

The effects of interval training with blood flow restriction and body cooling on the cognitive function of individuals with post-concussive symptoms for more than one year

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Introduction: Post-Concussion Syndrome (PCS) is a complex disorder in which concussion symptoms last for weeks, months, and even years. Recent research has shown that exercise can improve post-concussion symptoms. Our previous study applying blood flow restriction (BFR) and body cooling (BC) during exercise demonstrated the positive effects such as stable cognitive function recovery on people with PCS less than one year. Persistence of symptoms is a considerable problem even one year after the injury, with cognitive symptoms dominating. This current study aims to examine the effects of 12-session exercise under BFR and BC on people with PCS more than one year. **Methods:** This ongoing study has recruited eight individuals who have persistent PCS symptoms lasting more than one year with a modified Somatic Perception Questionnaire scored <10 . Five participants were assigned to the experimental group and rode a recumbent elliptical machine under BFR and BC (Vasper system, Vasper, Mountain View, CA). Three participants in the control group rode a recumbent elliptical machine (NuStep) without any secondary technologies. All participants followed an interval training program where resistance was varied throughout the session. Evaluations consisting of the Immediate Post-Concussion Assessment and Cognitive Test (ImPACT), Post Concussion Symptom Scale (PCSS), King-Devick test, Balance Error Scoring System (BESS), the Standardized Assessment of Concussion (SAC), and QOLIBRI (quality of life after brain injury) were conducted before and after the 12-session exercise program. PCSS were also acquired daily to assess the trend of PCS symptoms changes. To examine the changes of cognitive function due to the intervention, this abstract focuses on the results of cognitive efficiency index (CEI) of the ImPACT, SAC, and the cognitive symptoms domain of PCSS. Mixed ANOVA was used to test the group differences of CEI, SAC, and symptoms changes. **Results:** The current results showed that CEI of participants in the experimental group increased significantly higher compared to CEI of those in the control group ($p=0.02$). There was a trend that participants in the experimental group reduced the number of PCS symptoms ($p=0.05$). Additionally, there's a trend that the SAC score increased more compared to SAC scores of the control ($p=0.06$). **Discussion:** The preliminary results demonstrated that exercise under BFR and BC enhanced the recovery of PCS. CEI and SAC scores showed that symptoms in the cognitive domain improved significantly with the experimental conditions. Recovery in other symptom domains was comparable to conventional exercise. **Conclusion:** It is feasible to implement interval training as an exercise regimen for people with more than one year persistent PCS symptoms. Interval-training exercise alleviated the post-concussion symptoms of people with PCS. Symptoms in the cognitive domain improved more in the same time period when using BFR and BC.

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