DYNAMIC BALANCE RETRAINING USING GAIT PERTURBATIONS IN INDIVIDUALS WITH MODERATE-TO-SEVERE TRAUMATIC BRAIN INJURY

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Abstract

- Individuals with traumatic brain injury (TBI) often present with balance problems associated with a decrease in their social participation.
- An innovative approach consists in using perturbations on a split-belt treadmill to improve dynamic balance.
- The aim of this study was to quantify the effects of a training program including perturbations on a split-belt treadmill on dynamic balance, walking speed, balance confidence and social participation in individuals with TBI at the social integration rehabilitation phase or at a chronic stage.

Methods

- 8 individuals were recruited between March, 2017 and March, 2018.
- Inclusion criterias were: diagnosis of moderate or severe TBI in social integration rehabilitation phase or chronic stage, subjective and/or objective balance trouble, be able to walk on a treadmill with no technical aid.
- Intervention: 6 training sessions on a 3-week period on a split-belt treadmill with:
  - self-perturbations (head movements, 360° turns, dual cognitive task (Stroop))
  - unexpected perturbations (stop-and-go, predictable and unpredictable slips and trips by increasing or decreasing the speed of one treadmill belt for one step at a time).
- Outcome measures: Mini-BESTest, Community Balance & Mobility Scale (CB&M), comfortable and fast walking speed, Reintregration to Normal Living Index and Activity-Specific Balance Confidence Scale; measured twice before and twice after.

Results

•Results indicated a statistically significant improvement of 2.1(1.5)/28 at the Mini-BESTest and 7.0 (6.9)/96 at the Community Balance and Mobility Scale (CB&M).
•No significant change in speed, balance confidence and social participation were observed despite some variations for in some individuals.
•A learning effect was observed between the two pre-intervention assessments.

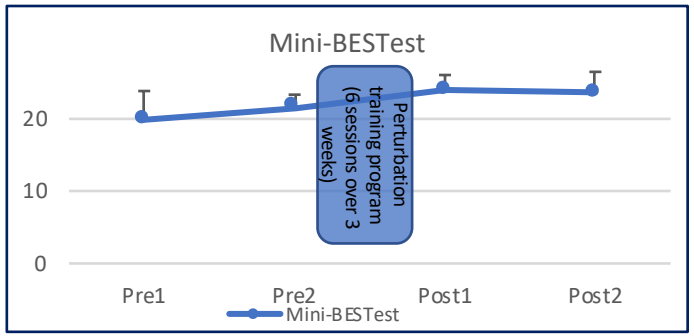

Figure 1: Group score for Mini-BESTest (max /28) for the two evaluations before (Pre1 and Pre2) and after (Post1 and Post2) training.

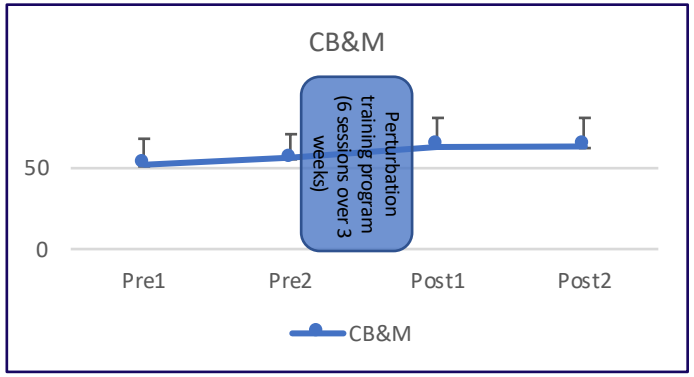

Figure 2: Group score for CB&M (max /96) for the two evaluations before (Pre1 and Pre2) and after (Post1 and Post2) training

Participants	Gender (F/M)	DOB	Age at time of TBI	Time since TBI	Type of TBI (M/S)	GCS at admission (/15)	Change in Mini-BESTest	Change in CB&M	Change in comfortable speed	Change in fast speed	Change in ABC	Change in RNLI
1	M	1987-10-02	28	8m	S	10	**4**	**14**	0.23	0.1	-8	-18
2	M	1960-11-16	52	4y 9m	S	6	2	7	-0.14	-0.13	10	2.7
3	M	1977-11-26	29	10y 4m	S	5	2	6	0.06	-0.02	2	**13.7**
4	M	1941-08-05	75	10m	S	12	1	**15**	0.03	-0.06	-7	-4.54
5	F	1989-10-02	19	8y 10m	S	4	0	7	-0.04	-0.27	1	2.7
6	M	1956-01-21	60	1y 5m	M	9	**4**	-6	-0.02	1.12	10	**19.5**
7	M	1946-10-16	69	1y 7m	M	ND	2	7	0.01	-0.26	5	**13.6**
8	M	1974-01-06	43	8m	M	14	**5**	5	-0.2	0.01	-2	-6.4

F: Female, M: Male, DOB: Date of Birth, TBI: Traumatic Brain Injury, M: Moderate, S: Severe, GCS: Glasgow Coma Scale, CB&M: Community Balance and Mobility Scale, ABC: Activity-specific Balance Confidence scale, RNLI: Reintegration to Normal Living Index. **Change above MCID** in bold and underlined.

Conclusions

- We saw variable effects depending on individuals.
- Minimally clinical important differences (MCID) for the Mini-BESTest (4/28) and for RNLI (7%) as well as minimal detectable change (MDC) for the CB&M (8/96) were reached by 3, 3 and 2 individuals, respectively. The training program thus had an important effect in 6 out of 8 participants.
- Cognitive impairments may have affected results for the two questionnaires (eg: two individuals with clinically important difference in balance and lower scores at the questionnaires).
- Training parameters may be questioned: number of sessions and timeframe of the study and applicability of the protocol in a social integration rehabilitation phase or at a chronic stage. (eg: 20 minutes every week or second week over a 8-12 week-period).
- The project was presented to the physiotherapist team of the Constance-Lethbridge Rehabilitation Center in September 2018. The possibility of a pragmatic study on the use of the modality was proposed for 2019.

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