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ORIGINAL RESEARCH

Contextualized Treatment in Traumatic Brain Injury Inpatient Rehabilitation: Effects on Outcomes During the First Year After Discharge

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Abstract

Objective: To evaluate the effect of providing a greater percentage of therapy as contextualized treatment on acute traumatic brain injury (TBI) rehabilitation outcomes.

Design: Propensity score methods are applied to the TBI Practice-Based Evidence (TBI-PBE) database, a database consisting of multi-site, prospective, longitudinal observational data.

Setting: Acute inpatient rehabilitation.

Participants: Patients enrolled in the TBI-PBE study (N=1843), aged 14 years or older, who sustained a severe, moderate, or complicated mild TBI, received their first inpatient rehabilitation facility admission in the US, and consented to follow-up 3 and 9 months post discharge from inpatient rehabilitation.

Interventions: Not applicable.

Main Outcome Measures: Participation Assessment with Recombined Tools-Objective (PART-O)-17, FIM Motor and Cognitive scores, Satisfaction with Life Scale, and Patient Health Questionnaire-9.

Results: Increasing the percentage of contextualized treatment during inpatient TBI rehabilitation leads to better outcomes, specifically in regard to community participation.

Conclusions: Increasing the proportion of treatment provided in the context of real-life activities appears to have a beneficial effect on outcome. Although the effect sizes are small, the results are consistent with other studies supporting functional-based interventions effecting better outcomes. Furthermore, any positive findings, regardless of size or strength, are endorsed as important by consumers (survivors of TBI). While the findings do not imply that decontextualized treatment should *not* be used, when the therapy goal can be addressed with either approach, the findings suggest that better outcomes may result if the contextualized approach is used.

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Traumatic brain injury (TBI) rehabilitation includes a number of interventions that vary in the extent to which they directly address functional or real-life activities or alternatively, target underlying impairments. Contextualized is a term that has been used to describe interventions provided in the context of a real life activity, while decontextualized has been used to designate clinic-based activities targeting a specific cognitive or motor impairment, using treatment tasks that are not normally encountered in everyday life.[1] Contextualized treatment is holistic in that the clinician's goal is to improve a real life functional activity and all of its component skills in their entirety, while decontextualized treatment systematically builds and strengthens a particular motor or cognitive function that is thought to underlie performance of real life activities. Computer-delivered programs to train attention and memory or therapeutic exercises targeting a specific muscle group are examples of decontextualized approaches. An example of a contextualized task is sitting on a stool in a diner and ordering from a menu—a meaningful activity that incorporates multiple functions at once, including attention, visual scanning, decision-making, social pragmatics, postural and upper extremity motor control, sitting balance, and verbal expression.

Decontextualized interventions have received more attention in the rehabilitation literature, in part due to the ease of standardizing the intervention and documenting progress. However, minimal evidence for generalization to real-world function is available.[1] Contextualized treatment has been promoted as a potentially more effective approach because the tasks are more meaningful to the patient. More meaningful tasks can lead to greater patient effort as well as better generalization of treatment effects.[2-5] Research on contextualized treatment is more difficult to conduct because it typically is more individualized, and therefore to date most evidence supporting this approach is based on single-subject or small group designs[4,6,7] and/or focused on persons in the postacute stage of recovery.[8] Some have studied the implications of adding a structured feature to the intervention (eg, Goal Attainment Scaling, prompting) or training activities of daily living during posttraumatic amnesia vs after posttraumatic amnesia cleared.[9,10] One randomized controlled trial (RCT) compared interventions resembling, in some respects, decontextualized and contextualized treatment as defined here.[11] Patients who received decontextualized training showed greater short-term gains, though no significant differences were noted in long-term outcomes. Additionally, the more impaired patients appeared to benefit most from the decontextualized training. Findings from this RCT, as well as ongoing disagreements in the field regarding which approach is more beneficial,[12,13] and for whom, support the need for further study.

List of abbreviations:

ASD	**absolute standardized difference**
CSI	**Comprehensive Severity Index**
CI	**confidence interval**
HTE	**heterogeneity of treatment**
IPW	**inverse probability weighting**
OT	**occupational therapy**
PART-O	**Participation Assessment with Recombined Tools-Objective**
PHQ-9	**Patient Health Questionnaire-9**
POC	**point of care**
PSM	**propensity score methodology**
PT	**physical therapy**
RCT	**randomized controlled trial**
ST	**speech therapy**
TBI	**traumatic brain injury**
TBI-PBE	**Traumatic Brain Injury Practice-Based Evidence**

The purpose of the current study was to evaluate the hypothesis that inpatient rehabilitation outcomes are improved when a greater percentage of the therapy time is devoted to contextualized treatment (ContextTx). The primary outcome, chosen a priori, was community participation at 9 months. We also explored whether persons with dissimilar levels of disability at admission to inpatient rehabilitation experienced different effects from ContextTx.

Methods

Propensity score methods applied to data from the TBI Practice-Based Evidence (TBI-PBE) observational dataset were used to draw causal inferences regarding the most effective rehabilitation approach. The TBI-PBE dataset was built from 2008-11 using data gathered from medical records and point of care (POC) documentation of inpatient rehabilitation treatment received by 2130 patients with TBI.[14] Outcomes were measured at inpatient rehabilitation discharge, and at 3 months and 9 months after discharge. A relatively unique aspect of this research was the use of input from stakeholders (persons with TBI, family members, clinicians) to guide the study from the formation of the research question through interpretation of the findings and dissemination. They were integral to the treatment classification process. The data collection for this study was approved through each site's institutional review board.

Participants

Consenting patients age 14 or older were included in the TBI-PBE study if they had recently experienced a TBI (severe, moderate, or complicated mild) for which they were receiving their first admission for inpatient rehabilitation. Additional criteria for inclusion in the current analysis required that participants (1) be enrolled at one of the 9 US sites; (2) consented to follow-up; (3) had treatment data. The final sample for analysis included 1843 participants (fig 1). For the evaluation of heterogeneity of treatment (HTE) effects, the sample was divided into 2 groups: Severe group (at admission, FIM Motor <28.75 and FIM Cognitive score ≤ 15, $n=820$) and Less Severe group (remainder of sample, $n=1023$).

Intervention

Treatment was considered to be ContextTx if it involved a real-life activity that an individual would likely perform at home or in the community. Treatment was designated as DeContextTx if it was a clinic-based activity that was not directly associated with a real life activity. (Some treatment provided by speech therapy (ST) was determined to be quasi-contextualized, the effects of which are being evaluated separately because it was not multidisciplinary.) When the TBI-PBE database was being compiled, data on rehabilitation treatment were collected by means of POC forms completed by occupational, physical, and speech therapists (OT, PT, ST) after each rehabilitation session. (See supplemental fig S1, available online only at http://www.archives-pmr.org/, for an example of a POC form; more details about the original data collection can be found in Horn et al.[14]) For the purposes of the current analysis of this database, research team members

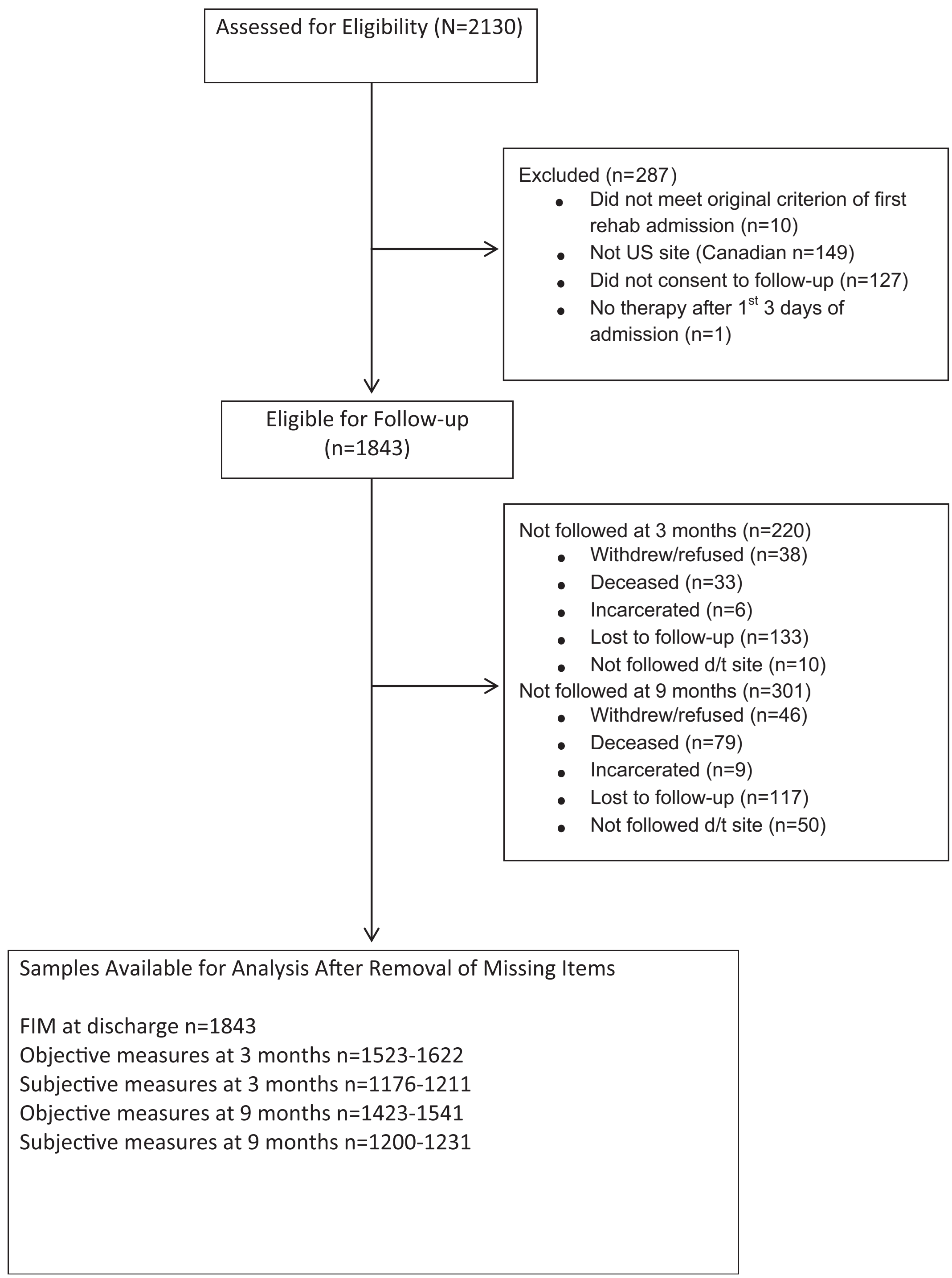

Fig 1 Participant flow diagram.

representing the different rehabilitation disciplines reviewed the spreadsheets showing the different therapy combinations, and classified the therapeutic activities conducted during the treatment sessions according to whether they met the definitions for ContextTx or DeContextTx, or did not meet the criteria for either (see supplemental fig S2 and S3, available online only at http://www.archives-pmr.org/, for graphical examples). In a few instances, where the interpretation of the POC syllabus text with respect to this dichotomy was unclear, therapists outside of the research team were contacted to answer questions as to how they would classify the activity or intervention. Persons with TBI and family members also assisted by providing their perspective on the extent to which an activity reflected real life. The POC's minutes of time information was used to calculate the percent of ContextTx minutes provided in OT, PT, and ST relative to the total number of minutes of ContextTx and DeContextTx that they provided (quasi-contextualized minutes and time in non-treatment activities, eg, assessment, were not included in the calculation).

Outcomes

The primary outcome measure was community participation, as measured by the Participation Assessment with Recombined Tools-Objective (PART-O)-17 at 9 months postdischarge, with participation at 3 months being a secondary outcome. The PART-O-17 measures participation in the community with 17 items in 3 domains: Productivity, Being Out and About, and Social Relations.[15,16] A PART-O Total score represents the average of the 3 domain scores, and ranges from 0 to 5. An alternative scoring method developed through Rasch analysis provided an overall participation score that is unidimensional and more suitable for advanced statistical analyses (PART-O Total [Rasch]).[17] The range for the PART-O Total (Rasch) score is 0-100.

Secondary outcomes included functional independence as measured by Rasch adjusted FIM[18-20] Cognitive and Motor scores at discharge, 3 and 9 months postdischarge; life satisfaction and depression at 3 and 9 months postdischarge as measured by the Satisfaction with Life Scale[21] and the Patient Health Questionnaire-9[22] (PHQ-9), respectively. The PHQ-9 was analyzed as a dichotomous variable: probable major depression vs no major depression.[23] The Satisfaction with Life Scale and PHQ-9 were not administered when the subject with TBI was not able to complete the follow-up interview; outcomes for FIM and PART-O were based on a proxy report in these cases.

Potential confounders

Data on premorbid medical and psychosocial history, injury characteristics, and functioning at admission to rehabilitation were abstracted from medical records. In order to ensure that the characteristics considered as potential confounders (of the contextualization-outcomes relationships) were not affected by the rehabilitation treatment, only those that could be measured at rehabilitation admission (first 3d) or earlier were included. The Comprehensive Severity Index (CSI)[24,25] was included in the severity adjustment measures. CSI defines severity as the physiologic and psychosocial complexity present due to the extent and interactions of a patient's disease(s). CSI Brain Injury captured severity of brain-related conditions while CSI Non-Brain Injury includes severity of all other medical conditions.[14]

Analytic methods

Data were analyzed using SAS version 9.3[a] and Stata version 14.0.[b] Inverse probability weighting (IPW) using a generalized propensity score (GPS) was used to control confounding and to balance participant characteristics across the range of ContextTx. A quantile binning approach was used to estimate the GPS and subsequently to construct the IPW for adjustment. Continuous exposure of the proportion of ContextTx was divided into 10 quantile bins.[26] A cumulative logistic model estimated the predicted probability of being in each bin, and inverse probability weights were constructed.[26] Balance of measured patient characteristics across the 10 quantile bins was assessed using the absolute standardized difference (ASD) between all possible pairs of groups, prior to and after weighting by the stabilized IPW. If, after IPW, the ASD for a potential confounder exceeded a conservative criterion of 0.10, the potential confounder was included in the outcome analysis model.[27]

The hypothesis that increasing the proportion of ContextTx results in better outcomes was evaluated through marginal regression models with robust sandwich standard error estimates, weighted by the stabilized IPW. To assess effect of attrition, multiple imputation was used to determine if findings were substantially different in the full sample. HTE effects in Severe and Less Severe subgroups was evaluated by conducting propensity score and outcome analyses separately for these groups and comparing effect estimates and their confidence intervals (CIs). Throughout, statistical significance was defined as $P<.05$. Additional details regarding statistical methods are provided in supplemental appendix S1 (available online only at http://www.archives-pmr.org/).

Results

Full cohort

Demographic and injury characteristics are summarized in table 1. The full list of confounders included in the propensity score model is in supplemental table S1 (available online only at http://www.archives-pmr.org/). For the full sample, prior to weighting, there was substantial inbalance of the covariates: the ASD between each of the quantile pairs ranged from 0.06 to 0.35, with an average ASD 0.14 and 63% (47/75) of covariates having a ASD that exceeded the criterion of 0.10. After IPW, the standardized differences (ASD) for the full sample ranged from 0.02 to 0.20, averaging 0.08, indicating excellent balance that represents much improvement over the unweighted sample. The mean ASD was >0.10 for 14 covariates (or their levels); these covariates were included in the outcome analysis.

Similar findings were obtained when regresssion models were tested with and without adjustment for those covariates not balanced by the IPW. Table 2 summarizes the adjusted models for the full cohort (see supplemental table S2, available online only at http://www.archives-pmr.org/, for unadjusted models). As shown for the full cohort, increasing the proportion of ContextTx resulted in small positive improvements on PART-O Total scores at 3 months and PART-O Total (Rasch) scores at 3 and 9 months. For example, when the percentage of ContextTx increased by 1 percentage point, the PART-O Total (Rasch) score at 9 months increased by .057 (adjusted but not imputed model). Table 2 also shows the effects on the secondary outcomes. The findings did not change substantially following multiple imputation for missing outcome data; however, FIM Motor at 3 months was no longer significant.

Stratification by severity of initial disability

Since stratification resulted in smaller groups, GPS models for severity subgrops were modeled with 5 quantile bins, instead of 10 to avoid sparse groups in these smaller subsets. For the Severe subgroup, prior to weighting, the ASD between each of the quantile pairs ranged from 0.02 to 0.44, with an average ASD of 0.15 and 72%>.10 (46/64), indicating very poor balance. ASD after weighting ranged from 0.02 to 0.29, averaging 0.09, indicating substantially improved balance. The 17 covariates with average ASD>0.10 were included in the outcome models. Increasing the percentage of ContextTx resulted in higher PART-O Total (Rasch) scores at 3 and 9 months, higher PART-O Total scores at 3 months, higher PART-O Productivity at 3 months, higher FIM Cognitive scores at discharge, and higher FIM Motor scores at discharge and 3 months postdischarge.

Table 1 Demographic and injury characteristics, minimum and maximum across quantiles, ASD before and after weighting

Covariates	Minimum Before IPW	Maximum Before IPW	ASD Before IPW	ASD After IPW
Demographics				
Age at admission (y), mean ± SD	38.73±19.5	48.86±21.8	0.21	0.11
Sex: male (%)	67	78	0.09	0.09
Race/ethnicity (%)				
White	72	80	0.09	0.05
White Hispanic	3	10	0.10	0.06
Black	11	22	0.10	0.05
Asian, other, or unknown	1	5	0.08	0.02
High school or greater education (%)	67	76	0.06	0.07
Insurance providers (%)				
Private insurance, MCO, HMO	33	57	0.21	0.09
Medicare	15	31	0.15	0.08
Medicaid	7	25	0.18	0.08
Self, other, none	16	25	0.08	0.07
Premorbid comorbidities				
Preinjury alcohol misuse (%)	27	46	0.16	0.05
Preinjury other drug use (%)	17	28	0.10	0.06
Injury and status at admission to rehabilitation				
Cause of Injury (%)				
Fall	21	42	0.17	0.11
Sports and other causes	3	9	0.09	0.05
Moving vehicle collision	41	69	0.21	0.07
Violence	4	10	0.09	0.09
Shorter session site (%)	53	82	0.30	0.09
Days to rehabilitation admission, mean ± SD	22.36±24.35	33.38±39.2	0.15	0.12
FIM (Rasch) Motor: admission, mean ± SD	25.62±17.96	34.96±18.11	0.23	0.09
FIM (Rasch) Cognitive: admission, mean ± SD	33.1±16.73	40.09±15.36	0.15	0.06
CSI Brain Injury Factors, mean ± SD	41.32±21.69	52.09±20.89	0.18	0.10
CSI Non-Brain Injury Factors, mean ± SD	12.45±11.38	21.86±15.79	0.29	0.09
PTA cleared before admission (%)	25	43	0.12	0.05
Glasgow Coma Scale (%)				
Intubated/missing	29	55	0.17	0.05
Mild (13-15)	7	18	0.11	0.08
Moderate-severe (3-12)	28	54	0.21	0.08

Abbreviations: HMO, health maintenance organization; MCO, managed care organization; PTA, post-traumatic amnesia.

Prior to weighting, the Less Severe group showed ASD ranging from 0.02 to 0.32, averaging 0.13, with 62% (40/64)>.10. After weighting, ASD for the Less Severe group ranged from <0.01 to 0.16, averaging ASD 0.06, indicating very good balance. The 7 covariates with d>0.10 were included in the outcome models. Higher scores were obtained on the PART-O Total score at 3 and 9 months, the PART-O Total (Rasch) score at 9 months, PART-O Out and About at 9 months, PART-O Productivity at 9 months, and PART-O Social at 3 months.

The degree of overlap in the CIs of the average differences in the outcomes was examined to evaluate HTE effects. Given a lack of overlap on the CIs for FIM Motor at discharge, we can conclude that the effect of increasing the proportion of ContextTx was stronger for the Severe subset of participants relative to the Less Severe subset. The CIs overlapped for the other outcomes, and general directionality of effects were consistent.

Discussion

The results support the hypothesis that increasing the percentage of ContextTx during inpatient TBI rehabilitation leads to better outcomes, specifically in regard to community participation. While positive effects were observed for participation in general, being out and about in the community was the domain of participation most affected. Increased ContextTx time benefited persons admitted with both severe and less severe disability; however, those with more severe disability experienced greater positive effects on self-care and mobility (FIM Motor).

Estimated effect sizes were small. The average differences represent the estimated change in an outcome measure score expected for each percentage point increase in ContextTx. For example, increasing ContextTx from 1% to 2% of therapy time would increase the PART-O Total (Rasch) score at 3 months by .08, which is too small to be meaningful. However, if the percentage of ContextTx were increased by 25%, there would be a 2-point increase (25×.08) in the PART-O Total (Rasch) score. While still small, a 2-point increase could involve substantive changes in community activities (eg, greater number of hours spent working or homemaking, more days out of the house, and/or more time socializing with friends). When considering the PART-O Out and About score alone, increasing ContextTx by 25% increases the frequency of 1 recreational activity. Anecdotally,

Table 2 Adjusted estimates of average differences in outcomes for increasing the proportion of ContextTx, full cohort, and Severe and Less Severe subgroups

	Full Cohort				Severe Subgroup				Less Severe Subgroup			
Outcome	n	Difference	Lower 95% CI	Upper 95% CI	n	Difference	Lower 95% CI	Upper 95% CI	n	Difference	Lower 95% CI	Upper 95% CI
PART-O Total (Rasch) 3 mo	1443	0.079*	0.026	0.132	665	0.106*	0.032	0.179	781	0.042	-0.005	0.09
PART-O Total (Rasch) 9 mo	1389	0.057*	0.016	0.099	641	0.107*	0.038	0.176	747	0.046†	0.003	0.089
PART-O Total 3 mo	1605	0.003*	0.001	0.006	739	0.005†	0.001	0.008	868	0.004†	0	0.007
PART-O Total 9 mo	1525	0.002	-0.001	0.005	702	0.002	-0.002	0.007	823	0.005†	0.001	0.008
PART-O Out/About 3 mo	1607	0.005*	0.002	0.009	739	0.006	0	0.011	870	0.003	-0.002	0.007
PART-O Out/About 9 mo	1529	0.005*	0.001	0.009	704	0.005	0	0.011	825	0.005†	0.001	0.009
PART-O Productivity 3 mo	1612	0.002	-0.001	0.006	740	0.005†	0.001	0.009	874	0.004	-0.001	0.008
PART-O Productivity 9 mo	1532	-0.001	-0.004	0.003	706	0	-0.006	0.007	826	0.006†	0	0.011
PART-O Social 3 mo	1608	0.003	-0.001	0.006	740	0.003	-0.003	0.008	870	0.005†	0.001	0.01
PART-O Social 9 mo	1526	0.002	-0.002	0.006	703	0.001	-0.005	0.006	823	0.004	-0.001	0.008
FIM Cog (Rasch) DC	1831	0.027	-0.039	0.093	819	0.100†	0.007	0.193	1014	0.032	-0.039	0.104
FIM Cog (Rasch) 3 mo	1529	0.024	-0.059	0.107	695	0.004	-0.124	0.132	835	0.055	-0.034	0.144
FIM Cog (Rasch) 9 mo	1433	-0.026	-0.112	0.06	657	-0.051	-0.169	0.067	776	0.032	-0.063	0.128
FIM Motor (Rasch) DC	1831	0.015	-0.051	0.081	819	0.130†	0.025	0.236	1014	-0.03	-0.085	0.025
FIM Motor (Rasch) 3 mo	1515	0.097†	0.006	0.189	687	0.168†	0.01	0.327	829	0.052	-0.03	0.134
FIM Motor (Rasch) 9 mo	1414	0.022	-0.062	0.105	649	0.113	-0.057	0.284	765	0.028	-0.058	0.114
SWLS 3 mo	1203	0.009	-0.031	0.05	474	-0.007	-0.088	0.073	730	-0.011	-0.058	0.035
SWLS 9 mo	1204	1.009	0.969	1.05	505	0.055	-0.029	0.14	731	0.989	0.942	1.035
PHQ-9 3 mo‡	949	1.009	0.996	1.023	366	0.995	0.97	1.02	585	1.011	0.997	1.025
PHQ-9 9 mo‡	1218	1.005	0.992	1.019	502	1.007	0.979	1.036	716	1.002	0.988	1.016

NOTE. Adjusted for the following covariates. Full cohort: covariates include previous number of brain injuries, employment category, brain injury category (closed contusion hemorrhage, closed no contusion hemorrhage, open contusion hemorrhage), injury cause category, comorbid pain condition, lived with category, age at admission, CSI Brain Injury, agitation first 3 days, days from injury to rehabilitation admission; Severe subgroup: age at admission, CSI Brain Injury, high school education or greater, lived with category, posttraumatic amnesia cleared prior to admission, injury cause (excluded from PHQ-9 analysis), brain injury category (closed contusion hemorrhage, closed no contusion hemorrhage, open contusion hemorrhage) (excluded from PHQ-9 analysis), epidural hemorrhage (excluded from PHQ-9 analysis), intraventricular hemorrhage, premorbid impaired activities of daily living (excluded from PHQ-9 analysis), midline shift category, (excluded from PHQ-9 analysis), previous residence; Less Severe subgroup: previous brain injury, lived with category, brain injury category (closed contusion hemorrhage, closed no contusion hemorrhage, open contusion hemorrhage), acute scraniectomy, premorbid impaired activities of daily living.

Abbreviation: SWLS, Satisfaction with Life Scale.

* $P<.01$.

† $P<.05$.

‡ Odds ratios.

when consumers participating on the research team were provided with this anchor to help visualize the effect, they indicated that any improvement, no matter how small, would be meaningful.

The results are consistent with a previous multicenter observational study that used similar data collection and classification methods, applied to the treatment of persons receiving inpatient rehabilitation for stroke.[28] Increased intensity of function-based therapy (similar to ContextTx) was associated with greater gains in mobility and self-care, while the intensity of impairment-based therapy was not associated with these outcomes. However, findings from the current study are substantially different from the one previous RCT that compared rehabilitation approaches that resemble the contextualized and decontextualized treatment used in the current study. Vanderploeg et al[11] compared a cognitive-didactic treatment (similar to decontextualized treatment) to functional-experiential treatment (similar to ContextTx), and did not find an effect on the primary outcomes of return to work and ability to live independently at 1 year posttreatment. However, cognitive-didactic treatment resulted in higher FIM Cognitive scores at the conclusion of treatment. The discrepant findings between the current study and Vanderploeg's may be at least partially due to differences in study design as well as participants (the Vanderploeg study had a smaller sample and much stricter inclusion criteria than the current research; they included exclusively service members who were further postinjury——an average of 50d compared to 27). Differences in the treatments were also notable; both groups in the Vanderploeg study had ongoing standard OT and PT that could have included decontextualized and contextualized activities, as well as the additional intervention (cognitive-didactic vs functional-experiential treatment) to which they were assigned.

Study limitations

The current study used propensity score methodolgy (PSM) to support causal inference in lieu of a RCT. The use of PSM can only mimic randomization; it is always possible that an important confounder was not identified, measured, and controlled. Supporting our conclusions, using PSM we were able to successfully achieve excellent balance on measured confounders with a very conservative criterion (ASD<.10) on most of the potential confounders; in addition, variables requiring additional control were included in the outcome analysis. Finally, while attrition from the usable cohort can affect generalizability, the rate of attrition in the current study was minimal and no substantial differences were observed between analyses using imputations vs complete data, indicating that attrition had minimal effect.

An additional limitation surrounds the slightly different results obtained for the PART-O Total score depending on whether the Rasch scoring or original scoring algorithms was used. When the original scoring algorithm was used with the full cohort, findings were only significant at 3 months postdischarge whereas the Rasch version yielded significant findings at both 3 and 9 months. While findings were directionally consistent between the measures, the scoring method thought to be more appropriate for parametric analyses (Rasch) yielded findings that more consistently supported the hypothesis.

It should be noted that the effects of increased contextualization of therapy as reported here likely are underestimated. The POC form was not designed by the TBI-PBE clinicians with ContextTx in mind; instead they attempted to create a practical tool for routine use that allowed them to record all their important therapeutic activities. Retroactively sorting of TBI-PBE POC activities into contextualized and decontextualized groups is a poor method of operationalizing contextualization of therapy, but the only one available with secondary analysis of existing data. It also should be noted that contextuality is not one-size-fits all. Activities that can be considered contextualized may differ from 1 patient to the next. Some patients may routinely complete puzzles at home, while other patients would never do so outside of the hospital. For the former, puzzle completion would be contextualized, while it would be decontextualized for the latter. In the current study, it was not possible to identify patient-level variation in determining contextualized activities. If we were to design a prospective study, contextualization would be defined, and the therapists completing POC forms would make a designation for each activity in the treatment session specific to the patient treated. Presumably, better measurement of our independent variable would result in greater effect sizes, suggesting more strongly the benefits of delivering as much treatment as possible in a contextualized format.

Clinical implications

Increasing the proportion of treatment devoted to contextualized activities appears to have a beneficial effect on outcome. When more rehabilitation time is devoted to contextualized treatment, patients are able to achieve greater community participation during the year following discharge. The findings do not imply that decontextualized treatment should *not* be used; however, when therapeutic goals can be addressed with either approach, the current findings suggest that better outcomes may result if the contextualized approach is used.

Increasing the amount of contextualized treatment provided could be impeded by higher administrative demands relative to decontextualized treatment. Decontextualized treatment is easier to administer and monitor for efficacy than contextualized treatment. Pre-established computer programs and workbooks minimize the need for treatment preparation, and efficacy can often be documented in a single summary number. However, the higher administrative demands of contextualized treatment can be reduced with some modifications to the current rehabilitation environment. For example, smart phrases built into electronic medical record templates could be used to summarize contextualized activities and progress on goals in order to minimize documentation time. Time spent in treatment planning can be reduced by assembling kits of materials that can be used across patients for similar real-life activities. Family members can help therapists identify activities done in the home and bring in materials that would actually be used in the home to perform the activity.

Conclusions

Inpatient rehabilitation facilities are under increasing pressure to demonstrate the achievement of functional goals to warrant the cost of care. It is therefore critical to identify which therapy approaches can contribute to better outcomes. This study supports selecting rehabilitation treatments that have a meaningful context, including using these treatments with patients with more severe levels of disability. Implementing treatment plans with contextualized therapies is challenging. Incorporating more of such activities in the inpatient treatment day will require collaboration between deliverers of care and operators of rehabilitation facilities for optimal outcome.

Suppliers

a. SAS, version 9.3; SAS Institute.
b. Stata, version 14.0; StataCorp.

Keywords

Brain injuries, traumatic; Healthcare; Occupational therapy; Physical therapy specialty; Propensity score; Recreation therapy; Rehabilitation; Speech therapy

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