

CONCUSSION 101

Concussion & the Benefits of Exercise

PATHOPHYSIOLOGY OF A CONCUSSION

WHAT IS A CONCUSSION?

- brain injury caused by a blow to the head, face or neck or blow to the body resulting in a sudden jarring of the head
- metabolic, physiological & microstructural injury to the brain

AUTONOMIC NERVOUS SYSTEM (ANS)

- ANS control centre may be damaged during a concussion
- ANS modulates bodily functions such as heart rate (HR), digestion and respiratory rate

EXAMPLES OF PATHOPHYSIOLOGIC CHANGES:

- altered control of:

autonomic nervous system (ANS)



cerebral blood flow (CBF) & cardiac rhythm



cerebral blood flow (CBF) autoregulation in response to changing blood pressure (BP)

EFFECTS OF CONCUSSION: EXERCISE INTOLERANCE

WHAT IS EXERCISE INTOLERANCE?

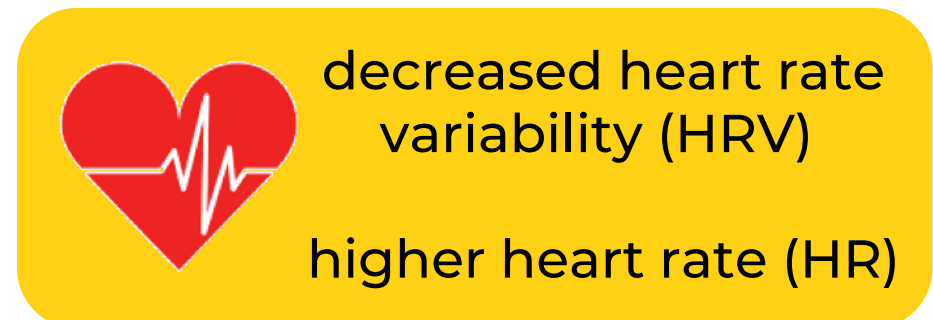
- when exercising, concussion patients need to stop due to:
 - symptom exacerbation
 - fatigue

WHY DOES EXERCISE INTOLERANCE OCCUR?

- impaired cerebral autoregulation in response to varying levels of systemic BP
 - may induce excessive changes in cerebral perfusion pressure

COMMON SIGNS & SYMPTOMS OF EXERCISE INTOLERANCE?

- commonly observed during submaximal exercise:



HOW CAN EXERCISE BENEFIT CONCUSSION PATIENTS?

THEORIZED BENEFITS OF EXERCISE FOR CONCUSSION PATIENTS:



promote neuron
growth & repair



higher levels of brain-
derived neurotrophic
factor (BDNF)



mitigation of
vascular disease
risk



return exercise
tolerance to normal



restore CBF
regulation and
ANS balance

BUFFALO CONCUSSION TREADMILL TEST (BCTT)

WHAT IS THE BUFFALO CONCUSSION TREADMILL TEST?

- Graded aerobic exercise test (modified Balke protocol)

WHY RUN THE BCTT?

- Establish symptom threshold so concussion participant can safely exercise below it
- Create individualized aerobic exercise program to improve concussion recovery for participant



BUFFALO CONCUSSION TREADMILL TEST (BCTT) CONT'D

HOW EARLY CAN THE BCTT BE ADMINISTERED AFTER A CONCUSSION?

- Within 1 week of a sustained concussion
- BCTT has been shown to be safe and do no harm to a participant's recovery when administered as early as 4 days post-concussion



BCTT PROTOCOL

TOOLS NEEDED

- Treadmill
- Rate of Perceived Exertion Scale (Borg Scale)
- Visual Analogue Scale (VAS)
- Timer
- BCTT protocol
- Heart rate (HR) monitor

BEFORE BEGINNING...

- Evaluate participants' mental and physical ability to exercise
- Administer PAR-Q
- Ask participant to rate symptoms on Visual Analogue Scale (VAS)
- Record participant's resting heart rate (HR)



BCTT CESSATION CRITERIA

A) SYMPTOM EXACERBATION

- When symptoms worsen
 - increase of 3 points or more from pre-exercise VAS value
 - 1 point or more if an increase in symptoms AND
 - 1 point if there is an appearance of new symptom

OR

B) VOLUNTARY EXHAUSTION

- RPE = 17 or more, max of 20

EXERCISE PRESCRIPTION

Minimum 20min/day, once a day for 6-7 days/week

Intensity at 80-90% of heart rate (HR) threshold (from BCTT), calculated using a HR monitor

WHEN TO STOP EXERCISING?

- When symptoms worsen
 - 2 or more point increase from baseline level

WHEN TO PROGRESS?

- The BCTT or the Buffalo Concussion Bike Test can be repeated every 2-3 weeks
- OR increase HR threshold by 5-10bpm every 1-2 weeks
- Physiological recovery (of a concussion)
 - Ability to exercise to voluntary exhaustion at more or equal to 80% of HR max for 20min several days in a row without symptom exacerbation

