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## NEUROPSYCHIATRIC ASSESSMENT OF ADOLESCENTS WITH POST-CONCUSSION SYNDROME BEFORE AND AFTER THE IMPLEMENTATION OF A NOVEL ACTIVE REHABILITATION PROTOCOL

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**BACKGROUND:** Patients with concussion symptoms beyond two weeks after the initial injury are diagnosed with Post-Concussion Syndrome (PCS). Adolescents may have longer recoveries. There is no standard PCS treatment. Recent studies show a potential for light exercise to facilitate recovery. These studies are loosely constructed and contain small sample sizes with broad age ranges. Our study expands upon prior knowledge by implementing a systematic and aggressive active rehabilitation (AR) protocol in a diverse sample of adolescents at nearly double prior sample sizes.

**METHODS:** A 13-18 year-old sample size of N=18 adolescents with PCS was enrolled in AR no earlier than 3 weeks after concussion at our pediatric sports medicine clinic. Demographic data included ethnicity, activities and histories. The Depression, Anxiety, Stress, Scale (DASS) was used to assess symptom severity. The symptom severity scale of the Sport Concussion Assessment Tool 3 (SCAT-3) was used to assess symptom type and low, moderate or high severity. DASS and SCAT-3 were used throughout AR. Subjects all visited clinic once per week for clinical evaluation and for treadmill monitoring. AR began at 50% Max Heart Rate (MHR) for 10 minutes. AR target MHR rose weekly by 10% through 90%. Duration increased 1 minute each week. A 5 minute warm up and cool down was used. If tolerance was poor, MHR stayed the same. Subjects had 5 bouts per week.

**RESULTS:** The sample consists of 44% Hispanic, 56% male, and 83% athlete with a mean age of 15.74 years (13.07-17.36). Mean weeks between concussion and enrollment was 6.01 (2.57-22.00) and mean weeks in AR was 5.91 (2.00-10.00) for N=17. Baseline DASS demonstrated 42% of subjects with stress, 24% with anxiety and 25% with depression. DASS post-treatment was available for N=7 and the total DASS between baseline (21.86; SD 19.420) and post-treatment (12.14; SD 14.496) was significantly decreased. No significant differences were found in the DASS subscales, but all means decreased. 38% of subjects had a history of psychiatric problems and/or ADHD and 44% had family histories of psychiatric problems. 100% of all subjects presented with psychiatric and/or ADHD symptoms. Paired samples statistics showed a significant ( $p < 0.05$ ) decrease in SCAT-3 from pre (15.47; SD 8.217) to post (5.65; SD 5.578). SCAT-3 moderate (3.47 to 1.12) and severe (2.12 to 0.29) symptoms significantly decreased. Mild (2.29 to 2.53) symptoms increased. 44% of subjects returned to pre-concussion health after AR. Scores in psychiatric (1.8235-0.5294), neurocognitive (5.0588-1.3529) and mixed (6.3529-1.8824) SCAT-3 symptom categories all had significant ( $p < 0.05$ ) pre and post differences.

**CONCLUSION:** Prospective evidence for the efficacy of AR in adolescents with PCS is shown. The study is restricted to adolescents, highlights the efficacy of weekly monitoring, is 44% Hispanic, and shows 44% experiencing complete symptom resolution with 100% experiencing significant improvement.