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To cite this article: Abhishek Jaywant , Chelsea Steinberg , Alyson Lee & Joan Toglia (2020): Feasibility and acceptability of the multicontext approach for individuals with acquired brain injury in acute inpatient rehabilitation: A single case series, Neuropsychological Rehabilitation, DOI: [10.1080/09602011.2020.1810710](https://doi.org/10.1080/09602011.2020.1810710)

To link to this article: <https://doi.org/10.1080/09602011.2020.1810710>



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Published online: 02 Sep 2020.



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Feasibility and acceptability of the multicontext approach for individuals with acquired brain injury in acute inpatient rehabilitation: A single case series*

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ABSTRACT

The Multicontext (MC) approach, a metacognitive intervention designed to improve awareness, strategy use, and executive functioning, may be beneficial for individuals with acquired brain injury (ABI) undergoing acute inpatient rehabilitation. The goal of this study was to provide evidence of feasibility and acceptability of the MC approach and to explore clinical outcomes. A case series of eight individuals with acquired brain injury and at least mild executive functioning impairment were recruited from an acute inpatient rehabilitation unit. The MC approach – involving guided questioning and patient self-generation of strategies practiced across everyday functional cognitive tasks – was implemented within routine occupational therapy. Occupational therapists implemented the MC approach with high adherence to the treatment protocol. Therapists' perceived challenges were the time constraints of inpatient rehabilitation as well as client factors. Participants rated the MC approach as highly satisfying and engaging. They described subjective improvements in their ability to use executive functioning strategies. The MC approach was associated with improvement in awareness, strategy use, and executive functioning at the conclusion of treatment. The MC approach may be a beneficial intervention for individuals with acquired brain injury and executive dysfunction undergoing acute inpatient rehabilitation. Further evaluation with larger samples in controlled trials is warranted.

Trial registration: [ClinicalTrials.gov identifier: NCT04363645..](https://clinicaltrials.gov/ct2/show/study/NCT04363645)

ARTICLE HISTORY

Received 21 January 2020
Accepted 12 August 2020

KEYWORDS

Neurologic rehabilitation;
Stroke; Brain tumour;
Traumatic brain injury;
Cognitive rehabilitation

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Introduction

Executive functions – including the ability to organize information, maintain it in working memory, inhibit distractions, and shift to relevant aspects of the task – are important cognitive skills for the efficient performance of adaptive, goal-directed everyday activities (Cahn-Weiner et al., 2002; Insel et al., 2006). Following acquired brain injury (ABI) – such as stroke, traumatic brain injury, and brain tumour – executive functioning skills are frequently compromised (Correa, 2010; Stuss, 2011; Zinn et al., 2007). Compounding these impairments, persons with ABI frequently experience poor awareness of their cognitive deficits (Spikman & van der Naalt, 2010; Vossel et al., 2013) and lack insight into the importance of using cognitive strategies to facilitate their performance in everyday activities.

Metacognitive strategy training is a cognitive rehabilitation technique that helps improve awareness, self-monitoring, and ability to initiate and implement effective cognitive strategies to facilitate goal-directed behaviour after ABI (Dawson et al., 2009; Kersey et al., 2019; Tornås et al., 2016). The Cognitive Rehabilitation Task Force (CRTF) of the American Congress of Rehabilitation Medicine recently published its updated guidelines on cognitive rehabilitation for ABI. It recommended metacognitive strategy training as a practice standard for the post-acute phase following ABI, specifically for improving attention and mild-to-moderate executive dysfunction (Cicerone et al., 2019). However, the CRTF guidelines also noted that cognitive rehabilitation interventions have varying evidence for their ability to generalize learned skills to everyday activities (Couillet et al., 2010; Fong & Howie, 2009).

Acute inpatient rehabilitation is a critical phase of recovery. Cognitive treatments delivered at this phase of recovery can capitalize on a critical period of brain plasticity (Murphy & Corbett, 2009). Unfortunately, there is relatively limited evidence supporting the use of cognitive rehabilitation techniques such as metacognitive strategy training during this phase of rehabilitation. Further, usual care in rehabilitation tends to be focused on physical impairments and recovery and thus persons with ABI may not have the opportunity to recognize difficulties in higher-level cognitively-based instrumental activities of daily living. This may result in persistent cognitive impairment (Turunen et al., 2018) and negatively impact return to work and other occupations. Conversely, intervening during the acute rehabilitation period can increase the potential of individuals with ABI to return to their everyday activities sooner and at a greater independence level after discharge from the hospital. In small studies of acute inpatients with stroke, strategy training outside of routine care has demonstrated preliminary evidence for feasibility (Skidmore et al., 2014), improved awareness and strategy use (Kersey et al., 2019), and improved cognitive flexibility and inhibition on neuropsychological assessment (Skidmore et al., 2015a). Metacognitive training has also demonstrated feasibility in inpatient psychiatric care (Tsapekos et al., 2019).

The Multicontext (MC) approach is one form of metacognitive strategy training that may be well-suited to the acute inpatient rehabilitation setting. The MC approach (Steinberg & Zlotnik, 2019; Toglia, 2018; Toglia et al., 2020) was developed to help persons with ABI increase their awareness of cognitive performance and ability to effectively apply executive functioning strategies across a range of functional tasks and everyday activities. This is important because many individuals with ABI have difficulty connecting similarities across activity experiences, including failing to recognize that similar cognitive symptoms are hindering performance across situations. The MC approach structures treatment activities in a “horizontal” manner by presenting a series of activities that gradually differ in surface features or physical characteristics, while requiring similar cognitive demands. For example, a patient may be presented with tasks that require maintaining three items in working memory, which is practiced across activities such as placing appointments in a daily schedule, organizing a pillbox, and searching for items on a menu. A therapist guides the patient to become aware of performance errors and self-generate cognitive strategies.

The MC approach has previously demonstrated feasibility and efficacy in outpatient treatment in individuals with traumatic brain injury (Toglia et al., 2010), Parkinson’s disease (Foster et al., 2018), and multiple sclerosis (Shevil & Finlayson, 2009). To date, however, it is unknown whether the MC approach can be integrated within routine clinical care in the acute inpatient rehabilitation setting for individuals with ABI. The goals of inpatient rehabilitation are to return patients as close as possible to their prior level of independence in everyday activities. The MC approach may be a form of metacognitive treatment that is especially well-suited to this setting and goal. The MC approach focuses on cognitive performance in functional activities such as medication management, scheduling appointments, bill paying, and cooking that patients may otherwise not have the opportunity to practice in a therapeutic setting in the acute post-injury phase.

The goal of this study was to provide evidence of feasibility and acceptability of the MC approach, and to explore clinical outcomes, in a series of eight cases with ABI and executive dysfunction within the acute inpatient rehabilitation setting. Patient acceptability and satisfaction, the latter of which is often considered a component of acceptability (Bowen et al., 2009), are important metrics in developing and refining interventions because of their importance for patient motivation and engagement (Rose et al., 2008). We hypothesized that the MC approach could be integrated within routine rehabilitation care and that patients who complete the MC approach would find the treatment to be engaging, beneficial, and perceived as helpful in improving their functional cognitive skills. A second, exploratory goal was to provide data on improvements in awareness, strategy use, and executive functioning at the conclusion of treatment.

Materials and methods

Design. Open-label, non-blinded, single case series of patients with ABI.

Participants and setting. Participants were individuals with ABI recruited from an acute inpatient rehabilitation unit (IRU) at a large, urban academic medical centre. It is a 22-bed general rehabilitation unit accredited by the Commission on Accreditation of Rehabilitation Facilities with specialty certification for stroke rehabilitation. Stroke and brain tumour tend to be the predominant forms of neurologic injury seen on the unit. Lengths of stay typically range from one to two weeks. Patients receive a minimum of three hours daily of occupational therapy, physical therapy, and speech therapy. Standard cognitive rehabilitation occurs within occupational therapy and/or speech therapy sessions and involves direct cueing and direction to use specific strategies without the metacognitive foundation of the MC approach.

All procedures were ethically approved by the medical centre's Institutional Review Board. Inclusion criteria included: age between 18 and 80 years; English-speaking; confirmed diagnosis of ABI based on radiological assessment; able to comprehend multistep directions and participate in conversation as assessed by the Functional Independence Measure (FIM; required score of 4 or above on Comprehension and Expression items); impaired performance (<2 SD below demographically-corrected normative data) on at least one screening measure of executive functioning (listed below); able to attend to a cognitive task for at least 10 min; cognitively independent in basic self-care activities; able to read standard size newsprint; and the ability to demonstrate functional use of at least one hand. Patients who were admitted to the IRU and who met inclusion/exclusion criteria were identified by the occupational therapy supervisor on admission, who described the project and obtained written consent.

Screening assessments. The Montreal Cognitive Assessment (MoCA) (Nasreddine et al., 2005) is a 30-point performance-based cognitive screening instrument that is a standard of care measure on our IRU. It assesses the domains of visuospatial/executive function, attention, language, abstraction, memory, and orientation. A higher score indicates better cognitive performance. The standard cutoff for cognitive impairment is a score less than 26/30. The Trail Making Test (TMT) and Symbol-Digit Modalities Test (SDMT) were used to screen for executive dysfunction. The TMT is a neuropsychological measure of visual attention and processing speed (TMT-A) as well as rapid attentional shifting and cognitive flexibility (TMT-B). The SDMT (Smith, 1991) is a timed assessment of divided attention, working memory, incidental learning, and psychomotor speed. As depicted in Table 1, all participants demonstrated impaired performance on at least one of the TMT-A, TMT-B, and SDMT.

Outcome assessments

Patient satisfaction questionnaire. At the conclusion of treatment, participants were given a questionnaire that was developed for this study by the authors

Table 1. Demographic and clinical information for each participant.

	Age Range	Gender	Pre-Injury Functioning	Diagnosis	Time Since Onset	Number of Treatment Sessions
P1	70–79	F	Retired, independent	Bifrontal Brain Tumour	4 weeks	9
P2	40–49	F	Working, independent	TBI and subarachnoid haemorrhage	10 days	8
P3	60–69	F	Retired, independent	Left frontoparietal Stroke	7 days	8
P4	30–39	F	Working, independent	Cancer with multiple haemorrhagic lesions	6 days	6
P5	60–69	F	Working, independent	L hemisphere Stroke	8 days	7
P6	60–69	F	Retired, independent	L hemisphere Stroke	4 days	6
P7	20–29	F	Working, independent	Left frontal Brain Tumour	5 days	6
P8	70–79	M	Working, independent	Right hemisphere Stroke	12 days	7

Note: We provide age ranges and only general details regarding pre-injury occupational functioning to protect participant confidentiality.

(see Table 3 for questions and participant responses). Participants were asked open-ended questions of what they liked most and least about the programme, what they would have changed about the programme, and any additional suggestions or recommendations. This questionnaire also included Likert-type ratings of their satisfaction, enjoyment, perceived benefit from the intervention, and perceived likelihood of continuing to use the strategies learned in treatment.

Treatment fidelity checklist. For each of the 8 participants, three treatment sessions were reviewed by JT for adherence to intervention procedures. The fidelity checklist rates seven components for each treatment session and is an early version of a subsequently validated fidelity checklist (Toglia et al., 2020).

Self-regulation skills interview (srsi). The SRSI (Ownsworth et al., 2000) is a clinician-administered semi-structured interview that assesses an individual's metacognitive skills and ability to use cognitive strategies. It comprises six questions and each question is scored on a 10-point Likert-type scale with lower scores indicating greater metacognitive skills (i.e., lower scores are desirable). It has demonstrated strong interrater reliability and test-retest reliability in individuals with ABI (Ownsworth et al., 2000). It consists of a total score and three factors, Awareness, Readiness to Change, and Strategy Behaviour. We administered the SRSI prior to and after the MC intervention and were particularly interested in the Total Score (0–60) as well as the Awareness (0–20) and Strategy Behaviour (0–30) subscores, as these have previously been shown to be diminished in individuals with ABI (Ownsworth et al., 2000). Examples of interview questions include “Can you tell me how you know that you experience [cognitive difficulty]; that is, what do you notice about yourself?” (Awareness subscale) and “What strategies are you currently using to cope with your [cognitive difficulty]?” (Strategy Behaviour subscale).

Weekly calendar planning activity (WCPA). The WCPA (Toglia, 2015; Toglia et al., 2017) is a standardized, performance-based, ecologically-valid measure of executive functioning in which the participant has to organize a list of appointments into a weekly schedule. Effective performance requires the individual to plan an effective approach, maintain in mind multiple task rules, problem-solve, avoid conflicts, and inhibit distracting information. The outcome variable was the percentage of appointments entered correctly relative to the total number of appointments entered.

Functional independence measure (FIM). The FIM (Keith, 1987) is a standard-of-care measure of disability that assesses the level of assistance required for an individual to perform activities of daily living. The FIM is comprised of 18 items that assess bathing, grooming, eating, upper/lower body dressing, toileting, bowel/bladder management, transfers, locomotion, stair mobility, comprehension, expression, social interaction, problem-solving, and memory. Each item is rated on a 1–7 scale, with higher scores indicating greater functional independence. The FIM Total was used in this study, with scores ranging from 18 to 126. While the FIM was primarily used as an outcome measure, we also used the Comprehension and Expression items to screen for language functioning sufficient to participate in the treatment.

Intervention: the multicontext (MC) approach

The MC approach used in this study involved 30–45 min sessions conducted within occupational therapy, five out of seven days weekly. The MC approach has been described in detail previously (see [Sheline et al., 2010; Steinberg & Zlotnik, 2019; Toglia, 2018; Toglia et al., 2010; Toglia & Foster, *in press*] for a full description). The initial focus of MC treatment is on helping the individual to self-discover cognitive error patterns and learn to anticipate cognitive performance challenges through repeated structured experiences across functionally relevant activities. Thus, generalization across activities is emphasized from the outset. Activities can address the person's motor goals while simultaneously requiring targeted cognitive performance skills. A metacognitive framework of guided questions is used throughout treatment to facilitate error detection and monitoring, self-assessment of performance, and patient self-generation of strategies.

A minimum of six structured or pre-assembled activities across a minimum of three sessions were used. These activities were selected from activity kits by therapists based on the client's cognitive profile and performance errors. Pre-made activity kits included directions and everyday materials such as menus, schedules, business cards, or food circulars were available, along with guidelines for using and positioning the materials. The activities are designed to place similar demands on specific cognitive abilities (e.g., working memory, inhibition) to build self-awareness and observe strategy transfer. An example includes

keeping track of 3–4 items from a list and determining if any of the items are in a kitchen cabinet. Six structured activities were completed by the majority of clients by the fourth session. The first session typically took longer and included one activity, whereas sessions two and three typically included two activities to provide the opportunity to immediately observe learning and carryover.

Following completion of six structured activities, therapists provided clients with the choice of continuing with structured activities or choosing other activities related to their interests or goals. Examples of self-chosen activities included investigating a yoga class online, cooking activities, or online shopping. The therapist presented these activities in a way that kept cognitive demands similar. For example, if the structured activities required adhering to criteria or rules while ignoring distractions (inhibition) or keeping track of information while searching (working memory), the therapist integrated these same activity demands into the chosen activities. These activities required more time, so that in these later sessions only one activity was completed within a session.

Guided learning methods are similar to use of Socratic questioning as described by others (see for example [Braun et al., 2015] for use in cognitive therapy for depression). Prior to the task, the therapist asked questions to help participants anticipate challenges and to self-generate executive functioning strategies (Toglia, 2018; Toglia et al., 2020). Therapists would ask, for example, “What kind of challenges do you anticipate having during this task?” and “What special strategies or methods could you use to complete everything you have to do?” The participant would then attempt the task while the therapist observed participant performance. If necessary, the therapist would mediate in the middle of the task to probe the participant’s self-assessment of success or challenge. After the task was complete, the therapist used guided questioning to ask participants what errors they made, what strategies they used, what strategy modifications or alternatives could be used in the future (“What could you do differently next time?”), and what other activities this same strategy would apply to including activities that had been completed in-session previously (“What other activities would using a checklist be helpful for?”). The latter question was used to facilitate transfer across practiced and non-practiced activities. Therapists also utilized praise and encouragement to reinforce participant success (Toglia et al., 2020).

Self-check lists are incorporated across treatment activities so that the person can self-evaluate their own work and self-discover performance errors themselves, with guided questions as necessary. The focus is not on awareness of deficits per se but on awareness of performance. Awareness of “performance” includes appraisal of task difficulty, recognition of performance challenges, identification of task methods that contributed to success (versus those that did not) and accurate evaluation of performance outcomes (Toglia & Maier, 2018b).

Procedure

One of two occupational therapists, who was the participant's treating clinician, implemented the MC approach. They were trained and supervised by the senior author. This included attendance at inservices, readings, review of case videos, and weekly meetings to review cases. One of two occupational therapists, who was the participant's treating clinician, implemented the MC approach. They were trained and supervised by the senior author. This included attendance at inservices, readings, review of case videos, and weekly meetings to review cases. The treating occupational therapist was not blind to these assessments because they required this assessment data to tailor the MC intervention to the specific participant. Post-treatment follow-up SRSI, WCPA, and satisfaction questionnaire were completed by a separate therapist who was blind to the participant's initial assessment scores and their progress in treatment.

Data analysis

We used both descriptive and qualitative approaches to analyse outcomes. To determine feasibility, we evaluated the number of patients who enrolled and completed the treatment, therapist adherence to intervention procedures using a fidelity checklist, and therapist-perceived barriers to implementation. To evaluate acceptability, we qualitatively describe the responses to the post-treatment patient satisfaction questionnaire. We provide two narratives from participants P5 and P7 to qualitatively illustrate the MC approach and describe within-session observations. These narratives were extracted by a neuropsychologist (AJ) who reviewed session videotapes and who was not involved in the assessment or treatment of individual participants. To explore clinical outcome, graphical analysis was conducted for each participant to evaluate the magnitude of change on each of the pre/post assessment measures.

Results

Demographic characteristics of sample

Demographics characteristics and medical information for the $N=8$ who completed the full protocol is provided in [Table 1](#). Four patients had stroke, two had primary brain tumours, one had metastatic cancer, and one had a traumatic brain injury. All were functionally independent prior to onset of illness and several were working. Participants' median age was 64.5 years (IQR = 36–71.5 years). Our sample was well-educated: one individual had a high school education, two had college degrees, and five had graduate degrees. The median time since onset of brain injury was 7.5 days (IQR = 5.25–11.5 days). Median length of treatment including the occupational therapy initial evaluation and discharge evaluation was 8 days (IQR = 6.25, 8.0). As depicted in [Table 2](#), median score on the

Table 2. Clinical screening results for each participant.

	MoCA Total Score (/30)	TMT-A age-corrected z-score	TMT-B age-corrected z-score	SDMT age-corrected z-score
P1	18	–	–	–
P2	24	–6.85	–4.21	–2.36
P3	15	–3.29	–5.68 (2 errors)	–2.09
P4	25	–3.35	–3.16 (1 error)	–3.00
P5	21	–9.09	–5.68 (4 errors)	–3.92
P6	23	–6.45	–5.68 (2 errors)	–0.20
P7	25	+0.49	–10.14 (5 errors)	–2.09
P8	28	–1.11	–0.01 (1 error)	–2.10

Notes: MoCA: Montreal Cognitive Assessment; SDMT: Symbol Digit Modalities Test; TBI: traumatic brain injury; TMT: Trail Making Test. Participant 1 was not administered the TMT or SDMT at admission to the rehabilitation unit.

MoCA was 23.5, below clinical cutoff for impairment (IQR = 18.75–25). Participants demonstrated significant impairment in baseline screening measures of executive functioning including the TMT-A, TMT-B, and SDMT.

Feasibility

Participant recruitment. Eighteen individuals admitted to the IRU were approached to participate in the study. Fifteen individuals signed consent to participate. Of those 15, $N = 8$ completed the protocol. Two patients experienced an interruption in their rehabilitation due to emergent medical issues and were transferred back to the acute medicine service. One patient was highly defensive regarding her areas of weakness and tended to attribute cognitive errors to external factors, and was subsequently withdrawn from the protocol because she was unable to engage in the treatment. Four patients could not complete the full protocol and/or the end of treatment outcome measures due to time constraints because their discharge dates were moved up.

Therapist fidelity. We sampled 42% of administered sessions (3 videotaped session each for 8 patients) and found 91% adherence to intervention procedures.

Therapist-identified challenges to clinical implementation. The main challenge was the time constraints of the inpatient setting, which made it difficult to fit in all of the treatment activities and goals, particularly in conjunction with the other occupational therapy goals of the acute rehabilitation setting. Therapists at times had to manage interruptions from the medical team as well as client factors (e.g., medical complications, fluctuating energy levels, lack of insight into deficits). An overarching challenge was training therapists on a novel treatment technique and shifting their clinical approach from a task/outcome-oriented approach to a Socratic, strategy generation, process-oriented approach.

Acceptability

Client satisfaction. On the client satisfaction questionnaire (Table 3), all but one participant reported that their strategy use improved “very much” or “extremely.”

Table 3. Patient Satisfaction Questionnaire with patient data and responses

Question	Response Type	Patient Responses
The things I liked most about the programme are:	Open-ended	"The challenge"; "Helped me formulate a construct on how to think"; "The simplicity of the strategies"; "Fun"; "Therapy tailored to specific needs of patient"; "Real life activities that apply directly to me"
The things I liked least about the programme are:	Open-ended	"Getting frustrated"; "Difficulty at the beginning"; "the work"
The things I would like to have changed about the programme are:	Open-ended	"Development of more/different tasks"
My suggestions/recommendations to improve the programme includes:	Open-ended	"More variety in activities"; "Activities outside of therapy"; "Longer if possible"; "Nothing"
How likely are you to use the strategies taught in this programme in your everyday life?	1–5 Likert-type scale (1=Extremely to 5=Not at All)	$N = 5$ patients answered "Extremely" (1); $N = 2$ patients answered "Very Much" (2); $N = 1$ patient did not answer and said "unsure"
How satisfied have you been with the programme overall?	1–5 Likert-type scale (1=Extremely to 5=Not at All)	$N = 3$ patients answered "Extremely" (1); $N = 5$ patients answered "Very Much" (2)
Rate the extent to which you felt you benefitted from the programme:	1–4 Likert-type scale (1=Not at All to 4=A Lot)	$N = 8$ patients answered "A Lot" (4)
Rate the extent to which you enjoyed participating in the programme:	1–4 Likert-type scale (1=Not at All to 4=A Lot)	$N = 6$ patients answered "A Lot" (4); $N = 2$ patients answered "Some" (3)

All participants described finding the MC intervention "very much" or "extremely" satisfying, and the majority of participants endorsed "a lot" of enjoyment. Participants stated that the aspects that they liked least were the time commitment and additional work required, emotions elicited (i.e., frustration), and challenges at the outset of the treatment. Despite these challenges, all participants derived subjective benefit from the programme, noting increased awareness ("helped me think"), practicality of the strategies learned ("simplicity of strategies"), and benefit from working on everyday activities that were relevant to their lives and goals ("Real life activities, not abstract tasks"; "Things were practical, gave me a sense of where I was at."). No participant experienced adverse events.

Patient narratives of treatment. In general, we observed increased specificity of responses, increased self-checking behaviours, more spontaneous strategy use as treatment progressed. We describe narratives and ratings from two participants of different ages and etiologies. P5 was a stroke survivor in her 60s. Her initial treatment goals were to return to work and driving, and to improve her word-finding. During an initial MC treatment session in which she had to schedule appointments into a calendar, she described minimal pre-task challenges of having "limited time," and articulated in a very limited sense one possible strategy she could use of "classifying by category." After the task, she again had difficulty articulating use of a strategy as she stated, "I probably was using strategies, but I don't remember them." She described the task as only "slightly" challenging. On a subsequent task that required her to create a schedule of

leisure activities, she again identified the task as only minimally challenging, though she did more clearly articulate a strategy prior to the task (“breaking the task down”). Post-task, she noted that it was also important for her to check her work for errors. During a later task requiring her to organize items in a mock kitchen, the participant clearly articulated two strategies to assist her in working memory and short-term maintenance of information (“categorizing” and “repeating things [to myself], especially things that are unusual because they may be harder to remember”). She successfully executed this strategy by grouping together items that belonged within a certain category (e.g., spices). She was also much more aware of her errors, describing the task as challenging and acknowledging that she “missed some items.”

P7 was in her 20s and had been diagnosed with a brain tumour. Her treatment goals were to return to work and get better physically in terms of her balance and fine motor skills. Her first activity was to find exercise classes at certain times that would fit a mock schedule. She did not acknowledge any potential challenges or the need to use any strategies. She began the task quickly. Some awareness emerged at the end of the task, as she allowed that she was “a little slow” and (with prompting from the therapist) stated that she “could have taken notes.” On a subsequent task in which she had to organize the schedule for a film festival, she demonstrated increasing awareness of the need to use strategies prior to the task. However, her description of the strategy was vague. After attempting the task, with prompting from the therapist, the participant was able to see that she had been using strategies to facilitate her performance – these included starring certain films and crossing off others. To facilitate transfer, the therapist helped the participant see that her approach could be useful in managing different kinds of schedules as well as webinars. At the end of treatment, P7 completed an online shopping task. She clearly articulated strategies pre-task, including “taking notes” and “marking it up ... highlighting things I need to remember.” She completed the task without errors and while doing so, generated an additional strategy that could be helpful in the future “breaking up the task.” P7 became increasingly adept at combining multiple strategies to facilitate her performance.

Exploratory analysis of clinical outcome

As shown in [Figures 1](#) and [2](#), all participants demonstrated an improvement on the SRSI Total Score (median = 11 points, range = 8–17), Awareness subscale (median = 4.5 points, range = 2–8), Strategy Use subscale (median = 7.5 points, range = 3–12), WCPA (median = 15.5 percent accuracy, range = 8–17), and Total FIM (median = 19 points, range = 2–30) from pre-treatment to post-treatment. [Table 4](#) provides participants’ goals, treatment activities used, and narrative responses to the SRSI at discharge. All participants were able to articulate cognitive strategies, many of which entailed strategies to better plan/organize, keep track of information, and self-check work for errors.

Discussion

Our principal finding was that participants rated the MC approach as acceptable and engaging and described subjective improvements in their awareness of and ability to use executive functioning strategies. All participants reported that they found the MC treatment to be “extremely” or “very much” satisfying. All rated their enjoyment and the extent of their benefit as “a lot” (the highest on the scale). Qualitatively, we observed that as participants experienced challenges in structured activities, they began to identify additional cognitively-based IADL activities that they wanted to try and were able to articulate new, cognitively-based goals. As demonstrated in [Table 4](#), at discharge all participants articulated clear and well-defined challenges and barriers to their cognitive performance as well as strategies that could help them manage the cognitive demands of everyday tasks. These strategies comprised rehearsal, categorization, writing information down, annotating stimuli to keep track of key details, and self-checking work for errors. The majority of participants reported that they were “extremely” or “very much” likely to use the strategies they had learned in treatment, though one participant said they were “unsure.” Participants additionally noted that while they enjoyed the “real life” and personalized activities, they desired more and a greater variety of tasks, which can inform further adaptation of the intervention.

We also evaluated the feasibility of integrating the MC approach within routine care in acute inpatient rehabilitation. For patients who completed the full treatment, occupational therapists delivered the intervention with high fidelity and adherence (91%) to the protocol. Therapists found it challenging to fit in all MC treatment activities in combination with additional occupational therapy goals, particularly if they were interrupted by emergent medical issues and medical staff members. Consistent with this report, some participants who were enrolled in the study were unable to finish the protocol and outcome measures because they were acutely transferred off the unit or their discharge date was moved up. Client factors such as fluctuating energy levels and medical complications also posed challenges. While the MC approach is designed to use guided questioning to facilitate self-monitoring and emergent awareness of cognitive performance, one patient was highly defensive regarding cognitive errors, and the therapist had difficulty following the treatment protocol. This may have been related to therapist training as it was an initial patient in the study or a different approach may be necessary in such cases. As described in detail elsewhere (Toglia, 2018), training therapists in a new treatment approach that emphasizes guided questioning and treatment process (as opposed to direct cueing and treatment outcome) requires a flexible shift to novel paradigm. Our findings suggest that in the future, feasibility can be increased by allocating additional time to therapist training and careful screening of patients for potential medical comorbidities.

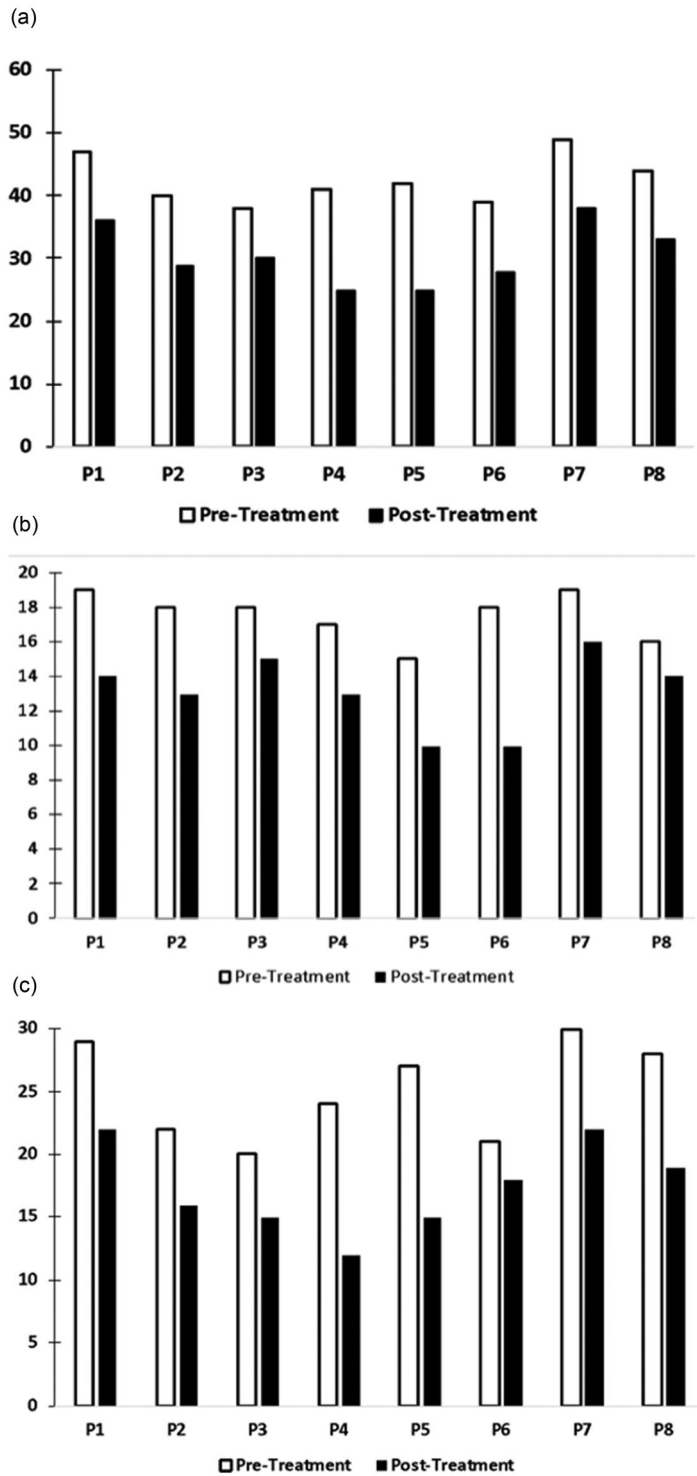


Figure 1. Pre-treatment to post-treatment change on the Self-Regulation Skills Interview (SRSI) (a) Total Score, (b) Awareness subscale, and (c) Strategy Use subscale. Lower scores on the SRSI denote better awareness, strategy use, and self-regulation.

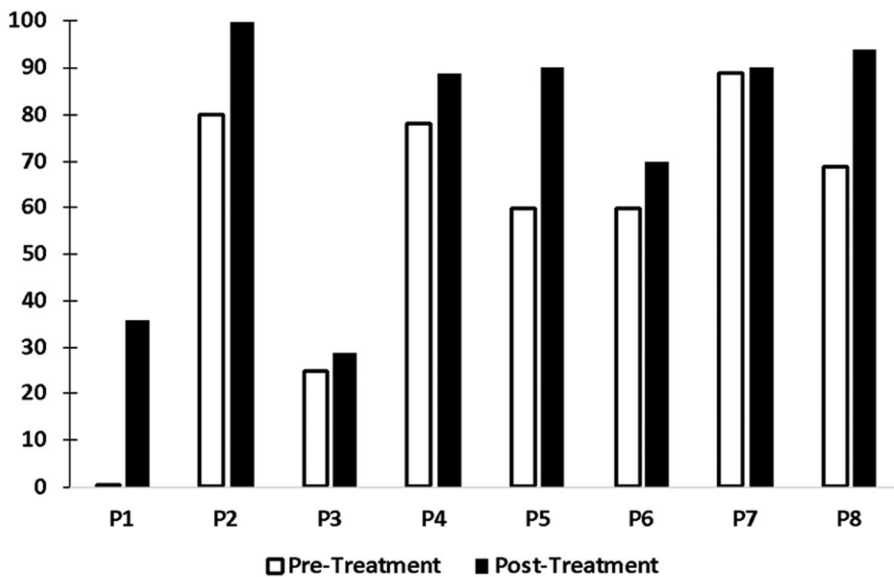


Figure 2. Pre-treatment to post-treatment change on the Weekly Calendar Planning Activity (WCPA). The outcome measure is the percentage of accurate appointments entered into the calendar, calculated by dividing the number of appointments accurately entered by the total number of appointments entered. A higher percentage correct indicates better performance.

The eight individuals with ABI treated with the MC approach demonstrated improvements in awareness, strategy use, and executive functioning. This was apparent despite the fact that qualitatively, our sample all initially identified fully or in-part only physically-based goals. This may have been enhanced by the integration of cognitive and motor activities during the early part of treatment. Functional cognitive activities were presented in a manner that simultaneously addressed the person's physical goals, such as standing balance, walking or reaching, particularly during initial sessions.

As described in our patient narratives and as measured by the SRSI, patients' awareness of their errors and of the importance of strategy use emerged during treatment. Through task practice and therapists' guided questioning, participants generated strategies to facilitate working memory, planning, and organization and attempted to use them in personally relevant, simulated tasks. From pre-treatment to post-treatment, participants' organization and planning improved on an objective, standardized measure of working memory and executive functioning (WCPA). Our results add to a large body of research that has demonstrated positive effects of experiential practice, guided questioning, and metacognitive strategy training for brain injury in the post-acute phase of recovery (Cicerone et al., 2019; Engel et al., 2019). Importantly, we extend this work to the acute inpatient rehabilitation setting, and complement recent studies demonstrating positive effect in acute settings (Skidmore et al., 2011, 2015b; Tsapekos et al., 2019). Existing metacognitive interventions often focus on

Table 4. Patient initial goals, structured activities, and strategies.

	Initial Treatment Goals	Example Multicontext Treatment Activities	Strategies Emphasized	Awareness of Performance and/or Strategy Use at Discharge
P1	"To be able to drive a car, go back to living in [state], and participate in social activities."	Keeping track of items on a list and shifting attention, using schedules, composing an email, ordering food online, reading and summarizing an article, looking at grocery coupons	Creating a plan prior to a task, self-checking during and after a task.	Acknowledges some cognitive difficulties, though others are minimized. "I am hesitant to drive." "My son will have to help me with walking the dog."
P2	Return home and live independently Return to work	Searching for, organizing, and selecting information in a shopping catalog, airline ticket, online drugstore, Excel spreadsheet, and menu	Planning ahead, breaking tasks down, Underlining/markings relevant information	"I am slower in paper tasks and things requiring more organization." "Use of colors helps me sort and organize. Repeating is helpful [for memory]."
P3	"I just want to be the way I used to be."	Shifting between 2–3 stimuli and following written directions. Motor activity (clothespins), laundry, card games, menus, medication pillbox	Use finger to block out distractions, verbal rehearsal, breaking down and chunking information, double checking work	"I have difficulty with memory when there is a lot of information at once." Identifies using her finger and breaking items down to one component at a time and states "they work very well."
P4	"I want to go back to work. I want to go back to cooking and doing things at home without needing assistance."	Searching and keeping track of information in pictures of grocery store items, retrieving kitchen ingredients, bills, pillbox organizer, cooking	Verbal rehearsal, writing lists and checking items off, double-checking accuracy	"My mind wanders and I can tell I'm off focus. [I have difficulty with] paying bills, keeping track of medicine, and other activities with several steps." Identifies strategies of rehearsal and writing information down, notes she has to use them more often.
P5	"Return to work and driving."	Searching, locating, and keeping track of information in schedules, on the computer, in the kitchen, and in a card game	Categorizing, chunking, verbal rehearsal, taking pauses	"I need to pay attention. I can't remember certain things like words." "I need extra time to think." Identifies categorizing, chunking, and rehearsal as helpful strategies.
P6	"To walk. To be able to write better."	Searching for and highlighting items on a list and placing them in different locations. Brunch menu, recreation/activity schedules, food pantry, motor activities	Using finger/ card for stimuli reduction (blocking out); verbal rehearsal, breaking down and chunking information, double checking work	"It is still frustrating because it is not easy as it was before but now I take time to think and concentrate. I know I need to repeat things to myself and chunk things together."
P7	"Get better and return to work."	Search and locate using a coupon book, a schedule of films, online shopping, and	Pre-planning, Verbal rehearsal, self-talk	"I am more organized in my approach. I know I have to plan and structure my day"

(Continued)

Table 4. Continued.

	Initial Treatment Goals	Example Multicontext Treatment Activities	Strategies Emphasized	Awareness of Performance and/or Strategy Use at Discharge
P8	Balance, walking, fine motor skills: "To get dressed by myself"	investigating exercise classes online Searching, keeping track of and shifting between stimuli using calendar, brunch menu, news articles online, online shopping	Taking time before jumping into activities and monitoring speed. Circling key details/ words or most important points. Double-checking.	Takes time to review tasks and accurately identifies challenges. Identifies priorities within complex tasks before starting. Able to monitor when he needs to slow down and when he needs to take a break due to mental fatigue. Consistently double checks work. Self-identified the need to schedule activities that require more concentration earlier in the day.

direct instruction of a problem solving strategy for a target activity before attempting to generalize (Skidmore et al., 2015b), while the MC approach attempts to train for early generalization across activities as a foundational component of the treatment. How the MC approach compares to existing metacognitive interventions is yet to be determined. Nonetheless, our results indicate that the MC approach can be integrated within routine therapy – with pre-made activity kits (Toglia, 2017), guidelines for therapist fidelity, and therapist training and feedback – with positive benefits for awareness and strategy use in persons with ABI.

This study had several limitations, including the small sample size and lack of control group. We sought to provide preliminary feasibility and acceptability data to inform future controlled clinical trials with larger sample sizes. The inclusion of a control group is important given that spontaneous neurologic recovery often occurs during the acute period following brain injury and likely impacted our treatment effects. Another limitation is that variability in participant lengths of stay resulted in a different number of sessions for participants. However, this limitation reflects the realities of implementing interventions within acute inpatient medical units. Further, while all participants had a form of brain injury affecting executive functioning, the heterogeneity of diagnoses within the category of acquired brain injury may mask important differences in treatment efficacy and satisfaction for different neurologic conditions. Given the time constraints of the inpatient setting, we administered only two neuropsychological measures of executive functioning. Further study of the MC approach would benefit from a more comprehensive neuropsychological battery to evaluate the effects of the treatment on specific aspects of executive

functions. We also did not have long-term follow-up to examine intervention effects over time, or additional assessments of transfer to everyday activities, which is important to investigate in future research.

Conclusion

In this case series of eight individuals with ABI, we demonstrated that in the acute inpatient rehabilitation setting, individuals with ABI found the MC approach to be satisfying and engaging, and perceived subjective improvement in their ability to use cognitive strategies to facilitate performance in everyday activities. Further, the MC approach was associated with improvements in awareness, strategy use, and executive functioning. Despite frequently not having cognitive goals at the outset of treatment, participants were engaged in functional cognitive activities, began to recognize cognitive challenges, and acknowledged the importance of using cognitive strategies. Goal revision and adjustment during early stages of intervention may be an indicator of increased awareness and should be further explored in future investigations. These findings suggest that larger clinical trials of the MC approach are warranted to determine whether it is a useful adjuvant treatment for individuals with brain injury and executive dysfunction during acute rehabilitation.

Acknowledgements

The authors thank Andrea Mastrogiovanni MA, OTR/L and Dan Tufaro MA, OTR/L for their assistance with this project, and the clients for their participation and contributions to this study. We also thank Michel O'Dell MD, for his support with this study.

Declaration of interest

JT is author of a published assessment used in this study (WCPA) and receives royalties from that publication. JT reports financial interests in MC CogRehab Resources, LLC., a company that may be affected by the research reported in the enclosed paper. This company produces functional cognitive treatment activities, some of which were used within this research project and were commercially produced after this project was concluded.

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