Role of Occupational Therapy in Concussion Rehabilitation

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BACKGROUND

Concussion is defined as a form of mild traumatic brain injury resulting from biomechanical forces producing complex pathophysiological process that typically results in the rapid onset of short-term neurologic impairments that typically resolve spontaneously (Leddy et al., 2017; Ellis et al., 2016). Symptoms associated with concussion include headache, nausea, dizziness, light and sound sensitivity, fatigue, drowsiness, sleep disturbance, and cognitive impairments (Ellis et al., 2018). Further, concussion can affect the autonomic nervous system, which controls cerebral blood flow and heart rate (Leddy et al., 2017), resulting in functional disturbance (Ellis et al., 2018).

Heart rate variability has been used to assess automimic dysfunction for all levels of traumatic brain injury (Leddy et al., 2017), with the gold standard including the use of the Buffalo Concussion Treadmill Test (BCTT) (Ellis et al., 2018). After completing a BCTT patients are prescribed a sub-symptomatic threshold heart rate to complete aerobic exercise at.

Occupational therapists are in a unique position to treat individuals who have experienced a concussion by providing activity modification in order to return to daily routines and occupations (Brayton-Chung, Finch, & Keilty, 2016). Further, occupation-based interventions have been shown to have higher adherence than traditional home exercise programs, (Proffitt, 2016) as individuals improve self-confidence by participating in their occupations, which in turn increases motivation (Cole & Tufano, 2008).

RESEARCH QUESTION

Do occupation-based interventions increase adherence to completing activities at a sub-symptomatic threshold for individuals who are experiencing autonomic dysfunction secondary to concussion?

https://www.theproactiveathlete.ca/some-concussions-need-more-then-rest/

CLIENT HISTORY

Patient #1: 44-year-old male

- DOI: 7-15-19
- MOI: Motor vehicle accident
- Test Dates: 1-24-2020; 2-28-2020
- Target Heart Rates: 115 bpm, 139 bpm
- Occupations Trialed: Care of pet, Child rearing

Patient #2: 17-year-old male

- DOI: 12-11-2018
- MOI: Motor vehicle accident
- Test Dates: 1-31-2020; 2-17-2020; 3-2-2020
- Target Heart Rates: 141 bpm, 150 bpm, 179 bpm
- Occupations Trialed: Leisure exercise, Care of pet, Care of 5-year-old sister. IADL of cleaning

METHODS

All patients received a referral to complete a BCTT from a neurologist and consent was obtained. Patients were randomly assigned to an occupation-based intervention group. Testing was completed under direct supervision wearing a continuous heart rate monitor. The patient began the test with an initial warm up minute at 2mph, followed by a testing speed of 3.2mph or 3.6mph depending on the patient's height. At set intervals the incline of the treadmill was increased by one degree, and the patient was asked to provide their rate of perceived exertion using the Borg scale and rate their symptoms using the visual analog scale. The test was discontinued at a symptomatic maximum.

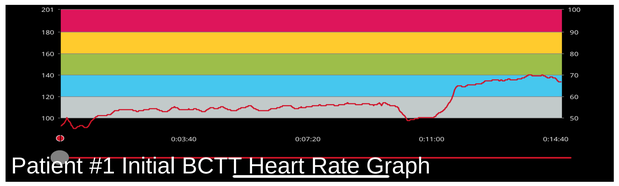
Upon completion of the BCTT, patients completed the Role Checklist with an occupational therapy student (OTS). The OTS and patient collaborated to identify two to three valued occupations to trial to achieve the sub-symptomatic heart rate identified by the BCTT. Patients were instructed to recorded their heart rate, through use of a device or manually, while completing prescribed occupations. Patients also recorded any symptoms experienced while participating in prescribed occupations.

Patients completed a follow up appointment with the OTS to provide any necessary activity modification to ensure optimal participation while maintaining a sub symptomatic threshold. The BCTT was retested approximately every two weeks, until patients were able to obtain 90% of their age-predicted heart rate maximum or were able to complete the BCTT with no reports of any concussion symptoms.

RESULTS

Patient #1:

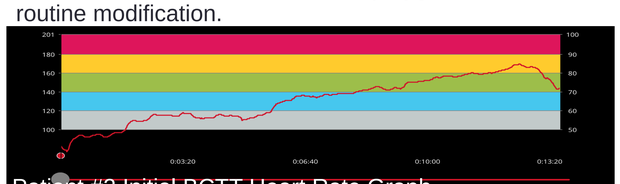
Upon completion of the initial BCTT, the patient's target heart rate was identified at 115 bpm (Figure 1). The patient elected to trial occupations of care of pet and child rearing. The patient recorded his heart rate manually and did not experience any concussion symptoms. The patient retested his BCTT and obtained a new target heart rate of 139 bpm. The patient elected to continue prescribed occupations at a higher intensity. The patient again experienced no concussion symptoms while completing prescribed occupations. The patient was offered additional consultative OT services to include verbal education to downgrade shoveling snow and moving furniture as the patient had expressed difficulty with these activities during his follow up appointments. The patient has been unable to retest his BCTT secondary to the COIVD-19 pandemic. Overall the patient was able to obtain his target heart rate with trialed occupations within +/- 10 bpm.



Patient #1 Initial BCTT Heart Rate Graph

Patient #2:

Upon completion of the initial BCTT, the patient's target heart rate was identified at 141 bpm (Figure 2). The patient elected to trial occupations of leisure: exercise, and IADL: cleaning. The patient recorded his heart rate manually and did not experience any concussion symptoms. The patient completed a second BCTT and received a new target heart rate of 150 bpm. The patient elected to trial care of pet, care of 5-year-old sister, and previously trialed leisure exercise. The patient was able to obtain his target heart rate within +/-10 bpm with no symptoms of concussion. The patient completed a third BCTT and new target heart rate of 179 bpm was identified. The patient elected to continue previously trialed occupations in addition to the leisure activity of baseball conditioning. The patient was discharged from BCTT and OT as during his third BCTT he was able to obtain his age-predicted heart rate maximum with no symptoms of concussion. The patient was offered additional consultative OT services to include verbal education on sleep hygiene and routine modification.



Patient #2 Initial BCTT Heart Rate Graph

BOTTOM LINE FOR OT

Although occupational therapy has a valued role in concussion rehabilitation, it is not widely recognized across concussion rehabilitation clinics. In regards for restoring autonomic function after sustaining a concussion, occupational therapy may have a role in providing occupation-based interventions to promote gradual return to activity at a sub-symptomatic threshold. With the two patients presented, the target heart rate determined by the BCTT was achieved by participating in overarching occupations of IADLs and leisure. The patients showed higher adherence to occupation-based intervention as seen through patient report and use of occupation logs.

The use of the Role Checklist may be beneficial for occupational therapists practicing in concussion rehabilitation to determine what occupations are most valuable to the patient in order to make interventions client-centered and occupation-based. Further, the OTS was better able to understand what functional limitations patients were experiencing through a semi-structured interview and use of the Role Checklist. Both patients were able to achieve higher target heart rates upon retesting, which may indicate restoration in autonomic function. Further research is needed to better understand occupational therapy's role in concussion rehabilitation as well as what standardized measures can be used to provide quantitative data regarding improved patient outcomes.

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