

Exercise intolerance after mild traumatic brain injury: subtypes and rehabilitation

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BACKGROUND

- Recent research and clinical observation indicate the presence of grouped symptom clusters after a mild traumatic brain injury (mTBI), forming organized clinical profiles called subtypes [1, 2].
- Five defined subtypes are: cognitive, ocular-motor, headache/migraine, vestibular, and anxiety/mood [3, 4].
- Exercise intolerance is common after mTBI [5] but its relationship with subtypes is unknown.
- Limited guidance exists for exercise intolerance treatment. Sub-symptom-provoking threshold exercise may improve symptoms, but the effects of traditional, rehabilitation on exercise intolerance is unexplored.

AIM

To explore exercise intolerance across subtypes and whether certain subtypes are more responsive to physical therapy with regard to exercise intolerance.

METHODS

Participants: 100 patients with prolonged recovery from mTBI (Table 1)

Table 1. Demographics

	Exercise Intolerant	Exercise Tolerant
Gender	22 F	60 F
Age (years)	35.4 ± 11.8	38 ± 11
BMI (kg/m ²)	27.2 ± 7	25.2 ± 5.4
Time since injury	77.2 ± 23.4	76.2 ± 32.3
Symptoms (NSI- Total 88)	40.9 ± 15.7	31.4 ± 13.7

Procedures and outcomes:

- Participants were tested pre and post rehabilitation for exercise tolerance using the Buffalo Concussion Treadmill Test (BCTT) [5]. Exercise intolerance: increase of ≥ 3 symptoms during BCTT. Exercise tolerance: heart rate reached 85% of age predicted maximum or a Borg Rating of Perceived Exertion ≥ 17.
- Concussion subtypes: We used the Neurobehavioral Symptom Inventory (NSI) to assign each person a primary subtype; defined as scoring between 'moderate-very severe' in a subtype category. Scores lower than this were classified as "none" and people with multiple scores in this range were classified as "mixed" subtypes.

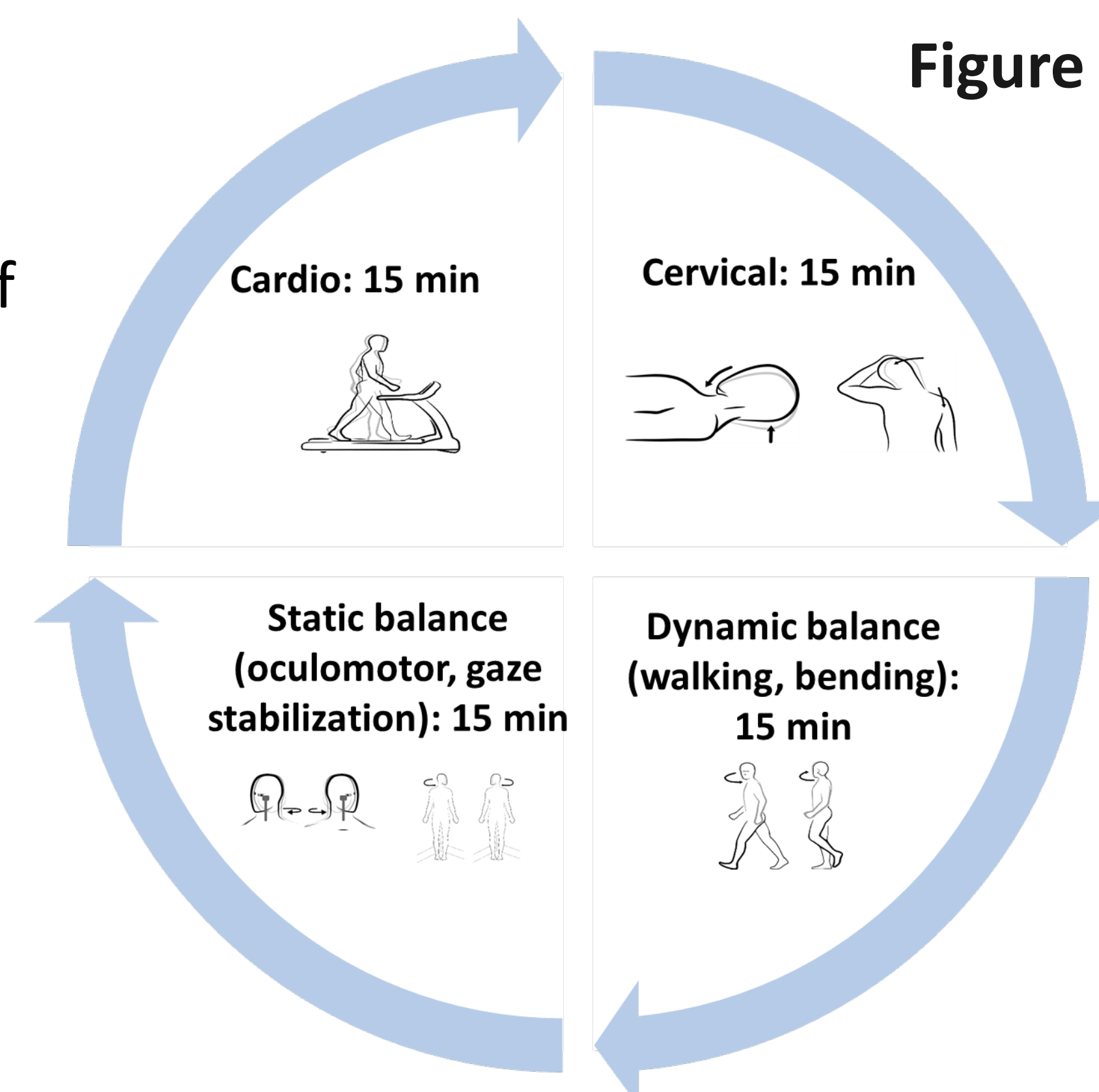


Figure 1. Rehabilitation: 6 weeks (8-60 min sessions)

RESULTS

- More than half of the participants were exercise intolerant with no significant group differences in baseline demographics (Independent t-tests: p 's > 0.05) except the NSI total score ($p=0.004$)
- Exercise intolerance occurred in all subtypes

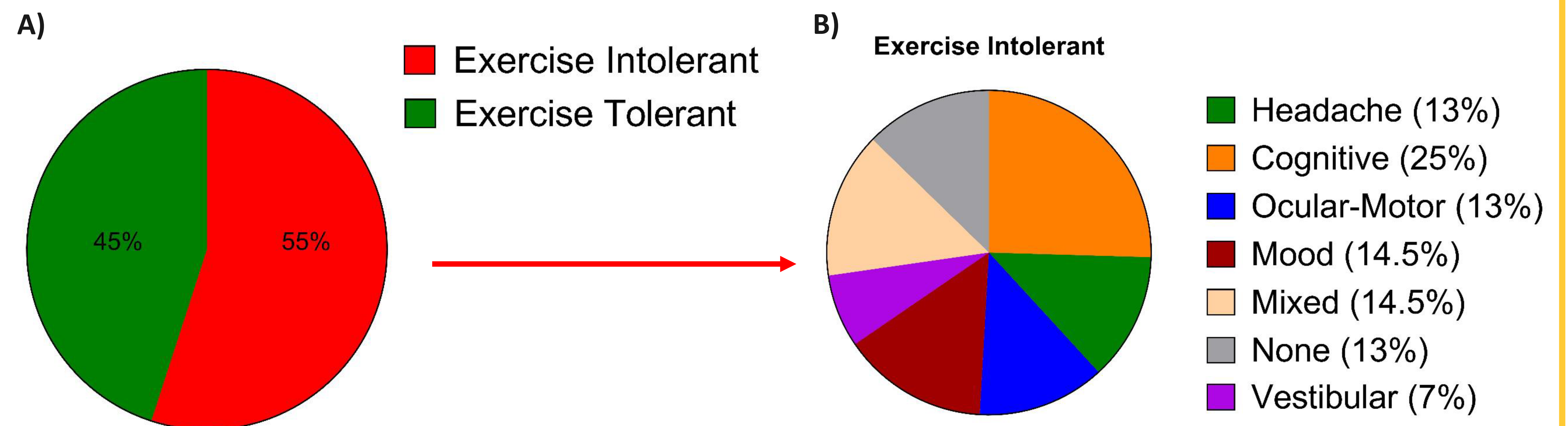


Figure 2. A) Classification of exercise tolerance in participants. B) Primary subtype assignment based on the NSI for the exercise intolerant group (n=55) before rehabilitation

No subtype was clearly more responsive than another (Figure 3). However, the subtypes that improved the most were ocular-motor and "none" (people with mild symptoms)

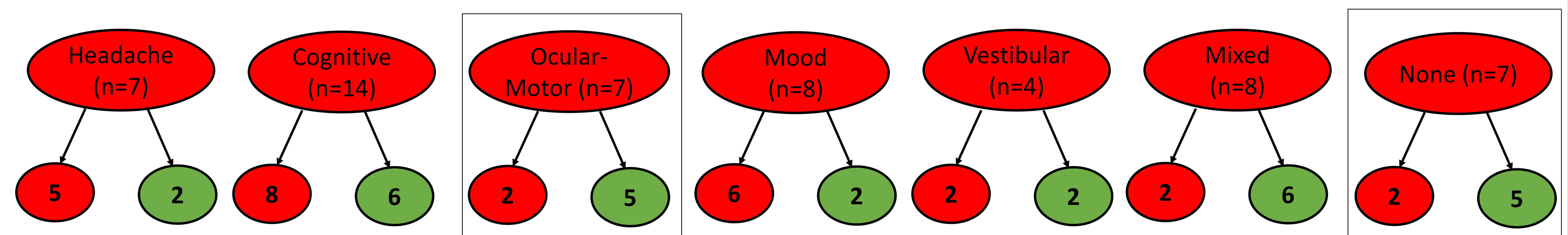


Figure 3. Primary subtype assignment based on the NSI for the exercise intolerant and tolerant groups after rehabilitation

CONCLUSIONS

- All patients, regardless of subtype classification, may benefit from an evaluation of exercise intolerance as part of their clinical examination.
- There is no clear subtype that is more (or less) responsive to rehabilitation with regard to exercise intolerance.
- Further work on understanding the mechanism underlying exercise intolerance after mTBI may help improve responsiveness to rehabilitation.

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