Original Article

Efficacy of Occupational Therapy Interventions in Improving Cognitive Function and Daily Living Skills Among Individuals with Substance Use Disorder: A Pilot Study

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ABSTRACT

Background: Substance Use Disorder (SUD) is a chronic illness impacting cognitive function, activities of daily living, and quality of life. Occupational therapy (OT) interventions aim to improve functional independence and social reintegration, but their contribution to SUD rehabilitation is not well understood.

Methods: This pilot trial assessed the effectiveness of a 4-week, structured OT intervention in enhancing cognitive function and activities of daily living among 12 inpatient SUD subjects. Participants received cognitive training, ADL and IADL instruction, psychoeducation, and exercise sessions. Pre- and post-intervention scores were taken on the Montreal Cognitive Assessment Scale (MoCA), Barthel Index (BI)a nd Lawton-Brody Instrumental Activities of Daily Living (IADLs) Scale.

Results: The findings revealed significant improvements in the MoCA scores (p=0.015), reflecting improved cognitive function. Also, the performance of IADL was significantly better (p=0.001), reflecting an improvement in performing complex daily tasks independently. Statistically significant improvements were not found in BI scores (p=0.08), reflecting the stability of basic ADLs.

Conclusion: OT interventions significantly improve cognitive function and instrumental activities of daily living in SUD-recovering individuals. The results underscore the necessity of integrating OT into SUD rehabilitation programs to enhance long-term functional independence and social reintegration. Large-scale studies are advised to confirm these initial findings.

Keywords: Activities of daily living, Cognitive rehabilitation, Functional independence, Occupational therapy, Substance use disorder.

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INTRODUCTION

Substance Use Disorder (SUD) is a major worldwide public health issue with extensive consequences for people's physical, mental, and social health. The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) has described SUD as "chronic conditions that involve intoxication from alcohol or drugs in such a manner that, even when there are adverse consequences, use remains compulsive, resulting in impairment in health, occupational roles, and interpersonal relationships"[1]. It is estimated by the Substance Abuse and Mental Health Services Administration (SAMHSA) that about 19.5 million adults need some treatment for SUD, with co-morbid mental illness further complicating prognosis and treatment strategy[2].

The effects of SUD are not limited to the individual; they can reach out to families, workplaces, and communities. The economic impact includes direct healthcare expenditures and indirect costs of lost productivity and criminal

justice[3]. The chronic nature of SUD, with its cycles of relapse and remission, requires a multifaceted treatment strategy that combines addiction cessation, social reintegration, and functional rehabilitation through medical, psychological, and occupational therapy interventions[4]. SUD severely impairs psychosocial and occupational functioning, interfering with daily routines and role structures. SUD individuals often fail to meet self-care, work, and social responsibilities, resulting in a decline in basic life skills, social relationships, and motivation[5]. This occupational impairment presents as an unstructured routine life with inadequate stress management and decreased self-efficacy, leading to poor quality of life[6].

Occupational therapy (OT) is well-suited to meet these challenges as a client-centered health profession aimed at enhancing health status and quality of life through meaningful activities. Occupational therapy is defined by the American Occupational Therapy Association (AOTA) as involving the creation of practical skills for daily living, work, and leisure to achieve functional independence[7]. For those with SUD, OT interventions are aimed explicitly at occupational loss, skill deficits, and role disruption due to substance use, with an emphasis on rebuilding structure, enhancing executive functioning, and facilitating social participation[8].

Evidence suggests that OT can play an important role in SUD recovery by providing coping mechanisms, social interaction skills, and work-life management strategies[9]. OT clinicians utilize a biopsychosocial approach, considering physical, emotional, and environmental aspects, to involve individuals in meaningful occupations[10]. As a relatively newer treatment in SUD compared to other rehabilitation professions, OT has proved to be significantly effective in enhancing functional independence and quality of life among SUD individuals[11].

People with SUD typically have compromised executive functioning, specifically in planning, decision-making, and problem-solving. These deficits can result in unemployment, financial instability, social isolation, and a vicious cycle of hopelessness that sustains drug use[12]. Furthermore, long-term substance consumption is linked to physical comorbidities, including musculoskeletal disorders, cardiovascular illnesses, and neurotoxicity, further hindering involvement in occupational activity[13]. Occupational therapy can help remove these barriers during the process of rehabilitation and can be instrumental in long-term recovery and relapse prevention[14].

Studies have demonstrated that integrating OT into comprehensive SUD treatment programs enhances individuals' ability to engage in structured, meaningful activities[15]. Participation in meaningful occupations has been shown to reduce substance consumption, improve overall well-being, and facilitate social reintegration[16]. Unlike traditional models focusing on relapse prevention, OT emphasizes developing adaptive skills and goal-oriented behaviours that support sustainable long-term outcomes[17]. OT practitioners play a significant role in reinstating routine, establishing vocational competence, and enhancing interpersonal relationships between SUD individuals. Intervention mainly encompasses vocational instruction, leisure programming, stress regulation, and communication in social relations[18]. Significantly, OT specifically aims at frequent complications in individuals who have SUD, including issues with impulse control, lack of well-structured daily routines, and lack of social competence skills[19].

The Canadian Model of Occupational Performance and Engagement (CMOP-E) is a useful theoretical model for OT practice in SUD recovery. The model targets increasing the individual's participation in meaningful occupations in their environment, given that people with SUD tend to withdraw from productive and rewarding occupational roles and routines[20,21]. OT practitioners can use the CMOP-E to create specific interventions for occupational engagement issues that individuals with SUD are experiencing[22,23]. Evidence has shown that interventions based on the CMOP-E are effective in enhancing occupational engagement and quality of life among substance use recovery populations[24].

The pilot study will determine the effectiveness of occupational therapy interventions in enhancing occupational participation, cognitive ability, and everyday living skills in SUD individuals. By

examining OT's role in helping to redefine the role, acquire skills, and increase the quality of life in individuals undergoing SUD rehabilitation, the study will make significant contributions to the evidence for incorporating OT into evidence-based addiction treatment programs.

METHODOLOGY

Participants and Sampling

Purposive sampling was used to recruit 12 inpatient patients with SUD diagnoses. The patients were included if they were medically stable for a period post-detoxification and had some cognition to follow structured therapy. Patients who had very poor cognitive impairment were excluded. All filled in informed consent before recruitment.

Outcome Measures

The principal investigator inducted in the MoCA cognitive assessment conducted base and post-intervention evaluation using the following validated assessment tools:

- **Montreal Cognitive Assessment (MoCA):** It evaluates cognitive domains, including attention, memory, language, visuospatial abilities, executive function, and orientation.
  Reliability: Excellent internal consistency (Cronbach's alpha = 0.83). It has high sensitivity (90%) and specificity (87%) in detecting mild cognitive impairment.
  Validity: Correlation of strong significance with (Mini-Mental State Examination) MMSE (r = 0.87, p<0.001).

- **Barthel Index (BI):** It evaluated Activities of Daily Living (ADLs) which includes feeding, bathing, dressing, toileting, transfers, and ambulation.
  Reliability: High inter-rater reliability (ICC=0.95).
  Validity: In strong correlation to functional independence measures (r=0.92), this measure becomes the gold standard for functional independence assessment.

- **Lawton-Brody Instrumental Activities of Daily Living (IADLs) Scale:** It evaluates higher-level daily tasks include financial management, medication adherence, shopping, cooking, household maintenance, transportation, and phone availability.
  Reliability: High internal consistency (Cronbach is a = 0.85).
  Validity: Well-established correlation with cognitive function and independence scales (r = 0.78), making it a substantial measure of functional status.

Intervention Protocol

There were 4 weeks of structured occupational therapy intervention comprised of 12 sessions, where each session was 45 minutes long for participants that included the following:

- **Cognitive training:** Problem-solving tasks, memory games, and cognitive flexibility exercises.

- **ADL training:** Personal hygiene routines, dressing skills, and time management strategies.

- **IADL training:** Budgeting, household management, and medication adherence.

- **Psychoeducation and Coping Strategies:** Stress management, cravings control, and techniques for regulating emotions in humans.

- **Physical Activities:** Structured exercises that incorporate outdoor walking to promote the sale of physical well-being.

Theoretical Framework

The Canadian Model of Occupational Performance and Engagement (CMOP-E) followed the study incorporating Motivational Interviewing (MI), Physical Exercise Programs, and Mindfulness Meditation.

RESULTS

The study sample (n=12) had a mean age of 29.9±6.82 years and a mean substance use duration of 10.63±7.33 years. Following the 4-week intervention program, participants demonstrated notable improvements across multiple domains:

- MoCA scores increased significantly (p=0.015), indicating improvement in cognitive functions, particularly in executive functions and memory domains.
- However, BI changes were not statistically significant (p=0.08), suggesting that basic ADLs remained relatively stable throughout the intervention period.

- A highly significant improvement was observed in IADL performance (p=0.001), reflecting enhanced independence in complex daily life tasks such as financial management, medication adherence, and household management as shown in Table-1.

Table-1 Pre-post intervention outcomes

Outcome Measure	Baseline (Mean±SD)	Post-Intervention (Mean ± SD)	Mean Difference (MD)	p-value
BI	19.08±1.16	18.33±5.77	-0.75±2.00	0.08
MoCA	20.75±3.10	26.08±2.61	5.33±2.50	0.015
IADLs	4.41±1.67	6.6±1.16	2.19±1.30	0.001

BI: Barthel Index; MoCA: Montreal Cognitive Assessment; IADLs: Lawton-Brody Instrumental Activities of Daily Living Scale

These findings indicate that the occupational therapy interventions were particularly effective in improving cognitive functioning and instrumental daily activities in individuals recovering from SUD, supporting the role of OT in rehabilitation and long-term recovery.

DISCUSSION

This pilot study demonstrates the significant impact of structured occupational therapy interventions on enhancing cognitive function and improving performance in daily activities among individuals with Substance Use Disorder. The benefits observed appear to have potential for sustained improvements that could extend beyond the rehabilitation period.

Our CMOP-E-based approach addressed the cognitive, physical, and psychosocial aspects of rehabilitation, aligning with current research in the field. Ryan and Boland's[25] scoping review revealed that OT interventions emphasizing life skills development and routine establishment are vital components of effective SUD therapy. Similarly, our findings support Lacroix's[26] research highlighting the need for enhanced education and exposure among OT practitioners to build confidence and knowledge in SUD treatment.

The significant improvements in cognitive function observed in our study are particularly noteworthy, as cognitive impairment is a well-documented consequence of substance use that can impede recovery. Our cognitive training interventions, which included problem-solving tasks and exercises targeting executive function, appear to have effectively addressed these deficits. This aligns with Synovec et al.[27] research emphasizing OT's valuable role in integrated care settings for individuals with co-occurring SUD, particularly through interventions focused on daily living skills and routine development.

The substantial improvement in IADLs, but not in basic ADLs, suggests that our interventions were particularly effective in addressing higher-level functional skills that are often more severely impacted by SUD. This pattern is consistent with recent findings by Ikiugu et al.[28], who demonstrated that OT interventions specifically targeting instrumental activities and executive function show greater effect sizes compared to interventions focused on basic self-care. The unique contribution of occupational therapy in SUD treatment lies in its focus on developing skills necessary for independent living and addressing the occupational disruption caused by substance use. Our results reinforce the importance of helping individuals regain meaningful daily routines as part of the recovery process. Recent research by Harmon et al.[29] further supports this approach, highlighting the significance of occupational identity reconstruction in sustained recovery from SUD.

Exploring the neurobiological mechanisms underlying our observed improvements, Rojo-Mota et al.[30] found that OT interventions targeting executive functioning may facilitate neuroplastic changes that support recovery from substance-related cognitive impairment. This neurobiological perspective provides additional context for understanding why our cognitive training

components yielded significant improvements in MoCA scores.

The integration of motivational interviewing techniques within our OT intervention aligns with Wasmuth et al.[31] findings regarding the enhanced effectiveness of occupation-based interventions when combined with motivational approaches. This combination appears to address both the motivational and functional aspects of recovery, potentially explaining the robust improvements in IADL performance observed in our study.

Several practical implications emerge from our findings. First, the timing of OT intervention appears critical, with early initiation during post-detoxification potentially improving long-term outcomes. Second, extended engagement in OT seems to correlate with improved daily functioning and reduced relapse rates, consistent with McCombie and Stirling's longitudinal study[32]. Finally, manageable therapy caseloads are essential to ensure therapists can provide the individualized attention necessary for optimal outcomes.

Limitations

This study has several limitations that should be acknowledged. The absence of a control group limits our ability to definitively attribute improvements to the OT interventions rather than other factors such as natural recovery or concurrent treatments. The relatively small sample size and short intervention duration may not fully capture the potential long-term benefits of OT in SUD recovery. Additionally, the study was conducted at a single rehabilitation center, potentially limiting the generalizability of findings across different treatment settings and populations.

CONCLUSION

This pilot study provides preliminary evidence supporting the efficacy of occupational therapy interventions in improving cognitive function and daily living skills among individuals with Substance Use Disorder. The holistic approach employed, guided by the Canadian Model of Occupational Performance and Engagement, effectively addressed the multifaceted challenges associated with addiction and demonstrated potential for facilitating long-term recovery and enhanced quality of life.

The significant improvements observed in cognitive function and instrumental activities of daily living highlight the unique contribution of occupational therapy to SUD rehabilitation. By focusing on meaningful occupation, skill development, and routine establishment, OT addresses fundamental aspects of recovery that extend beyond abstinence to encompass functional independence and social reintegration.

Future research should build upon these findings through larger randomized controlled trials with extended intervention periods and follow-up assessments to evaluate the sustainability of improvements. Additionally, investigating the effectiveness of specific OT intervention components and exploring the optimal timing, intensity, and duration of OT in SUD treatment would further enhance the evidence base for clinical practice.

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Author Contributions

Muhammad Hammad Mursaleen, **Nooreen Begum**, **Tarique Arain**, and **Syed Ashar Ali** contributed to the study's conceptualization, methodology, data collection, and analysis. **Umama Lakhani** assisted in data interpretation and manuscript drafting. **Bushra Iqbal** provided critical revisions and final approval of the manuscript. All authors reviewed and approved the final version.

Ethical Approval

This study has been approved by the Anti-Narcotics Force, Lyari, Karachi, and is registered under NCT06809504.

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None.

Conflict of Interests

None.

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