Efficiency of an active rehabilitation intervention in a pediatric population with atypical recovery following a mild traumatic brain injury

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Introduction

- Symptoms may persist beyond the expected recovery period in 11-17% of mTBI cases and may be longer in youth.

- Exercise is a promising therapeutic avenue as it may have a positive impact on depression, headaches, mood, dizziness, impairment of cognitive functions, balance, etc.

1. Barlow, K. M., et al. (2010), 2. Ponsford, J. et al. (1999), 3. Archer, T. (2012), 4. Archer, T. et al. (2012), 5.Baker, J. G. et al. (2012), 6. Leddy, J. J. et al. (2011) , 7. Majerske, C. W. et al. (2008), 8. Tan, C. O. et al. (2014). 9. Sady, M. D. and al. (2014). 10. Gagnon, I. et al. (2009), 11. Gagnon , I. et al. (2015).

Objective

✤ Identify whether the addition of an active rehabilitation intervention influence recovery of young patients aged from 10 to 17 years old who are slow to recover following mTBI.

Methods
Participants and evaluation

✤ n = 15 (6M/9F) from 11 to 17 years old (mean=15 ± 1,69) who sustained a sport-related mTBI.

✤ Postconcussion symptom inventory, neuropsychological, balance and coordination assessment were performed.

Pre-test	48 ± 88,73 days post mTBI
Post-test	9,73 ± 2,12 days without symptoms

Methods
Active Rehabilitation intervention

Low intensity cycling for 5 to 15 minutes (perceived exertion 2/10)

↓

Moderate intensity cycling for 15 to 20 minutes (perceived exertion 3/10)

↓

Low to high intensity cycling for 20 minutes (alternate 3 to 5 times 1 min 5/10, 1 min 2/10)

Sport specific motor coordination exercises

Balance and coordination therapeutic exercises

Methods
Assessment: Symptoms severity

		Before the injury	Current symptoms
1	Headache	0 1 2 3 4 5 6	0 1 2 3 4 5 6
2	Nausea	0 1 2 3 4 5 6	0 1 2 3 4 5 6
3	Balance problems	0 1 2 3 4 5 6	0 1 2 3 4 5 6
4	Dizziness	0 1 2 3 4 5 6	0 1 2 3 4 5 6
5	Fatigue	0 1 2 3 4 5 6	0 1 2 3 4 5 6
6	Drowsiness	0 1 2 3 4 5 6	0 1 2 3 4 5 6
7	Sensitivity to light	0 1 2 3 4 5 6	0 1 2 3 4 5 6
8	Sensitivity to noise	0 1 2 3 4 5 6	0 1 2 3 4 5 6
9	Irritability	0 1 2 3 4 5 6	0 1 2 3 4 5 6
10	Sadness	0 1 2 3 4 5 6	0 1 2 3 4 5 6
11	Nervousness	0 1 2 3 4 5 6	0 1 2 3 4 5 6
12	Feeling more emotional	0 1 2 3 4 5 6	0 1 2 3 4 5 6
13	Feeling slow down	0 1 2 3 4 5 6	0 1 2 3 4 5 6
14	Feeling mentally « foggy »	0 1 2 3 4 5 6	0 1 2 3 4 5 6
15	Difficulty concentrating	0 1 2 3 4 5 6	0 1 2 3 4 5 6
16	Difficulty remembering	0 1 2 3 4 5 6	0 1 2 3 4 5 6
17	Visual problems	0 1 2 3 4 5 6	0 1 2 3 4 5 6
18	Get confused with directions or tasks	0 1 2 3 4 5 6	0 1 2 3 4 5 6
19	Move in a clumsy manner	0 1 2 3 4 5 6	0 1 2 3 4 5 6
20	Answer questions more slowly than usual	0 1 2 3 4 5 6	0 1 2 3 4 5 6
21	In general, to what degree do you feel « differently » than before the injury (not feeling yourself)?	0 1 2 3 4 Circle your rating with « 0 » indicating « Normal » (No difference) and « 4 » indicating « major différence »	

Methods
Assessment: Balance/Coordination

✤ Sport Concussion Assessment Tool **(SCAT3)**

Methods
Assessment: Balance/Coordination

✤ BioSway

1) Modified Clinical Test of Sensory Interaction on Balance (mCTSIB)

2) Limits of stability (LOS)
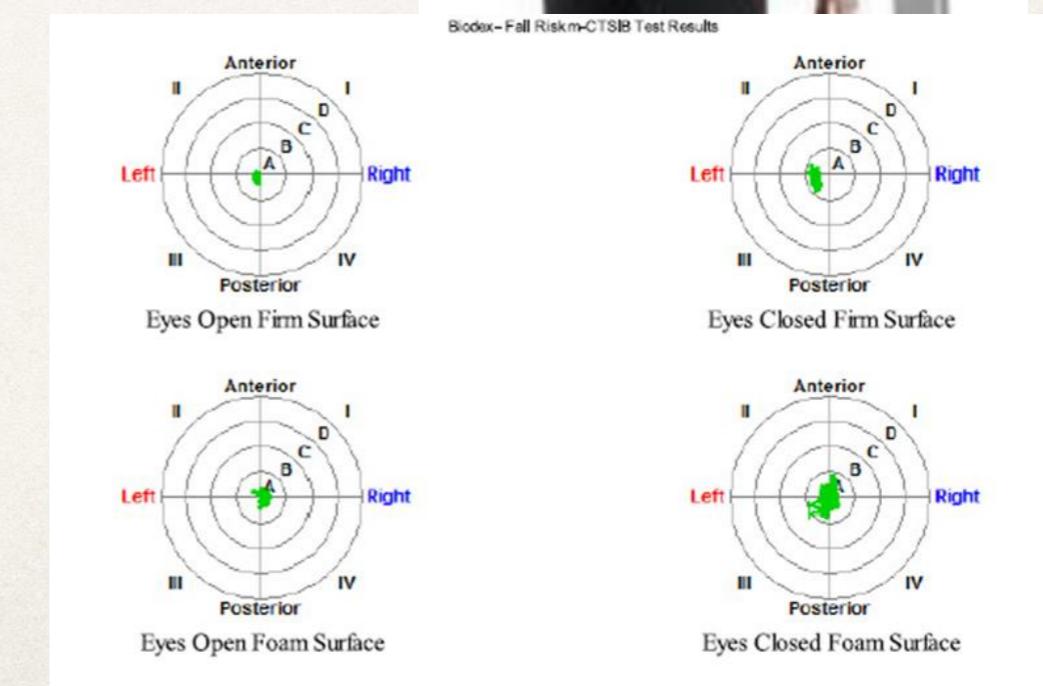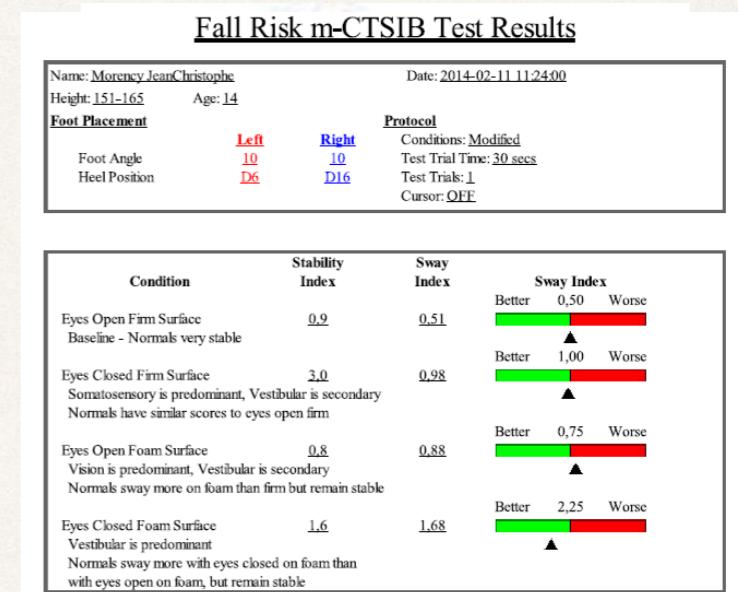
Methods
Assessment: Balance/Coordination

✤ Bruininks-Oseretsky Test of Motor Proficiency **(BOT2)**

Subtest 4: Bilaterale coordination

Subtest 5: Balance

Subtest 7: Upper-Limb Coordination

Main results

✣ All participants reported full recovery.

1) Absence of postconcussion symptoms;

	Pre-intervention ± SD	Post-intervention ± SD	p
PCSI score (sum of 20 items)*	36.85 ± 23.21	4.31 ±5.04	0.001
Self-reported abnormality score*	2.00 ± 3.33	0.17 ± 0.39	0.004

2) Cognitive function corresponding to standards when assessed by a neuropsychologist; and,

3) Absence of deficits in coordination and balance.

Main results

	Pre-Intervention ± SD	Post-Intervention ± SD	P
SCAT3			
BESS Double leg stance	0.07 ± 0.26	0.00 ± 0.00	0.317
BESS One leg stance*	5.20 ± 2.96	1.73 ± 2.63	0.002
BESS Tandem stance*	2.80 ± 2.48	1.20 ± 2.01	0.032
Tandem gait*	17.93 ± 7.89	13.21 ± 4.08	0.001
Finger-to-nose*	3.54 ± 0.55	3.00 ± 0.48	0.001
Biosway			
mCTSIB Eyes opened Firm surface*	0.53 ± 0.27	0.39 ± 0.17	0.027
mCTSIB Eyes closed Firm surface	1.12 ± 0.88	0.69 ± 0.21	0.061
mCTSIB Eyes opened Foam surface*	0.78 ± 0.21	0.67 ± 0.19	0.021
mCTSIB Eyes closed Foam surface*	2.27 ± 0.60	1.87 ± 0.46	0.050
LOS*	56.6 ± 13.14	70.8 ± 9.92	0.002
BOT2			
Bilateral coordination*	12.33 ± 4.69	16.07 ± 4.03	0.008
Balance	12.07 ± 4.82	13.27 ± 4.43	0.400
Upper-limb coordination*	13.73 ± 4.08	18.33 ± 4.03	0.002

Main results

✤ Duration of the intervention (44 ± 16.5 days) was correlated to self-reported adherence to the active rehabilitation intervention program.
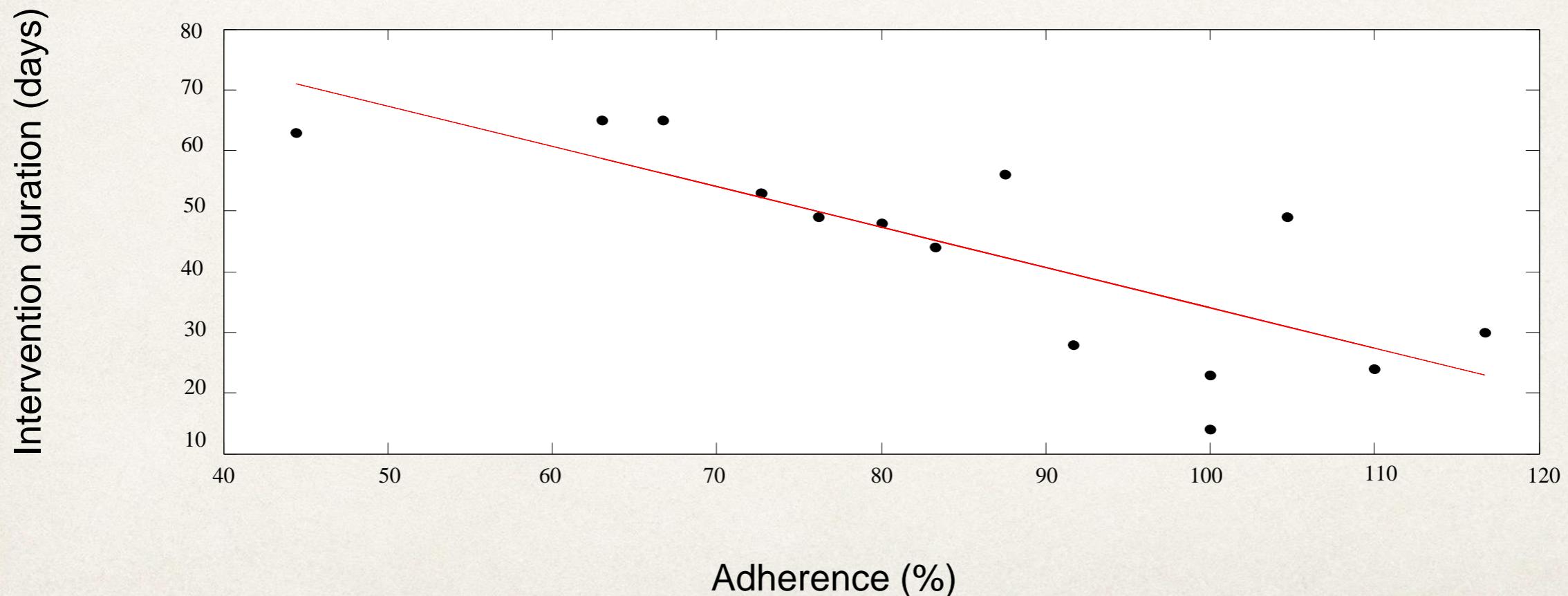
Conclusion

✤ A progressive sub-maximal active rehabilitation intervention may be beneficial when recovering from mTBI in youths.

✤ The majority of motor-cognitive assessment tests presented a significant improvement following the active rehabilitation intervention.

✤ Future studies are needed to validate this promising new approach.

Thank you!

Affiliations

Funding