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Task-Oriented Rehabilitation for Steroid-Responsive Encephalopathy (SREAT): A Case Report of Functional and Mood Outcomes

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ABSTRACT

Background: Steroid-responsive encephalopathy is an uncommon but complicated neurological condition, making its diagnosis and treatment challenging. It causes a wide range of neurological deficits and cognitive and behavioural changes that affect the patient's independent activities of daily living and emotional well-being. **Case Report**: A 66-year-old female patient with a known case of giant cell arteritis was diagnosed with steroid-responsive encephalopathy associated with autoimmune thyroiditis (SREAT). She experienced significant difficulties in performing Activities of Daily Living (ADL) due to cognitive and physical impairments, which contributed to depressive symptoms and reduced quality of life. The Task-Oriented Approach (TOA) is a structured, goal-directed rehabilitation method emphasising real-life functional tasks. It was administered for 50 minutes per session, 5 days a week, for 3 weeks, to enhance functional independence and alleviate depression. Activities of Daily Living (ADL) were evaluated using the Functional Independence Measure (FIM), and depression was assessed using the Beck Depression Inventory-II (BDI-II). **Result:** At the end of 3 weeks after the intervention, the patient showed notable improvements in functional and mood outcomes. Her FIM score increased from 47 to 80, indicating greater independence in ADL, while her BDI-II score decreased from 27 to 15, reflecting a reduction in depressive symptoms from moderate to mild. **Conclusion**: Improvement in functional and emotional outcomes was observed in this single case following a task-oriented approach to rehabilitation program.

Keywords: Activities of Daily Living, Behavioural changes, Emotional well-being, Functional independence, Mood

INTRODUCTION

Encephalopathy refers to a disorder that causes changes in mental status due to widespread disruption of brain function resulting from various factors such as infections, metabolic disorders, toxins, and oxygen deprivation. The defining characteristics of patients with encephalopathy are cognitive impairment and behavioural changes (1). There are various types of encephalopathy, such as metabolic encephalopathy, chronic trauma encephalopathy, hepatic encephalopathy, and steroid-responsive encephalopathy. Steroid - responsive encephalopathy is a rare neurological condition, often classified as autoimmune encephalopathy associated with autoimmune thyroiditis, characterised by progressive cognitive, psychiatric, and motor impairments (2).

A patient with high serum concentrations of anti-thyroid antibodies may develop psychiatric

symptoms. The pathophysiology involves an immune-mediated process affecting the brain. It is sometimes referred to as Hashimoto's encephalopathy, as it most commonly occurs in individuals with Hashimoto's thyroiditis, an autoimmune thyroid disorder that typically responds to steroid treatment. However, it can also be seen in people with normal thyroid function (1). The estimated prevalence of steroid-responsive encephalopathy is 2.1 per 100,000 individuals (3). The mean age of onset is about 56 years (range from 27 to 84 years), and 70% of cases occur in females. Common clinical features include behavioural and cognitive abnormalities (100%), tremor (80%), transient aphasia (80%), myoclonus (65%), gait ataxia (65%), seizures (60%), and sleep disturbances (55%) (4). Headache and lateralised motor or sensory deficits are also reported in a few cases of SREAT.

The associated laboratory findings include elevated serum TSH levels (55%), elevated erythrocyte sedimentation rate (26%), and elevated C-reactive protein levels (3 to 9 patients). CSF is also analysed in most cases, with protein levels elevated in 17 patients (85%). The radiological studies typically reveal abnormal EEG patterns, and MRI of the brain shows parenchymal abnormalities (4).

Patients with SREAT often experience difficulty in performing daily activities such as eating, washing, brushing, grooming, and walking because of combined cognitive and motor impairments, resulting in reduced independence in Activities of Daily Living (ADL). In addition to neurological deficits, patients with SREAT often exhibit neuropsychiatric disturbances and depression. These symptoms further compromise their ability to perform ADL and reduce social participation and overall quality of life (5).

Goal-setting should be developed by physiotherapists according to patients' preferences and needs. Task-oriented approach (TOA) is a patient-centred approach that incorporates repeated training in functional tasks that focus on activity level rather than the patient's impairment level (6). Changes within the human and environmental systems can induce behavioural adaptation. According to dynamic systems theory, the interaction among the individual, task, and environment influences motor behaviour and skill learning (7). This approach was also shown to be effective in other neurological conditions such as stroke, traumatic brain injury, encephalitis, and Parkinson's disease, which shared cognitive and motor impairments similar to SREAT. In these conditions, repetitive, goal-directed, and meaningful task practice enhances neuroplasticity, motor relearning, and functional independence, supporting its relevance in SREAT rehabilitation (8–11).

The patient's attempts to accomplish the functional tasks, rather than training in the normal pattern of movements, engage the person's abilities and encourage active problem solving. This case report presents the implementation of a structured task-oriented rehabilitation program for a patient with SREAT, aimed at enhancing independence in daily living activities and reducing depression severity. By documenting this rare case, we aim to contribute to the limited body of evidence on physiotherapeutic management of SREAT and emphasise the significance of integrating function-focused approaches in neurological rehabilitation.

CASE PRESENTATION

Patient History

A 66-year-old female was apparently normal eight months prior to presentation at the clinic, after which she developed behavioural changes, difficulty in walking, and swallowing. She was a homemaker and right-handed. Her medical history included Type 2 diabetes mellitus for 11 years, prior to her presenting to our facility, and she had been undergoing treatment. One year earlier, she had been diagnosed with giant cell arteritis and had received methylprednisolone therapy, following which she achieved symptomatic recovery. In the weeks leading up to her presentation, her husband reported behavioural changes such as confusion, tangential speech, irritability, and intermittent anger outbursts, along with difficulty performing activities of daily living. On evaluation, she was diagnosed with Steroid-Responsive Encephalopathy Associated with Autoimmune Thyroiditis (SREAT), confirmed by positive anti-thyroid antibody findings. She received corticosteroid therapy initially and was later placed on intravenous immunoglobulin (IVIG) treatment. During her hospital stay, she underwent regular physiotherapy sessions as part of a multidisciplinary rehabilitation plan.

Laboratory Investigations

Laboratory investigations revealed reduced levels of triiodothyronine (T3) and thyroid-stimulating hormone (TSH), while thyroxine (T4) levels were within normal limits. Anti-thyroid peroxidase antibodies were markedly elevated, indicating autoimmune

thyroid involvement. Inflammatory markers, including erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP), were significantly increased (Table 1).

Radiological Imaging

EEG showed diffuse rhythmic delta activity, and moderate specific electrophysiological cerebral dysfunction involving both hemispheres was noted. MRI of the brain showed focal gliosis with cortical laminar necrosis in the right anterior temporal lobe.

Diagnostic Reasoning

The diagnosis of SREAT was established based on elevated anti-thyroid antibody levels, the presence of neuropsychiatric symptoms, and supportive EEG and MRI findings demonstrating cortical dysfunction and gliosis. Infectious, metabolic, and vascular causes were excluded through normal laboratory parameters and the absence of acute vascular lesions on neuroimaging. The patient's marked improvement following corticosteroid therapy, along with further stabilisation after IVIG administration, confirmed the autoimmune and steroid-responsive nature of the condition, leading to the final diagnosis of SREAT.

Neurological Assessment

On examination, her GCS was 15/15, she was conscious, oriented to person, but could not identify the date or her current location. On a mental state examination, her speech was disorganised and tangential, her mood was depressed, she had reduced ability to concentrate, she lacked interest, and was worried about her medical condition. The problem list based on the International Classification of Functioning, Disability and Health (ICF) classification is presented in Table 2.

The patient's activities of daily living were affected. Her needs were clearly identified as part of patient-centred care, and her main goal was to perform her daily tasks independently and stabilize her emotional status. Before the commencement of rehabilitation, her Activities of Daily Living (ADL) and mood were assessed. On baseline evaluation, her FIM score was 47, indicating moderate dependence in performing activities of daily living, as scores between 40 and 54 reflected the need for assistance in several functional domains. Her BDI-II score was 27, which fell within the range of moderate depression, suggesting significant emotional distress that might have impacted her motivation and participation in rehabilitation.

Timeline of the Clinical Course and Rehabilitation

The patient developed behavioural and neurological symptoms months prior to diagnosis, with investigations confirming SREAT. Following corticosteroid and IVIG therapy, partial improvement was noted. A three-week task-oriented rehabilitation program led to significant functional and emotional recovery, which was sustained at follow-up (Table 3).

Intervention

The study was approved by the Institution's ethics committee 08/07/24/ISRB/FR/SCPT. Based on dynamic systems theory, task-oriented approach programs were constructed by modifying tasks and the environment according to the patient's level and goals. The patient was clearly instructed on each task, and informed consent for treatment was obtained, with confidentiality assured.

The patient received task-oriented exercises for 50 minutes (10 reps and a rest period of 2 minutes for each activity) per day for 5 days a week for 3 weeks in the evening session (7,9). The level of difficulty of the tasks for the patient was increased gradually day by day, depending on the patient's capacity. During the morning session, the patient received conventional Physiotherapy interventions such as strengthening exercises, gait, and balance training. The task-oriented activities are listed in Table 4.

In addition to the task-oriented rehabilitation program, the patient attended morning sessions of conventional physiotherapy. Before the initiation of the rehabilitation phase, she had completed corticosteroid and intravenous immunoglobulin (IVIG) therapy as part of the standard medical management for SREAT. These medical and physiotherapy interventions were components of an integrated multidisciplinary plan. The improvements observed in this case represent the combined effect of medical management and rehabilitation approaches rather than the task-oriented approach alone.

Table 1: *Laboratory Investigations*

Parameter	Observed values	Interpretation	Reference range
T3 (Triiodothyronine)	2.19 pg/mL	Low	2.3 - 4.1 pg/mL
T4 (Thyroxine)	1.55 ng/dL	Normal	0.8-1.8 ng/dL
TSH(Thyroid Stimulating Hormone)	0.1852 µU/mL	Low	0.4-4.5 µU/mL
Anti-thyroid peroxidase antibodies	200 IU/mL	High	<35 IU/mL
Erythrocyte Sedimentation Rate	120 mm/hr	High	Female 17-60yrs: <19 mm/hr >60yrs: 20-35 mm/hr
C-Reactive Protein	171.4 mg/L	High	<10mg/L – Negative >10mg/L - Positive

Table 2 - *Problem list based on the International Classification of Functioning, Disability and Health (ICF) classification*

Body structure	Body function	Activity limitation	Participation restriction	Personal factors	Contextual factors
Focal gliosis with cortical laminar necrosis in the right anterior temporal lobe (MRI findings).	1. Reduced tone and strength (lower > upper limbs) 2. Diminished deep tendon reflexes 3. Involuntary tremor 4. Depressed mood, reduced concentration.	Difficulty performing daily tasks	Reduced involvement in social roles - Inability to return to previous functional roles	Positive: Willing to regain independence and motivated for rehabilitation Negative: Depression, irrelevant speech, anxiety, lack of concentration	Low confidence and mood issues affected therapy engagement, Irrelevant speech and poor focus limited participation in rehabilitation, Family support available, Task-oriented physiotherapy approach used

Table 3: *Timeline of Clinical Course and Rehabilitation*

Time Period	Clinical Event / Intervention	Description & Findings
8 months before intervention	Symptom onset	Onset of behavioural changes, irritability, confusion, gait difficulty and mild dysphagia
Month 1-3	Medical evaluation	Neurological assessment was conducted, and initial laboratory & imaging work were initiated.
	Investigations	Positive anti-thyroid antibodies; EEG showed diffuse delta activity; MRI revealed focal gliosis with cortical laminar necrosis
Month 4	Diagnosis of SREAT	Diagnosis confirmed based on clinical profile, antibody positivity, and imaging findings
Month 5	Steroid therapy	Intravenous methylprednisolone was initiated; partial clinical improvement was observed
Month 6	IVIG therapy	IVIG was administered for residual deficits; further improvement in cognition & behaviour was noted.
Month 7 (Pre-intervention phase)	Baseline assessment	GCS: 15/15; FIM:47/126; BDI-II:27/63; patient was dependent for ADLs and exhibited depressive symptoms
Week 1-3	Task-Oriented Approach (TOA)	50-minute sessions, 5days/week for 3 weeks; focused on functional and goal-directed activities
Week 3 (Post-intervention)	Outcome evaluation	FIM improved to 80; BDI-II reduced to 15; functional and emotional gains achieved
6 weeks post-intervention	Telephonic follow-up review	Sustained improvement noted in ADL and mood; maintained independence in self-care & mobility; no relapse reported

Table 4: *Task-oriented activities*

S. No	Tasks	Goals	Instructions	Repetitions / Progression	Safety considerations
1.	**Folding laundry**	Improve bilateral coordination and functional ADL	Neatly fold the clothes on the table and stack them.	Start with 5–10 items; progress to 15–20 items; vary clothing size and type	Ensure stable seating or table height; avoid overreaching to prevent fatigue or strain
2.	**Stack the cone challenge**	Enhance fine motor control, precision, and hand-eye coordination	Lift a cone with one hand and carefully stack it on top of another cone that is already placed on the surface. Focus on placing the cone directly on top of the other cone without knocking over the stack	5–10 stacks per session; increase cone size/colour variability and speed	Ensure a clear workspace to prevent cones from falling; supervise to avoid frustration
3.	**Pegboard activity**	Improve cognitive planning, visual-motor integration, and fine motor skills	Instructed to place, remove or rearrange the pegs according to the specific pattern. (Figure 1)	Complete 1–2 patterns initially; progress to 3–5 patterns of increasing complexity	Proper seating posture; use adaptive pegs if grip is weak
4.	**Tail wind**	Strengthen upper limb coordination with rhythm	Push the handles up and down using both hands, along with the tempo of the metronome.	10–15 repetitions per hand; gradually increase metronome tempo and vary the angle of the handle	Monitor for shoulder fatigue; ensure handles are securely fixed
5.	**Puzzle-solving game**	Enhance problem-solving, attention, and fine motor coordination	Begin with the border (edge pieces) to create the frame, and then work towards filling in the middle sections.	Start with simple 12–piece puzzles; progress to 50–piece or complex puzzles	Ensure seating stability; avoid small pieces being a choking hazard
6.	**Drawing**	Improve creativity, fine motor control, and visual-motor coordination	Draw a free-style drawing and colour it	1 drawing per session initially; progress to multiple drawings with varied complexity	Use non-toxic paints/markers; ensure ergonomic seating
7.	**O Connor Tweezer**	Enhance finger dexterity, precision grip, and hand-eye coordination	Using the tweezers, pick up the pin and place it into the holes.	10–20 pins per session; progress with smaller pins or increased speed	Supervise to prevent pin loss; avoid excessive finger strain
8.	**Jenga game**	Improve finger dexterity, strategic planning, and bimanual coordination	Remove one block from the small tower of wooden blocks from any level (except for the top level), then place it back on top without causing the tower to collapse.	3–5 rounds per session; progress to larger towers	Ensure the table is stable; supervise to prevent blocks from falling on hands
9.	**Balloon tap with feet**	Improve lower limb coordination, timing, and seated balance	While seated, lift one foot and tap the balloon.	10–15 taps per foot; increase alternation speed	Ensure a stable chair; avoid overextending to prevent loss of balance
10.	**Modified musical chair**	Improve reaction time, postural control, and dynamic sitting-to-standing ability	While seated, stand when the music starts and sit when it stops, with the help of assistance or hand supports.	5–10 repetitions per session; progress by adding clapping or a faster tempo	Use hand support or assistance; ensure non-slip floor and chair stability

Figure 1: *Pegboard activity demonstrating task-oriented training to improve fine motor skills, hand-eye coordination, and cognitive planning through structured peg placement.*

Outcome

After three weeks of intervention, the patient showed considerable improvement in functional independence and mood. The FIM score increased from 47 at baseline to 80 after intervention, reflecting a gain of 33 points, while the BDI-II score decreased from 27 to 15, a reduction of 12 points. The 33-point improvement in FIM exceeds the minimal clinically important difference of approximately 22 points reported in neurological rehabilitation, indicating a clinically meaningful enhancement in the patient's ability to perform daily activities independently. Similarly, the 12-point reduction in BDI-II surpasses the 5–10-point threshold typically considered significant for depressive symptoms, showing a meaningful improvement in emotional well-being.

These results suggest that the combined rehabilitation approach, which included the Task-Oriented Approach (TOA), conventional physiotherapy, and medical management, led to functional and psychological recovery. The observed improvement was not only numerical but translated into visible progress in the patient's daily life, supporting the value of structured, goal-directed therapy in individuals with SREAT. A telephonic follow-up conducted six weeks after the intervention indicated sustained improvement in activities of daily living and mood, with the patient maintaining independence in mobility, self-care, and household tasks. She reported increased confidence in performing routine activities and expressed satisfaction with her recovery, noting that the therapy sessions closely resembled real-life challenges and improved her motivation to participate in rehabilitation. Figure 2 illustrates the Comparison of Pre-test and post-test scores of FIM and BDI–II scales, confirming the quantitative and clinically relevant improvements achieved through the intervention.

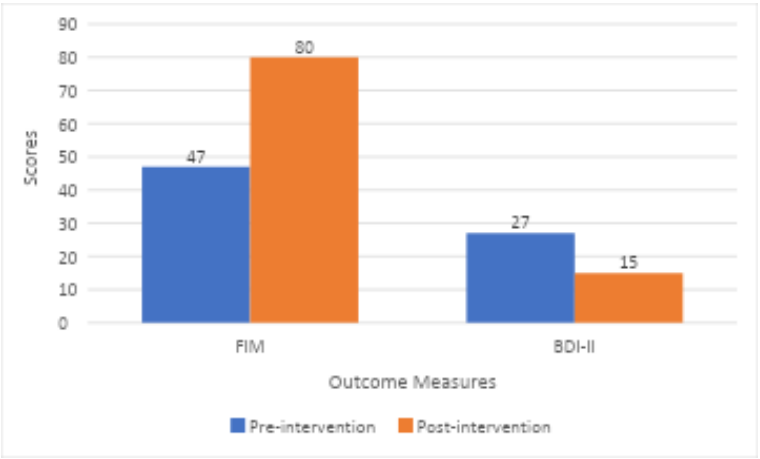

Figure 2: *Comparison of pre- and post-intervention scores after three weeks of task-oriented rehabilitation. Assessments were performed by an independent physiotherapist who was blinded to the intervention details. FIM- Functional Independence Measure; BDI-II Beck Depression Inventory II*

DISCUSSION

This case study aimed to design and implement a task-oriented rehabilitation program for a patient diagnosed with Steroid-Responsive Encephalopathy Associated with Autoimmune Thyroiditis (SREAT) to facilitate recovery of functional independence and to reduce the severity of depression.

In the present case, the patient exhibited moderate depression, confusion, and ADL limitations before the initiation of the rehabilitation program, reflecting typical features of SREAT. The neurocognitive and emotional symptoms of SREAT present a major challenge in rehabilitation. Endres et al. (2016) and Liyanage & Perera (2023) reported that SREAT may present primarily as depression or other psychiatric symptoms, complicating diagnosis and delaying treatment (5,8).

An integrative, function-focused approach is essential in such cases (7). TOA supports this need by engaging patients in goal-directed, real-life activities that promote motor, cognitive, and emotional recovery. In this case, structured task-oriented activities were implemented, such as laundry folding, pegboard tasks, and puzzle-solving, progressively adapted to the patient's capacity.

The observed improvements in ADL independence and mood align with findings from Alsubiheen et al. (2022) and Perry et al. (2019), who found TOA effective for motor and emotional outcomes in stroke and Parkinson's disease (6,9). Similarly, Chompoonimit and Nualnetr (2016) reported enhanced functional engagement and community participation in spinal cord injury patients undergoing a task-oriented approach (10). Furthermore, Sivakumar et al. (2025) demonstrated TOA to be effective in children with spastic bilateral cerebral palsy, reinforcing its cross-condition and age-group applicability (11). Since specific research on SREAT rehabilitation is limited, the present findings are supported by evidence from related neurological conditions, acknowledging that this extrapolation is theoretical rather than condition-specific. These converging findings support the broader applicability and clinical relevance of task-oriented rehabilitation, and its use in this rare autoimmune encephalopathy (SREAT) appears both appropriate and beneficial for addressing functional and emotional impairments.

This case illustrates the functional and psychological advantages noted after implementing an integrative rehabilitation strategy in a patient with SREAT. However, its single-case design limits broader applicability. This report also has several limitations, including the presence of co-interventions such as conventional physiotherapy and prior steroid and IVIG therapy, which may have contributed to the observed outcomes. The short follow-up duration, reliance on self-reported mood measures, and absence of blinded assessment further restrict generalizability. Despite these limitations, our study has notable strengths. It presents a rare clinical condition with a structured, well-documented rehabilitation protocol supported by objective outcome measures (FIM and BDI-II) and ethical approval. The integration of task-oriented therapy within a multidisciplinary plan provides a novel and practical framework for improving both functional independence and emotional well-being in individuals with SREAT. These findings offer valuable clinical insight and can serve as a foundation for future research on rehabilitation strategies in rare autoimmune encephalopathies.

Future studies should consider adopting N-of-1 or small case-series designs to better quantify variability and treatment-interaction effects. Extended follow-up durations and the inclusion of broader psychological outcomes, such as agitation, sleep disturbances, and confusion, could offer a more comprehensive understanding of the intervention's long-term impact.

CONCLUSION

In this SREAT case, the task-oriented approach (TOA) was associated with improved activities of daily living (FIM) and reduced depressive symptoms (BDI-II) over a three-week intervention period. Although these improvements were observed in a single patient, the findings highlight the potential role of TOA in promoting both functional independence and emotional well-being. The structured rehabilitation program enhanced the patient's ability to perform daily activities and helped alleviate depressive symptoms. Its adaptability, real-life relevance, and patient-centred engagement make it a valuable component of multidisciplinary rehabilitation for individuals with rare neuropsychiatric and autoimmune encephalopathic disorders. Controlled studies with larger samples and longer follow-up periods are warranted to validate these findings and further establish the role of task-oriented rehabilitation in SREAT recovery.

Ethics and Consent: The study was approved by the Saveetha college of Physiotherapy,

SIMATS, Institutional Scientific Review Board (ISRB) Chennai, India (Ref: 08/07/24/ISRB/FR/SCPT).

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Conflict of interest: None.

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