Reducing Disability in Patients with Traumatic Brain Injuries via a Transdisciplinary Biopsychosocial Therapeutic Community Model Occupational Medicine Program

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Institutes of Health Multi-Specialty Clinics

Background & Objectives

Background

- Patients with traumatic brain injuries (TBI) frequently experience chronic pain. [1, 2]
- Chronic pain may cause disability, as it can impede patients' abilities to perform activities of daily living. [3]
- As both psychosocial and physical factors may hamper TBI recovery, a transdisciplinary occupational medicine program helps patients with deficits due to TBI reduce their degree of disability using a biopsychosocial therapeutic community approach. This approach may improve patients' health along multiple dimensions concurrently, addressing issues such as disability, anxiety, depression, and pain catastrophizing.

Objectives

- To assess whether increased program participation was associated with reduced disability at program completion in a population of patients being treated for TBIs and experiencing severe pain-related disabilities at program initiation.
- To assess whether increased program participation by this population reduced anxiety, depression, and pain catastrophizing.

Materials & Methods

Sample

Data Source: Occupational medicine clinic data.

Inclusion Criteria: Patient initiated care with a transdisciplinary biopsychosocial therapeutic community model program between January 1, 2021, and December 31, 2024.

Exclusion Criteria: Patient lacked a severe disability due to pain (Oswestry Disability Questionnaire [ODQ]>40) at program initiation.

Variables

Outcome Variables

- Change in Oswestry Disability Questionnaire (ODQ) score (lower is better)
- Change in Activities of Daily Living (ADL) composite measure (higher is better)
- Change in Beck Anxiety Inventory (BAI) score (lower is better)
- Change in Beck Depression Inventory (BDI) score (lower is better)
- Change in Pain Catastrophizing Scale (PCS) score (lower is better)

Independent Variable: Hours of program participation (logged, base 2)

Control Variables: Age, gender, treatment location (San Diego vs. Riverside vs. other), first responder status, scores on measures at the start of treatment (ODQ, ADL, BAI, BDI, PCS)

Analyses

Descriptive Statistics: t-tests to assess significance of pre/post changes

Changes in Outcomes: Multiple linear regression analyses were used to assess the associations between outcomes and program participation, considering the control variables

Results

- A total of 187 patients were included in the sample after exclusion criteria were applied
- Patients participated for between 60.0 and 450.0 hours, with a median of 180.0 hours (IQR: 143.5-258.0; mean: 199.0; s.d.: 77.1)
- Patients had a mean ODQ of 54.8 (s.d.: 10.6) at initiation and 42.7 (s.d.: 17.5) at completion, a significant change (p<0.01)
- Multivariable linear regression models found that doubling hours of program participation was significantly associated with improvements on the ODQ (-4.05; p=0.03), ADL (2.07; p<0.01), and BDI (-3.04; p=0.01) scales
- While there was not a significant association with improvements on the BAI (-2.46; p=0.07) and PCS (-1.93; p=0.25) scales, the associations were directionally suggestive of a potential relationship between participation and improved health

Conclusion

In a population of patients with brain injuries and severe pain-related disabilities at program initiation, increased program participation was associated with significantly decreased disability, significantly enhanced ability to perform activities of daily living, and significantly reduced depression.

References:

[1] Nampiaparampil DE. Prevalence of chronic pain after traumatic brain injury: a systematic review. Jama. 2008 Aug 13;300(6):711-9.

[2] Irvine KA, Clark JD. Chronic pain after traumatic brain injury: pathophysiology and pain mechanisms. Pain medicine. 2018 Jul 1;19(7):1315-33.

[3] Blyth FM, Van Der Windt DA, Croft PR. Chronic disabling pain: a significant public health problem. American journal of preventive medicine. 2015 Jul 1;49(1):98-101.

Increased program participation was associated with significantly:

- Decreased disability
- Enhanced ability to perform activities of daily living
- Reduced depression

(p<0.01)

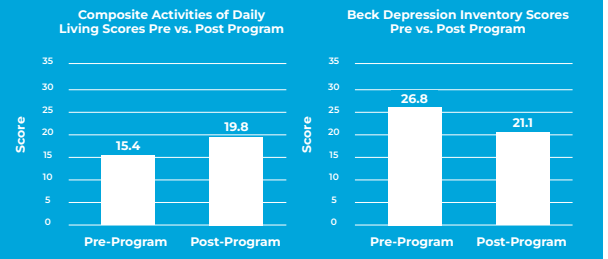

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Table 1: Descriptive Statistics (N=187)

	Initiation / All	Completion	p-value of Change
Participation hours, mean ± SD	199.0±77.1	-	-
Male patient, n (%)	115 (61.5)	-	-
Patient age, mean ± SD	52.9±11.5	-	-
Treatment in San Diego, n (%)	100 (53.5)	-	-
Treatment in Riverside, n (%)	72 (38.5)	-	-
Treatment elsewhere, n (%)	15 (8.0)	-	-
Patient is a first responder, n (%)	17 (9.1)	-	-
ODQ, mean ± SD	54.8±10.6	42.7±17.5	<0.01
ADL, mean ± SD	15.4±6.0	19.8±7.0	<0.01
BAI, mean ± SD	29.6±13.3	22.1±13.2	<0.01
BDI, mean ± SD	26.8±11.6	21.1±11.9	<0.01
PCS, mean ± SD	34.5±13.7	25.0±15.1	<0.01

As shown in Table 1, the study sample contained 187 patients. The majority (61.5%) of patients were male. The patients had a mean age of 52.9 years (s.d.: 11.5). A subset (9.1%) of patients were first responders. On all outcome measures, performance was significantly improved (p<0.01) after program participation.

Table 2: Adjusted Linear Models Examining the Association between Participation Hours and Change in Scale Scores

	Δ Oswestry Disability Questionnaire (ODQ)	Δ Activities of Daily Living (ADL)	Δ Beck Anxiety Inventory (BAI)	Δ Beck Depression Inventory (BDI)	Δ Pain Catastrophizing Scale (PCS)
Intercept	33.94 (18.31).	11.15 (7.09)	12.69 (13.43)	12.11 (12.09)	6.74 (16.54)
Participation hours (logged, base 2)	-4.05 (1.86)*	2.07 (0.72)**	-2.46 (1.36).	-3.04 (1.23)*	-1.93 (1.68)
Male patient	0.74 (2.32)	0.15 (0.90)	-0.84 (1.70)	-0.97 (1.53)	3.19 (2.10)
Patient age	0.27 (0.10)**	-0.06 (0.04)	0.04 (0.07)	-0.02 (0.06)	0.00 (0.09)
Treatment in San Diego	0.27 (4.23)	-0.40 (1.64)	9.90 (3.10)**	7.69 (2.79)**	1.49 (3.82)
Treatment in Riverside	-2.32 (4.31)	-0.59 (1.67)	8.44 (3.16)**	7.01 (2.84)*	5.27 (3.89)
Patient is first responder	3.34 (3.94)	-0.46 (1.53)	-1.85 (2.89)	0.02 (2.60)	-0.08 (3.56)
Initial ODQ	-0.51 (0.12)***	-0.14 (0.05)**	0.12 (0.09)	0.23 (0.08)**	0.26 (0.11)*
Initial ADL	-0.55 (0.23)*	-0.60 (0.09)***	-0.18 (0.17)	0.02 (0.15)	-0.01 (0.20)
Initial BAI	0.21 (0.12).	-0.12 (0.04)**	-0.53 (0.08)***	0.15 (0.08).	0.31 (0.10)**
Initial BDI	0.12 (0.13)	0.01 (0.05)	0.07 (0.10)	-0.64 (0.09)***	-0.04 (0.12)
Initial PCS	-0.08 (0.10)	0.04 (0.04)	-0.05 (0.07)	-0.01 (0.07)	-0.83 (0.09)***

*Standard errors are reported in parentheses. *** means p<0.001, ** means p<0.01, * means p<0.05, and . means p<0.1*

As shown in Table 2, multiple linear regression analysis found that participation hours were significantly associated with improvements on the Oswestry Disability Questionnaire (p=0.03), the composite measure of performance of Activities of Daily Living (p<0.01), and the Beck Depression Inventory (p=0.01). Although the associations were not significant, patients with increased participation had directionally improved scores on the Beck Anxiety Inventory (p=0.07) and the Pain Catastrophizing Scale (p=0.25).

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