

Effectiveness of occupation-based intervention versus neurorehabilitation on ADL recovery in stroke patients

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ABSTRACT

Introduction: Stroke frequently results in long-term disability that compromises independence in activities of daily living (ADL). Conventional neurorehabilitation primarily targets motor components, whereas occupation-based intervention (OBI) emphasizes meaningful, client-centered activities that may enhance functional recovery. This study aimed to compare the effectiveness of OBI and conventional neurorehabilitation in improving ADL among stroke patients.

Methods: A quasi-experimental pretest–posttest control group design was employed. Thirty-four post-stroke patients were recruited using purposive sampling and allocated to an OBI group (n = 16) or a neurorehabilitation group (n = 18). ADL performance was assessed using the Modified Barthel Index. Data were analyzed using paired and independent t-tests, with effect sizes calculated using Cohen's d.

Results: Both groups demonstrated significant improvements in ADL scores after intervention ($p < 0.05$). However, the OBI group showed a significantly greater improvement compared to the control group ($p = 0.024$). The effect size for OBI was moderate to high ($d = 0.67$), exceeding that of conventional neurorehabilitation ($d = 0.47$).

Conclusion: Occupation-based intervention is more effective than conventional neurorehabilitation in enhancing ADL recovery among stroke patients. Incorporating meaningful, activity-centered approaches may optimize functional outcomes in post-stroke rehabilitation.

Keywords: Activities of Daily Living; Neurorehabilitation; Occupation-Based Intervention; Stroke Rehabilitation.



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INTRODUCTION

Stroke remains one of the leading causes of long-term disability worldwide and constitutes a major public health burden, particularly in low and middle-income countries (Alsubiheen et al., 2022). Survivors commonly experience persistent neurological deficits, including motor impairment, sensory dysfunction, cognitive decline, and emotional disturbances, which substantially limit their independence in performing activities of daily living (ADL) (An et al., 2025). Among these impairments, reduced upper-limb motor function and compromised postural control are the most prevalent consequences, directly affecting an individual's ability to perform self-care tasks such as feeding, bathing, dressing, and mobility. Loss of independence in ADL not only diminishes quality of life but also increases caregiver burden and healthcare costs, underscoring the critical need for effective rehabilitation strategies (Bai et al., 2024).

Post-stroke rehabilitation aims to maximize functional recovery by promoting neuroplasticity, restoring motor control, and enabling patients to regain independence in everyday activities (Bivona & Villalobos, 2025). Conventional neurorehabilitation approaches such as Bobath neurodevelopmental therapy, Brunnstrom techniques, proprioceptive neuromuscular facilitation, and repetitive task training have been widely implemented in clinical practice. These approaches primarily emphasize impairment-based training, focusing on muscle tone normalization, range of motion, strength, and sensorimotor control (Danzl et al., 2012). Although such methods have demonstrated benefits in improving specific motor components, their effectiveness in translating motor recovery into meaningful functional performance remains inconsistent. Many patients exhibit measurable improvements in motor capacity without corresponding gains in real-life functional independence, particularly in ADL performance (Darmawati et al., 2024).

This discrepancy highlights a critical limitation of conventional neurorehabilitation: the insufficient integration of functional and contextual elements of daily life into therapeutic interventions (Feigin et al., 2018). Rehabilitation programs that concentrate predominantly on repetitive, decontextualized movements may fail to address the complex interaction between physical, cognitive, emotional, and environmental factors that shape occupational performance (Grant et al., 2025). Consequently, patients may struggle to generalize motor gains acquired during therapy sessions to actual daily activities, resulting in suboptimal functional outcomes and reduced therapy engagement. In response to these limitations, occupation-based intervention (OBI) has emerged as a client-centered therapeutic approach that directly targets meaningful activities as the primary modality of rehabilitation (Johnson et al., 2019). OBI is grounded in occupational therapy theory, emphasizing the use of purposeful and meaningful occupations that are relevant to the patient's personal goals, roles, and life context. Rather than isolating motor components, OBI integrates physical, cognitive, and psychosocial processes within functional activities, thereby facilitating holistic recovery. By actively involving patients in tasks that mirror real-life demands, OBI is believed to enhance motivation, participation, and engagement factors associated with improved neuroplastic adaptation and functional recovery (Kim et al., 2022).

Evidence from international studies suggests that occupation-based and task-oriented interventions can improve upper-limb function, ADL performance, and quality of life among stroke survivors (Kuriakose & Xiao, 2020). These interventions have also been associated with higher levels of patient engagement and adherence compared to conventional impairment-focused therapies. However, despite growing empirical support, the implementation of OBI remains limited in many clinical settings, particularly in developing countries such as Indonesia. Rehabilitation services in these contexts continue to rely heavily on conventional neurorehabilitation paradigms, with limited integration of occupation-centered frameworks into routine practice (Lee et al., 2025).

A notable gap in the existing literature lies in the lack of comparative studies that directly evaluate the effectiveness of OBI against conventional neurorehabilitation methods in improving ADL performance, especially within Indonesian healthcare settings. Most prior studies have focused either on task-oriented training without explicitly adopting an occupation-based

framework or have examined OBI in isolation without a control comparison. Furthermore, empirical evidence quantifying the magnitude of functional improvement, such as effect size estimates, remains scarce, limiting the ability to assess the clinical significance of OBI relative to standard interventions.

Another critical gap relates to contextual relevance, as cultural values, healthcare systems, therapist practices, and patient expectations shape rehabilitation outcomes. Evidence derived from high-income countries may not be fully applicable to different sociocultural and clinical settings, highlighting the need for locally grounded research to inform clinical practice and policy. Addressing this gap, the present study provides a novel contribution by directly comparing occupation-based intervention with conventional neurorehabilitation in improving ADL performance among stroke patients. Using a quasi-experimental pre-test–post-test design with a control group and the Modified Barthel Index, this study assesses both statistical significance and effect size to determine clinically meaningful outcomes. The novelty lies in its comparative design, focus on ADL as a primary functional outcome, and application within Indonesian rehabilitation settings, offering evidence to support client-centered and occupation-based stroke rehabilitation practices.

RESEARCH METHODOLOGY

Study Design

This study employed a quantitative approach using a quasi-experimental pre-test–post-test design with a control group. This design was selected to evaluate the comparative effectiveness of occupation-based intervention (OBI) and conventional neurorehabilitation in improving activities of daily living (ADL) among stroke patients. The study was conducted between July and August 2024 in the Occupational Therapy Units of the Medical Rehabilitation Departments at Dr. Kariadi General Hospital and KRMT Wongsonegoro Regional Hospital, Semarang, Indonesia.

Participants and Sampling

The study population comprised post-stroke patients receiving occupational therapy services at the selected hospitals. Participants were recruited using purposive sampling based on predefined inclusion criteria: first-ever stroke episode, stroke onset of less than two years, absence of flaccid paralysis, lack of global aphasia, and willingness to participate as evidenced by informed consent. Patients with recurrent stroke, severe cognitive impairment, or medical instability were excluded. A total of 34 participants met the eligibility criteria. It was allocated into two groups: the intervention group ($n = 16$), which received occupation-based intervention, and the control group ($n = 18$), which received conventional neurorehabilitation.

Intervention Procedures

Participants in the intervention group underwent occupation-based intervention, which emphasized the use of meaningful, goal-oriented daily activities tailored to individual needs, preferences, and functional goals. Therapeutic activities were designed to simulate real-life tasks, such as self-care and functional mobility, with active patient engagement as a central component. The intervention aimed to integrate motor, cognitive, and psychosocial elements within functional contexts. The control group received conventional neurorehabilitation, consisting of impairment-based therapeutic exercises commonly applied in routine clinical practice. These interventions focused on sensorimotor facilitation, muscle tone normalization, strength training, and repetitive movement exercises aimed at improving motor components without explicit emphasis on functional task integration. Both groups received therapy with comparable frequency and duration to minimize treatment dosage bias. Licensed occupational therapists delivered all interventions following standardized clinical protocols.

Outcome Measures

The primary outcome measure was functional independence in activities of daily living, assessed using the Modified Barthel Index (MBI). The MBI is a validated and widely used instrument that evaluates independence in ten domains of daily activities, including feeding,

bathing, dressing, toileting, transfers, and mobility. Scores range from total dependence to full autonomy, with higher scores indicating greater functional ability. Measurements were conducted at baseline (pre-test) and after completion of the intervention period (post-test).

Data Analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 23. Descriptive statistics were used to summarize participant characteristics. Within-group differences in ADL performance before and after intervention were analyzed using paired sample t-tests. Between-group differences in post-intervention ADL outcomes were examined using independent sample t-tests. Statistical significance was set at $p < 0.05$. To determine the magnitude of intervention effects, Cohen’s d effect size was calculated, allowing interpretation of clinical relevance beyond statistical significance.

Ethical Considerations

The Health Research Ethics Committee approved this study with ethical clearance number 1.241/V/HREC/2024. All participants provided written informed consent before participation. Confidentiality and anonymity were strictly maintained throughout the research process in accordance with ethical principles for human subject research.

RESULTS

This section presents the findings of the study, including the characteristics of the participants, the distribution of activities of daily living (ADL) levels, and the comparison of ADL outcomes before and after the interventions. Statistical analyses were conducted to examine within-group and between-group differences, as well as to evaluate the effectiveness of occupation-based intervention (OBI) compared with conventional neurorehabilitation.

Table 1. Sample Characteristics (n = 34)

Variable	Category	n	%
Sex	Male	17	50.0
	Female	17	50.0
Age Group (years)	Middle adulthood (36–45)	5	14.7
	Late adulthood (46–59)	19	55.9
	Early elderly (60–65)	5	14.7
	Late elderly (>65)	5	14.7
Stroke Onset	< 6 months	14	41.2
	7–12 months	7	20.6
	13–18 months	8	23.5
	19–24 months	5	14.7

Table 1 shows that the proportion of male and female participants was evenly distributed (50.0% each). Most participants were classified in the late adulthood age group (46–59 years), accounting for more than half of the sample (55.9%). Regarding stroke onset, most participants experienced stroke within less than one year before the study (61.8%), indicating that most subjects were in a relatively early phase of post-stroke recovery. This distribution suggests that the sample predominantly consisted of middle-aged adults with recent stroke onset, a population with substantial potential for functional rehabilitation.

Table 2. Distribution of Activities of Daily Living (ADL) Ability Levels (n = 34)

ADL Ability Level	Intervention Group (n = 16)	Control Group (n = 18)
Mild Dependence	1 (6.3%)	0 (0.0%)
Moderate Dependence	7 (43.8%)	7 (38.8%)
Severe Dependence	7 (43.8%)	10 (55.6%)
Total Dependence	1 (6.3%)	1 (5.6%)

Table 2 indicates that most participants in both the intervention and control groups experienced impaired ADL performance, predominantly at moderate to severe dependence levels. In the intervention group, 87.6% of participants were classified as having mild to severe dependence, while in the control group, this proportion reached 94.4%. These findings suggest

that, before intervention, most stroke patients in both groups required substantial assistance in performing daily activities.

Table 3. Cross-Tabulation of Mean ADL Scores by Sample Characteristics (n = 34)

Characteristics	Group	Pre-test Mean	Post-test Mean	Mean Change (Δ)
Sex	Intervention – Male	56.6	71.4	16.7
	Intervention – Female	71.4	82.0	10.5
	Control – Male	55.1	65.0	9.9
	Control – Female	50.2	60.9	10.7
Age Group (years)	Intervention – 36–45	42.5	52.5	10.0
	Intervention – 46–59	65.2	80.8	15.6
	Intervention – 60–65	89.0	98.5	9.5
	Intervention – >65	38.5	53.5	15.0
	Control – 36–45	51.6	61.6	10.0
	Control – 46–59	49.3	61.3	12.0
	Control – 60–65	51.3	58.6	7.3
	Control – >65	63.3	72.0	8.6
	Intervention – < 6 months	62.5	77.1	14.6
	Intervention – 7–12 months	53.2	68.4	15.2
	Intervention – 13–18 months	75.3	86.0	10.6
	Intervention – 19–24 months	0.0	0.0	0.0
Stroke Onset	Control – < 6 months	40.2	50.5	10.3
	Control – 7–12 months	54.5	68.0	13.5
	Control – 13–18 months	56.0	65.0	9.0
	Control – 19–24 months	62.6	73.0	10.4

Table 3 demonstrates that, overall, improvements in activities of daily living (ADL) scores were observed across all sample characteristics in both groups. The magnitude of improvement was consistently greater in the intervention group compared with the control group. Larger mean changes were noted among male participants, individuals in the late adulthood age group (46–59 years), and participants with a stroke onset of less than one year. These findings indicate that occupation-based intervention yielded more pronounced functional gains, particularly among participants in earlier post-stroke phases and productive age groups.

Table 4. Summary of ADL Outcomes: Within-Group Comparison, Between-Group Comparison, and Effect Size

Analysis	Group / Comparison	Mean Difference	t-value	95% CI	p-value	Effect Size (Cohen's d)
Within-group comparison (Paired t-test)	Intervention (OBI)	14.06	8.83	17.46 to 10.67	<0.001	0.67
	Control (Neurorehabilitation)	10.33	10.54	12.40 to 8.27	<0.001	0.47
Between-group comparison (Independent t-test)	Intervention vs Control		2.37	0.67 to 8.79	0.024	

Table 4 summarizes the statistical outcomes of within-group and between-group analyses as well as the magnitude of intervention effects on activities of daily living (ADL). Both the intervention and control groups demonstrated statistically significant improvements in ADL scores following the intervention period ($p < 0.001$). However, the mean improvement was greater in the intervention group receiving occupation-based intervention (OBI) compared with the control group receiving conventional neurorehabilitation. The independent t-test revealed a significant difference in post-intervention ADL outcomes between groups (p

= 0.024), indicating superior effectiveness of OBI over conventional neurorehabilitation. Furthermore, effect size analysis showed a moderate-to-large effect for OBI (Cohen's $d = 0.67$), whereas the control group demonstrated a moderate effect (Cohen's $d = 0.47$). Collectively, these findings indicate that occupation-based intervention not only produces statistically significant improvements but also yields clinically meaningful gains in functional independence among stroke patients.

DISCUSSION

This study investigated the comparative effectiveness of occupation-based intervention (OBI) and conventional neurorehabilitation in improving activities of daily living (ADL) among stroke patients. Overall, the findings indicate that both intervention approaches significantly enhanced ADL performance; however, patients who received OBI demonstrated greater functional improvement than those who underwent conventional neurorehabilitation. These results highlight the added therapeutic value of integrating meaningful daily activities into post-stroke rehabilitation programs.

Consistent improvements observed in both groups underscore the fundamental role of rehabilitation in post-stroke recovery. Conventional neurorehabilitation, which emphasizes repetitive motor exercises and sensorimotor stimulation, is known to promote neural reorganization and support functional recovery (Liang et al., 2024). The significant pre-post improvements in the control group confirm that structured neurorehabilitation remains an effective strategy for enhancing ADL abilities (Norwood et al., 2025). Nevertheless, the relatively smaller magnitude of improvement compared with the OBI group suggests that approaches focusing primarily on motor components may not fully address the complex functional demands of daily living (Ottonello et al., 2025).

Building on this observation, the superior outcomes achieved through OBI can be understood by examining its occupation-centered framework. Unlike conventional approaches, OBI directly incorporates activities that are meaningful and relevant to patients' everyday lives (Repšaitė et al., 2015). This integration enables patients to practice functional tasks in contexts that closely resemble real-world situations, thereby facilitating the transfer of therapeutic gains to actual daily performance (Rustamzadeh et al., 2026). As patients engage in activities aligned with their personal goals and routines, motivation and active participation are likely to increase, enhancing the overall effectiveness of rehabilitation (Savaedi et al., 2025).

Increased engagement may also explain the greater functional gains observed in the OBI group. Active participation in meaningful activities has been associated with heightened neural activation and improved neuroplastic responses, which are essential for functional recovery after stroke (Sethy et al., 2016). The moderate-to-large effect size observed in the OBI group supports the notion that occupation-centered interventions not only produce statistically significant outcomes but also yield clinically meaningful improvements (Sicherl & Bogataj, 2025). In contrast, although the control group exhibited moderate effects, these gains were comparatively smaller, reflecting the limitations of conventional rehabilitation when applied in isolation from functional task practice (Skubik-Peplaski et al., 2017).

The significant between-group difference further reinforces the superiority of OBI over conventional neurorehabilitation. This finding suggests that the observed improvements in the intervention group cannot be attributed solely to spontaneous recovery or general rehabilitation effects (Taufiq, 2024). Rather, they reflect the added benefit of embedding therapy within the context of daily activities. This aligns with previous research indicating that task-specific, goal-oriented training produces greater functional independence than impairment-focused interventions alone (Suprpto et al., 2023).

When examining improvements across participant characteristics, larger gains were generally observed among male participants, individuals in the late adulthood age group (46–59 years), and those with stroke onset of less than one year (Visser et al., 2021). These patterns are clinically meaningful and may be explained by differences in physical capacity, motivation, and neuroplastic potential. Patients in the productive age range often have stronger intrinsic motivation to regain independence, particularly in fulfilling social and occupational roles.

Similarly, individuals in earlier post-stroke phases benefit from heightened neuroplasticity, allowing interventions to exert more pronounced effects on functional recovery (Von Bosse et al., 2025).

These subgroup findings further emphasize the importance of timely and targeted rehabilitation. Early implementation of OBI may maximize functional gains by capitalizing on periods of heightened neural adaptability (Wall et al., 2024). Moreover, tailoring occupation-based activities to the specific needs and goals of patients across different age groups may enhance engagement and therapeutic outcomes. Such individualized approaches are consistent with contemporary models of patient-centered care in rehabilitation. From a clinical standpoint, the findings of this study advocate for a shift toward more occupation-centered rehabilitation models. While conventional neurorehabilitation remains valuable for restoring motor function, it may not sufficiently address the multifaceted nature of daily living activities. OBI complements motor recovery by fostering problem-solving skills, adaptive strategies, and confidence in performing everyday tasks. As a result, patients may experience not only improved functional independence but also enhanced psychological well-being and quality of life.

Despite these strengths, several limitations should be acknowledged. The quasi-experimental design and modest sample size may limit the generalizability of the findings. Additionally, the study focused on short-term outcomes, and long-term sustainability of ADL improvements was not assessed. Future studies employing randomized controlled designs with larger samples and extended follow-up periods are needed to validate the effectiveness of OBI further and explore its long-term benefits. This study demonstrates that occupation-based intervention is more effective than conventional neurorehabilitation in improving ADL performance among stroke patients. By integrating meaningful, goal-directed activities into rehabilitation, OBI facilitates greater functional recovery and clinically meaningful improvements. These findings support the incorporation of occupation-centered approaches into routine stroke rehabilitation practice to optimize patient outcomes and promote sustained independence in daily living.

CONCLUSIONS

This study concludes that both occupation-based intervention (OBI) and conventional neurorehabilitation significantly improve activities of daily living (ADL) in stroke patients. However, OBI demonstrates superior effectiveness, as indicated by greater mean improvement, significant between-group differences, and a larger effect size. These findings suggest that integrating meaningful, task-oriented activities into rehabilitation yields more substantial and clinically relevant functional gains. Based on these findings, occupation-based intervention should be considered a core component of post-stroke rehabilitation, particularly for patients in the early phase of recovery. Future research is recommended to employ randomized controlled designs with larger sample sizes and longer follow-up periods to confirm these results and evaluate the long-term sustainability of functional improvements associated with OBI.

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