



**MOTOR RELEARNING PROGRAM THERAPY IN STROKE
SURVIVORS AIMS TO PREVENT RECURRENCE OF STROKES WHILE
ALSO IMPROVING MOVEMENT AND FUNCTIONAL ABILITY**

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ABSTRACT

Background: Stroke is the most common central nervous system disorder and the leading cause of functional impairment. Stroke-related illnesses are difficult. Movement and function issues in stroke patients are related to an inability to regulate body weight transfer as well as a deterioration in muscle movement capacity, resulting in a loss of balance.

Objective: to analyze motor relearning program therapy in stroke survivors aims to prevent recurrence of strokes while also improving movement and functional ability

Methods: This type of research is a quasi-experimental pre-posttest with a control group design. The population in this study was all recurrent strokes at Medan in the last three months, with an average of 120 recurrent strokes. **This study is non-probability sampling with a purposive sampling.** Sample number using the Lameshow formula and obtained 120 recurrence strokes, 60 intervention group 60 control group. The study initially employed the T-test.

Results: There were differences in movement and standing balance function before and after Motor Relearning Program (MRP) therapy

Conclusion: There were differences in movement and standing balance function before and after Motor Relearning Program (MRP) therapy. Future researchers should conduct further studies on pharmacological and non-pharmacological supportive therapies, such as electrical acupuncture or muscle and nerve training.

Keywords: Stroke, Motor Relearning Program, Berg Balance Scale, Standing balance, Quasi-experiment

ABSTRAK

Latar Belakang: Stroke merupakan gangguan sistem saraf pusat yang paling umum dan penyebab utama gangguan fungsi. Penyakit yang berhubungan dengan stroke sulit diobati. Masalah pergerakan dan fungsi pada pasien stroke berkaitan dengan ketidakmampuan mengatur perpindahan berat badan serta penurunan kapasitas gerak otot, yang mengakibatkan hilangnya keseimbangan

Tujuan: Menganalisis program terapi relearning motorik pada penyintas stroke yang bertujuan untuk mencegah kekambuhan stroke sekaligus meningkatkan kemampuan pergerakan dan fungsi.

Metode: Jenis penelitian ini adalah eksperimen semu dengan desain pre-posttest with control group. Populasi dalam penelitian ini adalah seluruh penderita stroke kekambuhan di Medan dalam tiga bulan terakhir, dengan rata-rata 120 kasus stroke kekambuhan. Penelitian ini menggunakan non-probability sampling dengan purposive sampling. Jumlah sampel menggunakan rumus Lameshow dan diperoleh 120 kasus stroke kekambuhan, 60 kelompok intervensi dan 60 kelompok kontrol. Penelitian ini awalnya menggunakan uji-T.

Hasil: Terdapat perbedaan fungsi gerakan dan keseimbangan berdiri sebelum dan sesudah terapi Motor Relearning Program (MRP).

Kesimpulan: Terdapat perbedaan fungsi gerakan dan keseimbangan berdiri sebelum dan sesudah terapi Motor Relearning Program (MRP). Peneliti selanjutnya disarankan untuk melakukan studi lebih lanjut tentang terapi suportif farmakologis dan non-farmakologis, seperti akupunktur elektrik atau latihan otot dan saraf.

Kata Kunci: Stroke, Motor Relearning Program, Skala Keseimbangan Berg, Keseimbangan berdiri, Kuasi-eksperimen

INTRODUCTION

Stroke is the most frequent central nervous system illness and a primary cause of functional disability. Stroke-related disorders are complicated. (Chavan & Raghuvver, 2023). These illnesses interfere with critical brain processes such as coordination, postural control, sensory, motor

reflexes, and balance, which can affect an individual's everyday functioning tasks. (Lee et al., 2020). Movement and function difficulties in stroke patients are associated with an inability to manage body weight transfer and a decline in muscular movement capacity, resulting in a loss of balance. (Menezes-Oliveira et al., 2024). The Berg Balance Scale (BBS) was created to assess functional task performance in people with decreased balance function. (Joa, 2024). Stroke is still the world's second greatest cause of death and third largest cause of death and disability combined (as measured by disability-adjusted life-years lost, or DALYs). The projected worldwide cost of stroke is more than \$721 billion (0.66% of global GDP). From 1990 to 2019, the burden (in terms of the absolute number of cases) increased significantly (70.0% increase in incident strokes, 43.0% deaths from stroke, 102.0% prevalent strokes, and 143.0% DALYs), with lower- and lower-middle-income countries accounting for the majority of the global stroke burden (86.0% of deaths and 89.0% of DALYs, respectively). This World Stroke Organization (WSO) Global Stroke Fact Sheet 2022 contains the most recent information that can be used to inform communication with all internal and external stakeholders; all statistics have been reviewed and approved for use by the WSO Executive Committee and leaders from the Global Burden of Disease research group. (Feigin et al., 2022). The number of stroke patients in Indonesia continues to rise year after year, reflecting changes in people's lives. Indonesia now has the most stroke patients in Asia. Activity and functional deficits, such as standing balance, in stroke patients are related to an inability to control weight transfer and diminished muscle activity, which leads to poor balance. (Turana et al., 2021). These issues lead post-stroke individuals to have difficulty doing functional tasks. Good balance is required to execute functional activities. Therefore, efforts to enhance standing balance in stroke patients require both pharmaceutical and non-pharmacological therapy. There are other non-pharmacological treatments, including the Motor Relearning Program (MRP) (Ghrouz et al., 2024). The Motor Relearning Program is a specialized program that combines cognitive processes, movement science and psychology, training, neuroanatomy, and physiology, and the philosophy of normal life. (Ghrouz et al., 2022) . The Motor Relearning Program has seven training components: bridge exercises, lying-to-sitting exercises, sitting balance exercises, upper extremity function exercises, sitting-to-standing activities, standing balance exercises, and walking balance exercises. (Zheng et al., 2024). The Motor Relearning Program activities will help stroke victims improve their standing balance. (Sawarkar et al., 2024). Based on the above, the author is interested in researching Motor Relearning Program Therapy In Stroke Survivors, Aims to Prevent Recurrence of Strokes While Also Improving Movement and Functional Ability. This research has received a letter of ethical approval from Universitas NHM with number: No. 2760/KEPK/UNIV-NHM/EC/II/2025

METHOD

Participant characteristics and research design

The subject matter is an effect size investigation, trying to explain, estimate, and test associations based on current theories to see the link between the variables independent is Motor Relearning Program (MRP) and the variables dependent is activity and functional deficits, such as standing balance. This type of research is a quasi-experiment pre-posttest with a control group design. The population in this study was all recurrent strokes at Medan in the last three months, with an average of 120 recurrent strokes.

Sampling procedures

The sampling technique in this study is non-probability sampling with a purposive sampling technique, and is taken according to the criteria. Inclusion criteria: recurrent strokes < 1 years, Exclusion criteria: Has a history of osteoporosis and osteomyelitis, fracture history, and extremities abnormalities.

Sample size, power, and precision

Sample number using the Lameshow formula and obtained 120 recurrence strokes, 60 intervention group 60 control group. The variables that are seen here are independent variables: Motor Relearning Program (MRP), and dependent variables, which are activity and functional deficits, such as standing balance. The instruments in this study are Berg Balance Scale is very reliable, with inter-rater reliability evaluated at 0.97 (95% CI 0.96 to 0.98) and intra-rater reliability calculated at 0.98 (95% CI 0.97 to 0.99). The Berg Balance Scale's absolute dependability ranges across the scale, with minimum discernible variation at 95% confidence ranging from 2.8/56 to 6.6/56.

Measures and covariates

The method of collecting data in this research is using primary data, because the researcher collected the data by using the Berg Balance Scale is very reliable, with inter-rater reliability evaluated at 0.97 (95% CI 0.96 to 0.98) and intra-rater reliability calculated at 0.98 (95% CI 0.97 to 0.99). Which had been tested for validity and reliability.

Data analysis

The univariate analysis performed produced the frequency and percentage values of each variable studied and the distribution of the Socioeconomic status, education level, Residence, Age, Employment status, and Wealth status, and dependent variables, which are the standing balance. The study initially employed the T-test. Subsequently, a collinearity test was conducted to determine whether there was a statistically significant effect size of the independent variables. Additionally, we utilized the IBM SPSS Statistics 26 software to conduct the statistical analyses for the survey, and the statistical test results were obtained using a 95% degree of significance, and the error rate (α) = 5%. For the interpretation of the results, if the p-value of the value α is 0.05.

RESULTS AND DISCUSSION

Characteristic of Respondents

The study showed that the proportion of recurrent strokes

Table 1 The Results of Univariate Analysis (n=120)

Characteristics (n=120)	Mean±SD Experiment Group (EG) (n=60)	Mean±SD Control Group (CG) (n=60)
Age (M)	38±12.7	35±10.2
Living in one house (years)	5.10±2.01	7.40±4.29
	N =%	N =%
Gender		
Male	36 (60)	31 (51)
Female	24 (40)	29 (49)

Marital status		
Divorced / never married / widow	47 (78)	41 (68)
Married	13 (22)	19 (32)
Employment		
Full-time/part-time	13 (21)	16 (26)
Unemployed/retired / student	47 (79)	44 (74)
Education		
Primary	17 (28)	11 (18)
Middle	35 (58)	37 (61)
High	8 (14)	12 (21)
Duration of illness		
<1 year	7 (11)	6 (10)
1-5 years	33 (55)	32 (53)
> 5 years	20 (34)	22 (37)

Bivariate Analysis

Table 2: The Results of T-Test Analysis (n=120)

Variables		Group	Mean ± SD	p-value Normality	p-value	p-value
Berg Balance Scale	EG	Pre	47.78±8.05	0.380	0.001 ^a	0.001 ^b
		Post	23.31±5.18	0.450		
	CG	Pre	45.24±2.26	0.248	0.004 ^a	
		Post	39.47±7.80	0.193		

EG=Experiment Group; CG=Control Group; $\alpha = 0.05$; ^aPaired t test ; ^bIndependent t test

Table 1 shows the findings of bivariate analysis. Based on the Age Experiment Group (EG) Mean±SD (38±12.7) is higher than the Control Group (CG). This is substantiated by a study, which comprised 204,244 postmenopausal women with no history of stroke at baseline (7,883 from EPIC-CVD (5,292 from the subcohort), and 196,361 from UK Biobank). The combined mean age at baseline was 58.9 years (SD, 5.8), while the combined mean age at menopause was 47.8 years (SD, 6.2). Over a median follow-up of 12.6 years (interquartile range, 11.8-13.3), 6,770 women had a stroke (5,155 ischemic, 1,615 hemorrhagic, 976 intracerebral hemorrhage, and 639 subarachnoid hemorrhage). Early menopause is related to an increased risk of stroke. We discovered no statistically significant link between genetically predicted age at menopause and stroke risk, implying a causal connection (Tschiderer et al., 2023). Besides that, Additional information, according to Living in one house (7.40±4.29) CG have a more in a moment than EG. in line with other research that The research investigation determined one key theme (optimism and hope) in the first phase, four key themes in the second (pre-discharge emotional concerns and reactions, lack of stroke knowledge and stroke care information, difficulties of performing home-based healthcare, expectation of hospital pre-discharge), and in the third phase (high level of post-discharge stress, inaccessible post-discharge care services and health resources, interpersonal relationship disruption, and life In addition, multiple interrelated subthemes for stroke survivors' and caregivers' experiences were found during each phase (Lin et al., 2022). whereas, based on Gender, males 36 (60%) have a higher percentage than females at EG, the exact same percentage

at CG, males 31 (51%). This is in line with research that states that sex and gender differences are complex topics in medicine, and acute stroke is no exception. Several important differences among acute stroke patients are related to biological/pathophysiological factors, or sociocultural factors, such as education, power, and financial status (Ospel et al., 2023). Meanwhile, based on Marital status, Divorced / never married / widow 47 (78%) have a more than the Married at EG, the exact same rate at CG status Divorced / never married / widow 41 (68%). The results we report highlight the impact of marital/partner status on PROMs in stroke patients' mental health, but not on human resource quality of life. Future research should seek to unify evaluation and standardize reporting to further examine this relationship, identify gender-based disparities, and investigate the relationship between marital/partner status and poststroke functional outcomes (Zhu et al., 2025). According to Employment Variable, Unemployed / retired / student 47 (79%) have more in a moment than Full-time/part-time at EG. The exact same at CG Unemployed / retired / student 44 (74%). whereas, based on Education, middle level 36 (60%) have a higher percentage than other education levels at EG, the same at CG, Middle level 37 (61%). Whereas, based on Duration of illness, 1-5 years 33 (55%) have a more than less than 1 year and more than 5 years at EG, the exact same at CG, 1-5 years 32 (53%). The usual age of stroke survivors was 62.08 years, whereas caregivers was 32.5. The female stroke survivors were all homemakers, whereas the males were government employees, private employees, businesspeople, farmers, or retirees. The majority of female caregivers were homemakers, whereas all male caregivers worked on a daily basis. Many stroke survivors were uneducated (five), whereas the others had attended school. One of the caretakers was illiterate, whereas most of them had gone to school (Tiwari et al., 2021). The results of the Paired T test and the Independent T test analyses are displayed in Table 2. According to this analysis indicates that the standing balance to the stroke patients on EG have a higher standing balance (47.78 ± 8.05) than CG, regarding pre-post analysis on EG ($p=0.001$) and on CG ($p=0.004$). Besides that result independent T Test analysis ($p=0.001$), The data presented implies that There was no contribution of Motor Relearning Program (MRP) to the activity and functional deficits, such as standing balance in EG and CG, Reinforced in other studies that MRP into rehabilitation showed some evidence of improvement in upper limb function and impairment post stroke (O'Rourke & Edwards, 2024). A motor relearning program combined with electrical stimulation effectively improves upper limb function in individuals with sub-acute stroke (Ullah et al., 2020). The findings of several evaluation tools (instrumental and outcome measures) will be compared between the two groups to ensure the usefulness of MRP-based task-specific training. The findings of this study can help us better understand stroke rehabilitation. Furthermore, the current study aims to help bridge the current knowledge gap in rehabilitation and training recommendations in the stroke population by providing a therapeutic plan in post-stroke rehabilitation that focuses on the use of task-specific training to help patients return to their daily functional activities in the community quickly and effectively (Ghrouz et al., 2022). The motor relearning groups showed a clinically meaningful improvement, which was only significant in one trial when compared to another intervention (Mateus-Aria et al., 2023). A Motor Relearning Program (MRP) outperforms functional training in increasing walking abilities in post-stroke patients (Umardi et al., 2025)

LIMITATION OF THE STUDY

The researchers acknowledged the study's limitations. First, the patient's history of stroke, cardiovascular complications, and nervous system conditions such as cerebral palsy and a history of brain infection were excluded. Therefore, the Motor Relearning Program (MRP) treatment could

be combined with other therapies, such as acupuncture and exercise, to strengthen nerve and muscle activity and function to prevent atrophy.

CONCLUSIONS AND SUGGESTIONS

There were differences in movement and standing balance function before and after the Motor Relearning Program (MRP) therapy. Future researchers should conduct further studies on pharmacological and non-pharmacological supportive therapies, such as electrical acupuncture or muscle and nerve training.

ETHICAL CONSIDERATIONS

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Conflict of Interest

No conflict of interest that is directly or indirectly related to the current article was found.

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