and medial/lateral (MLv) velocities, total COM displacement in the frontal plane, and average walking speed. These variables have been previously reported to provide sensitive detection of gait imbalance [2].

To compare data between concussion and control groups in the first 2 months of collection, two-way mixed effects ANOVAs were used to analyze each dependent variable to determine the effect of group and testing day. For all omnibus tests, significance was set at p < .05. Follow up pairwise comparisons were examined using the Bonferroni procedure to control Family Wise Type I Error.

To assess longitudinal change in the concussion group a univariate ANOVA comparison was made to detect differences across the three time points (7hr, 2 month, 1 year).

RESULTS AND DISCUSSION
Data across the 2-month testing period showed concussion subjects walked with significantly greater MLdisp than control subjects (Figure 1, main effect of group p = .032). Concussion subjects that completed the 1-year follow up continued to show improvement in mean MLdisp across 72hr, 2 month, and 1 year time points, though not statistically significant (p = .271).

For peak Av, a group*test day interaction was detected (p = .009). At 72hr and 2-month testing time points, concussion subjects walked with significantly less Av compared to controls. Concussion subjects walked with significantly less Av at the 72hr time point compared to the 2-month time point. For the 5 concussion subjects that completed a 1-year follow up, a main effect of group was detected (p = .018) but follow-up comparisons indicated no significant differences.

CONCLUSIONS
The data suggest continued gait balance impairment in concussion subjects occurring up to two months post-injury. Gait balance improvement appears to continue from the 2-month to 1-year testing days; further data collection of 1-year follow up concussion subjects should continue to develop pilot data.

REFERENCES