



## **THE EFFECT OF PUZZLE AND CLOCK-DRAWING THERAPY ON COGNITIVE FUNCTION IN ISCHEMIC STROKE PATIENTS**

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### **Abstract**

According to the World Stroke Organization (WSO), there are 13.7 million new stroke cases and around 5.5 million deaths due to stroke each year. Based on the results of the 2023 Indonesian Health Survey (SKI), the prevalence of stroke in Indonesia is 8.7%. Meanwhile, in DKI Jakarta, the prevalence of stroke based on diagnosis among people aged  $\geq 15$  years is 13.5%. The most common type of stroke is ischemic stroke, with an increasing prevalence reaching 87% of all stroke cases. Stroke generally occurs in middle-aged and elderly populations. Stroke patients often experience cognitive impairment. Objective to determine the effect of puzzle and clock-drawing therapy on improving cognitive function in patients with ischemic stroke. Research method a quasi-experimental study using a one-group pretest–posttest design. The population in this study consisted of all ischemic stroke patients treated at Jakarta Islamic Hospital Pondok Kopi, totaling 34 patients. Research result the results showed a significant improvement in cognitive function before and after the administration of puzzle therapy and clock-drawing therapy. The majority of participants initially had mild cognitive impairment (88.2%), and after the intervention, most participants showed no cognitive impairment (70.6%). Data analysis using the paired sample *t*-test revealed a *p*-value of 0.001 with  $\alpha = 0.005$ , indicating that puzzle and clock-drawing therapy had a significant effect on improving cognitive function in ischemic stroke patients, with a significant difference in mean scores before and after the intervention. Conclusion puzzle and clock-drawing therapy have a positive effect on improving cognitive function in ischemic stroke patients. It is recommended that nurses assist ischemic stroke patients in maintaining memory by providing puzzle and clock-drawing therapy, which can help enhance cognitive function.

**Keywords:** *Puzzle and clock-drawing therapy, Ischemic stroke, Cognitive function*

@Jurnal Ners Prodi Sarjana Keperawatan & Profesi Ners FIK UP 2026

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## INTRODUCTION

Stroke is the leading cause of disability worldwide and the second leading cause of death after heart disease. However, approximately 90% of strokes can be prevented by controlling risk factors such as hypertension, smoking, unhealthy dietary patterns, physical inactivity, diabetes, and atrial fibrillation (16).

The most common type of stroke is ischemic stroke, with its prevalence reaching approximately 87% of all stroke cases. Stroke incidence is generally found among older adults and the elderly. However, an increasing trend in stroke occurrence has been observed in the young adult population. Adulthood is classified into early adulthood (18–40 years), late adulthood (41–60 years), and older age (>60 years) (25).

Stroke can also result in neurological disorders in patients or stroke survivors. One of the common neurological complications is seizures, which are a frequent neurological condition affecting stroke patients and may lead to cognitive impairment (30).

Cognitive impairment in stroke patients can adversely affect their ability to perform activities of daily living. Cognitive rehabilitation should therefore be considered an integral component of stroke management alongside physical therapy, as cognitive deficits also have a significant impact on the quality of life of stroke patients. This underscores the importance of addressing cognitive impairment in individuals with stroke (17).

Various non-pharmacological interventions have been implemented in individuals who have experienced hemorrhagic or non-hemorrhagic stroke and are experiencing cognitive impairment. Therefore, the development of effective non-pharmacological intervention programs is necessary to address cognitive decline in stroke patients (Sun et al., 2021). Numerous non-pharmacological approaches have been employed to manage cognitive impairment in stroke patients. A recent summary of guidelines from the American Academy of Neurology recommends cognitive training as one of the strategies to improve cognitive impairment (22).

Other studies have also demonstrated that combined interventions involving cognitive training and physical training provide greater benefits in reducing cognitive impairment in stroke patients (Bo et al., 2019; Amoros et al., 2021; Jiang et al., 2022).

Furthermore, subsequent studies have reported that brief and simple goal-setting interventions can improve cognitive function, particularly in executive function, memory, attention, and learning. These studies also indicate that cognitive impairment in stroke patients is not a permanent disability when appropriate care and rehabilitation are provided (Fishman et al., 2021).

One effective therapy for stroke patients with cognitive impairment and muscle damage is engaging in puzzle-solving activities (23). Puzzles are games composed of small pieces that, when assembled correctly, form a complete and meaningful image. Puzzle activities are introduced to patients as a form of therapy that simultaneously trains physical abilities and memory through play-based cognitive engagement. Puzzle therapy has been shown to improve cognitive skills in patients with mild cognitive impairment, and assembling puzzles may also assist stroke patients who experience gross motor impairments. The use of puzzle-based techniques in PIP interventions, such as brain-stimulating games including Brain Gym, has been reported to support the recovery of short-term memory in stroke patients (23). Picture puzzles are considered an effective tool for cognitive stimulation. During puzzle completion, older adults experience a sense of achievement. Picture puzzles help stroke patients enhance cognitive abilities by requiring concentration to correctly place puzzle pieces, which may also contribute to increased self-confidence. In addition, picture puzzles improve motor skills, as placing pieces into position requires grasping and releasing movements. Locating and fitting puzzle pieces also strengthens hand-eye coordination (5).

The current trend toward shortening the length of stay for stroke patients in care and rehabilitation settings has increased the importance of the ability to rapidly and accurately assess cognitive function in specific neurological populations. The identification of sensitive screening tools tailored to particular populations is therefore essential. The Clock Drawing Test (CDT) is a well-established cognitive assessment tool that requires individuals to draw a clock from memory (command clock) and to copy a displayed clock (copy clock).

Regarding stroke prevalence, the World Stroke Organization (WSO) reports approximately 13.7 million new stroke cases and about 5.5 million

stroke-related deaths worldwide each year (Setiawan, 2021). The World Health Organization (WHO) has also estimated that the number of deaths due to stroke will increase from approximately 6 million in 2010 to 8 million in 2020 (Jamini et al., 2020).

Therefore, this study aims to analyze the effect of puzzle therapy and clock-drawing activities on the improvement of cognitive function in patients with ischemic stroke at RS Islam Jakarta Pondok Kopi in 2025.

## METHODS

### 1. Study Design and Settings

This study employed a quasi-experimental design using a one-group pretest–posttest approach. The study was conducted at RS Islam Jakarta Pondok Kopi in November 2025. Cognitive function of the participants was assessed prior to the intervention (pretest) and reassessed after the intervention (posttest) to evaluate the effect of puzzle therapy and clock-drawing activities on cognitive function in patients with ischemic stroke.

### 2. Participants

The participants of this study were 34 patients diagnosed with ischemic stroke who were hospitalized at RS Islam Jakarta Pondok Kopi. A purposive sampling technique was used based on predefined inclusion and exclusion criteria. Eligible participants were patients with cognitive impairment, stable clinical conditions, the ability to communicate, and willingness to participate in the study. Patients with decreased consciousness or severe communication disorders were excluded.

### 3. Intervention

The intervention consisted of puzzle therapy and clock-drawing activities administered to all participants. Puzzle therapy involved assembling picture puzzles to stimulate cognitive functions such as attention, memory, and visuospatial abilities, while clock-drawing activities required participants to draw a clock based on given instructions to

enhance executive and visuospatial skills. The intervention was conducted in structured sessions under supervision during the hospitalization period and was applied consistently to all participants according to standardized procedures.

### 4. Data Collection Instruments

Data were collected using validated cognitive assessment instruments, including the Mini Mental State Examination (MMSE) and the Clock Drawing Test (CDT). The MMSE was used to assess general cognitive function, while the CDT was employed to evaluate executive and visuospatial functions. Data collection was carried out at two time points, namely before the intervention (pretest) and after the intervention (posttest), to determine changes in cognitive function following the intervention.

### 5. Data Analysis

Data were analyzed using statistical software. Univariate analysis was performed to describe the characteristics of participants and the distribution of cognitive function scores before and after the intervention. Data normality was tested using the Shapiro–Wilk test. Because the data were normally distributed, differences in cognitive function scores before and after the intervention were analyzed using a paired *t*-test. The level of statistical significance was set at  $p < 0.05$ .

### 6. Ethical Considerations

Ethical approval was obtained from the Ethics Committee of STIKes Abdi Nusantara, Jakarta (Approval No. 102/EC/STIKesAN/2025). All participants provided written informed consent. The study adhered to the principles of autonomy, beneficence, non-maleficence, and justice.

## CODE OF HEALTH ETHICS

If research is directly related to patients, and uses test animals in research. Please attach a research code of ethics related to your article.

## RESULTS. AND DISCUSSION

Table 1. Distribution of Cognitive Function Levels Before and After the Intervention

Cognitive Function	Pre-test n (%)	Post-test n (%)
No impairment	0 (0.0)	24 (70.6)
Mild impairment	30 (88.2)	10 (29.4)
Severe impairment	4 (11.8)	0 (0.0)
<b>Total</b>	<b>34 (100)</b>	<b>34 (100)</b>

Table 2. The Effect of Puzzle and Clock-Drawing Therapy on Cognitive Function in Patients with Ischemic Stroke

Variable	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	<i>p</i> -value
Puzzle and Clock-Drawing Therapy	19.67 ± 1.962	25.24 ± 3.095	0.001

\*Significant at  $p < 0.05$

Based on Table 1, the distribution of respondents' cognitive function levels before and after the intervention showed a significant change. In the pre-test, most respondents experienced mild cognitive impairment, accounting for 30 participants (88.2%), while 4 participants (11.8%) had severe cognitive impairment, and none had normal cognitive function. After the implementation of puzzle and clock-drawing therapy, the post-test results indicated that the majority of respondents had no cognitive impairment, with 24 participants (70.6%). Meanwhile, 10 participants (29.4%) remained in the mild cognitive impairment category, and no respondents were classified as having severe cognitive impairment.

Furthermore, as presented in Table 2, the mean cognitive function score increased after the intervention. The mean pre-test score was  $19.67 \pm 1.962$ , which increased to  $25.24 \pm 3.095$  in the post-test. Statistical analysis revealed a *p*-value of 0.001 ( $p < 0.05$ ), indicating that puzzle and clock-drawing therapy had a statistically significant effect on improving cognitive function in patients with ischemic stroke.

## Discussion

The findings of this study conducted from 03 to 29 November indicated that most respondents were male (76.5%) and aged over 40 years (82.4%). This result is consistent with previous evidence showing that males and older adults have a higher risk of stroke and post-stroke cognitive impairment due to lifestyle factors, vascular changes, and age-related neurological decline. These characteristics highlight the importance of targeted nursing interventions to improve cognitive function, particularly among male and middle-to-older aged patients with ischemic stroke. These findings indicate a predominance of male respondents and individuals aged over 40 years among patients

experiencing stroke. Stroke is known to occur more frequently in men than in women. This difference may be attributed to lifestyle factors, particularly the higher prevalence of smoking among men, which increases the risk of stroke. Cigarettes contain nicotine and other toxic substances that can damage the inner walls of blood vessels, leading to the adhesion of blood cells and lipid deposits. Over time, this process results in plaque formation, which obstructs cerebral blood flow and increases the risk of stroke.

Based on the results presented in Table 1, prior to the implementation of puzzle and clock-drawing therapy, 4 respondents (11.8%) experienced severe cognitive function impairment. This finding was supported by the pre-test assessment using the Mini Mental State Examination (MMSE) and observation sheets, which indicated that 30 respondents (88.2%) had mild cognitive function impairment. These results demonstrate that, before the intervention, respondents exhibited varying levels of cognitive function impairment.

Following the intervention, a substantial improvement in cognitive function was observed. The post-test results showed that 24 respondents (70.6%) were categorized as having normal cognitive function, while 10 respondents (29.4%) remained in the mild cognitive function impairment category. No respondents were classified as having severe cognitive function impairment after the intervention.

These findings are consistent with the study conducted by Selviyanti (2024), which reported that prior to the intervention, most ischemic stroke patients experienced mild cognitive function impairment (49 respondents; 89.1%), while 6 respondents (10.9%) had severe impairment. After the intervention, the majority of patients demonstrated normal cognitive function (36 respondents; 65.5%), with the remaining patients

classified as having mild cognitive function impairment (19 respondents; 34.5%).

Similarly, a study by Pedatu and Manda (2023) reported that pre-test results showed 14 respondents (70%) with severe cognitive function impairment, 5 respondents (25%) with mild impairment, and 1 respondent (5%) with normal cognitive function. In contrast, post-test results demonstrated improvement, with 12 respondents (60%) achieving normal cognitive function and 8 respondents (40%) classified as having probable cognitive impairment, with no respondents experiencing definitive cognitive impairment.

The findings showed an increase in the mean cognitive function score from 19.97 (pre-test) to 25.24 (post-test), with standard deviations of 1.962 and 3.095, respectively. Statistical analysis demonstrated a significant difference between pre- and post-intervention scores ( $p = 0.000$ ;  $p < 0.05$ ), indicating that puzzle and clock-drawing therapy had a significant effect on improving cognitive function in stroke patients.

These results are consistent with previous studies, including Khoirotunnisa (2020), which reported a significant improvement in cognitive function following puzzle-based cognitive interventions. Puzzle games and clock-drawing activities provide continuous cognitive stimulation involving attention, memory, visuospatial ability, and executive function, which are essential for cognitive recovery after stroke. Therefore, the findings of this study confirm that puzzle and clock-drawing therapy is an effective non-pharmacological intervention for enhancing cognitive function in patients with ischemic stroke.

## CONCLUSION

Most respondents were over 40 years of age and male. Prior to the intervention, the majority of respondents experienced mild cognitive impairment. After the implementation of puzzle and clock-drawing therapy, most respondents demonstrated normal cognitive function. The findings indicate that puzzle and clock-drawing therapy has a significant effect on improving cognitive function in patients with ischemic stroke at RS Islam Jakarta Pondok Kopi.

## FUNDING

This research received no external funding.

## ACKNOWLEDGMENTS

The authors would like to express their sincere gratitude to RS Islam Jakarta Pondok Kopi for facilitating this study. Appreciation is also extended to all patients who willingly participated in this research.

## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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