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Efficacy of Nurse-Led Rehabilitation Intervention on Activity of Daily Living, Mobility Motor Function of Stroke Survivors: A Randomized Controlled Trial

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Abstract

Background: Stroke stands as a prominent contributor to enduring disability, inflicting motor and functional limitations upon survivors, significantly impacting their quality of life. Mirror therapy, a cost-effective and easy-to-use method, is increasingly employed in stroke rehabilitation to alleviate sensory-motor impairments and expedite limb recovery. This promising technique harnesses visual feedback to enhance neuroplasticity and boost post-stroke motor function. ***Methods:*** A randomized controlled trial was conducted among thirty stroke survivors; participants were assigned to either a mirror therapy (MT) group (n=15) or a standard rehabilitation group (n=15). The MT group underwent five 15-minute daily sessions for 21 days. Baseline data, including Barthel Index and Rivermead Mobility assessments, were gathered pre-intervention. Three-week post-intervention assessments targeted to investigate outcomes of MT in motor mobility and daily living activities in functional independence among stroke survivors. ***Results:*** A notable age difference was observed between the intervention (59±7.78) and comparison groups (58.8±6.50). The intervention group showed slightly more effects in Gross Function (d=0.162 vs. 0.132), Leg & Trunk (d=0.191 vs. 0.219), and Arm Function (d=0.323 vs. 0.205). Barthel Index effect size increased from small (d=0.261, CI 0.217–1.393) to large (d=0.172, CI 1.850–4.339). ANCOVA indicated no heteroscedasticity (F=0.704, p>0.05). A strong correlation (r=0.98) was found between daily functioning and motor function gains. ***Conclusion:*** MT effectively enhances daily activities in stroke survivors. However, statistical analysis showed no significant difference between groups in Rivermead scores (t = 0.17, p = 0.87). Yet, additional longitudinal studies are needed to thoroughly assess its impact on motor function improvement.

Keywords: Nurse-Led Interventions, Rehabilitation, Activity of Daily Living, Mobility Motor Function, Stroke Survivors.

INTRODUCTION

Stroke is a leading cause of long-term disability globally, with significant consequences for individuals' mobility and functional independence. It is estimated that approximately 25% of individuals aged 25 and older worldwide will experience a stroke in their adult lives, with an increasing risk among the elderly population [1]. Aging, particularly after the age of 55, is a major non-modifiable risk factor, and the incidence of stroke is expected to rise as the number of individuals aged 65 and older increases [2]. The prevalence of stroke is compounded by the impact of COVID-19, which has been shown to increase the risk of ischemic stroke, exacerbating the global burden of the condition [1]. Moreover, stroke survivors often face a range of impairments, particularly affecting the upper limbs, with around 85% of survivors experiencing hemiplegia, and 69% encountering functional limitations in their upper extremities [7]. This can significantly impact their ability to perform activities of daily living (ADLs) and instrumental activities of daily living (IADLs), resulting in reduced quality of life and increased dependency.

A stroke, which occurs due to a disruption in the brain's blood supply either through ischemia or bleeding can lead to significant neurological impairments. The World Health Organization defines a stroke as a cerebrovascular-related neurological deficiency that may result in death within 24 hours or cause lasting damage. The basic symptoms of a stroke include motor and sensory deficits, cognitive impairment, speech

difficulties, dizziness, imbalance, and blurred vision [3]. These impairments, particularly those affecting the upper limbs, contribute significantly to post-stroke disability. Approximately 80% of stroke survivors face motor impairments, with half of these individuals also experiencing upper limb pain within the first year after the event [9]. Traditional rehabilitation therapies have made some progress, but many stroke survivors still struggle with regaining full motor function in the affected limbs, with conventional methods often proving inadequate [8].

Innovative and cost-effective rehabilitation approaches, such as mirror therapy, are being explored to address challenges in stroke rehabilitation. Mirror therapy, initially developed for phantom limb pain, involves using a mirror to create a visual illusion of normal limb movement [10]. This technique shows promise in enhancing neuroplasticity and motor function by stimulating the brain's mirror neuron system [12, 13]. Despite its accessibility and affordability, further research is required to establish its effectiveness and integration into clinical practice.

The increasing incidence of stroke, especially in aging populations, highlights the urgent need for effective rehabilitation strategies to enhance functional outcomes in stroke survivors with upper limb impairments. Motor dysfunction, like hemiparesis, affects most survivors, impacting independence and quality of life [4]. Limited accessibility and affordability of existing therapies underscore the need for more cost-effective and widely available treatment options for motor recovery [6].

Mirror therapy, a cost-effective option, shows promise in improving motor function for stroke survivors by stimulating brain motor areas through visual feedback [13, 14]. Despite its potential, further research is needed to determine its effectiveness and application in clinical practice for upper limb recovery.

This study aimed to fill this gap by investigating the impact of mirror therapy in improving mobility motor function recovery and functional independence- daily living activities in stroke survivors by a randomized controlled trial. By evaluating the impact of mirror therapy on neuroplasticity, functional recovery, need to find out the relationship between mobility motor function and functional independence-activity of daily living.

Therefore, the research question for this randomized controlled trial was:

How did the impact of Mirror Therapy compare to usual standard hospital care rehabilitation interventions in improving motor function and activity of daily living?

METHOD

Design

A randomized controlled trial was conducted in the form of experimental pre-test post-test design. All stroke survivors were involved in the study who fulfil the inclusion criteria of the study. Approval through appropriate authorities and ethics committees was obtained for the trial. The study was adhered to tertiary care hospital and all government regulations pertaining the ethical use of study participants and carried out in the Medicine and Neurology Department of a tertiary care hospital of Patna, Bihar in India. A secure and safe environment was established prior to start of the trial and eligible study participants scrutinized in the recruitment process and allocation schedule was concealed from study participants and randomly allocated in either interventional group (n=15) and comparison group (n=15) by blocked randomization method.

Participants

In-patients stroke survivors aged 18 and above, diagnosed with ischemic or hemorrhagic stroke, and admitted to selected tertiary care hospitals were recruited over a 5-month period commencing from July -2023 to November-2023. Eligible participants were those expected to be discharged for home care within 21 days, not in an acute coma or requiring ventilatory support, and willing to undergo the proposed interventions. Exclusions comprised stroke survivors declining participation, individuals with significant comorbidities (e.g., severe circulatory, digestive, blood, or endocrine disorders), acute conditions (e.g., epilepsy), mental health disorders (e.g., schizophrenia, psychosis), and pre-existing disabilities. Participants who were not present during the intervention and data collection periods were also ineligible for the study.

Interventions

Interventional group

Study participants in the interventional group were given Nurse-Led Rehabilitation Intervention as Mirror therapy interventions involving using a mirror to create a reflective illusion of movement in the affected limb. The hemiplegic patients received this therapy on specific tasks (upper limb wrist and elbow flexor, extensor and lower limb exercises for 15-minute mirror therapy session, five sessions daily for 21 days until discharge as per the hospital's protocol. Stroke patients were seated on comfortable position and keep them aware during the therapy sessions. A vertical face mirror (As per the need) (60 × 30 cm) was placed on the desk in a sagittal plane. The paralyzed limb was positioned behind the mirror, while the non-paralyzed limb was placed in front of the mirror, creating the illusion that the affected hand was responding[11]. If more than one implication was chosen to get benefits from such training which was directly and indirectly based upon clinician subjective judgment after relevant factors.

The Mirror therapy intervention was demonstrated by the principal investigator and during each session, study participants performed repetitions at least for defined period of 15 minutes for 5 times a day as well as usual therapy sessions. During each session, participants were given rest if they fatigued and encouraged to take a brief recuperation of 3-4 minutes between each session set of 5 repetitions. The information of mirror therapy interventions recorded in a dedicated diary after each session. Post-test evaluations for both groups were conducted using the Barthel Index and Rivermead Motor Function activity tool after discharge from hospital.

Comparison group

Study participants in the comparison group received usual standard hospital care rehabilitation interventions.

Outcome Measures

The study evaluated improvements in mobility motor function, and daily living activities following mirror therapy using standardized tools: the Rivermead Motor Function Assessment (RMFA) and the Barthel Index.

Socio-demographic and clinical characteristics

Baseline socio-demographic and clinical data were collected through face-to-face interviews using a 17-item questionnaire.

Barthel Index for Activity of daily living

The Barthel Index assessed functional independence through 10 activities, including feeding, bathing, dressing, toileting, mobility, and stair use. Scores ranged from 0 to 15 per item, with higher scores indicating greater independence. A post-test was conducted at the trial's end to assess participants' progress.

Rivermead Motor Function Assessment (RMFA) for Mobility motor function

The RMFA evaluated motor function across three sections: (A) gross functions (13 items), (B) leg and trunk functions (10 items), and (C) arm functions (15 items). Responses were scored as 0 (unable to perform) or 1 (able to perform). Each item was attempted three times, with gross and arm function testing discontinued after three consecutive zero scores, whereas all leg and trunk function items were assessed. These standardized tools ensured consistent evaluation of participants' mobility and functional improvements.

Statistical Analysis

Sample size was determined in a priori in the published study, using the daily living activities and Mobility motor function score as the primary outcome. In brief, the calculation took alpha as 0.05, power as 80%, the smallest worthwhile effect as 15 points and the standard deviation as 14.8 points. It indicates that approximately 31 participants would require for the study. The findings of the study were analyzed using SPSS-27 software package version.

RESULTS

Trial Adherence

The intended sample size was obtained. The prospective registered outcome measures were collected. There was not any serious adverse event related to the intervention were reported. Study participants' compliance with the experimental intervention is discussed further.

As per the trial protocol, participants in the interventional group were requested to perform mirror therapy sessions exercises to 15 minutes for 5 times a day. After 3 weeks of under supervision. All interventional group participants were participated in regular mirror therapy interventions instead of any public holiday.

Participants

The flow of the study participants through the trial is given the figure 1. There was total 85 stroke survivors were recruited and screened for eligibility criteria 53 and 30 were randomized into interventional and comparison groups. There was not any single study participant dropped out from the trial.

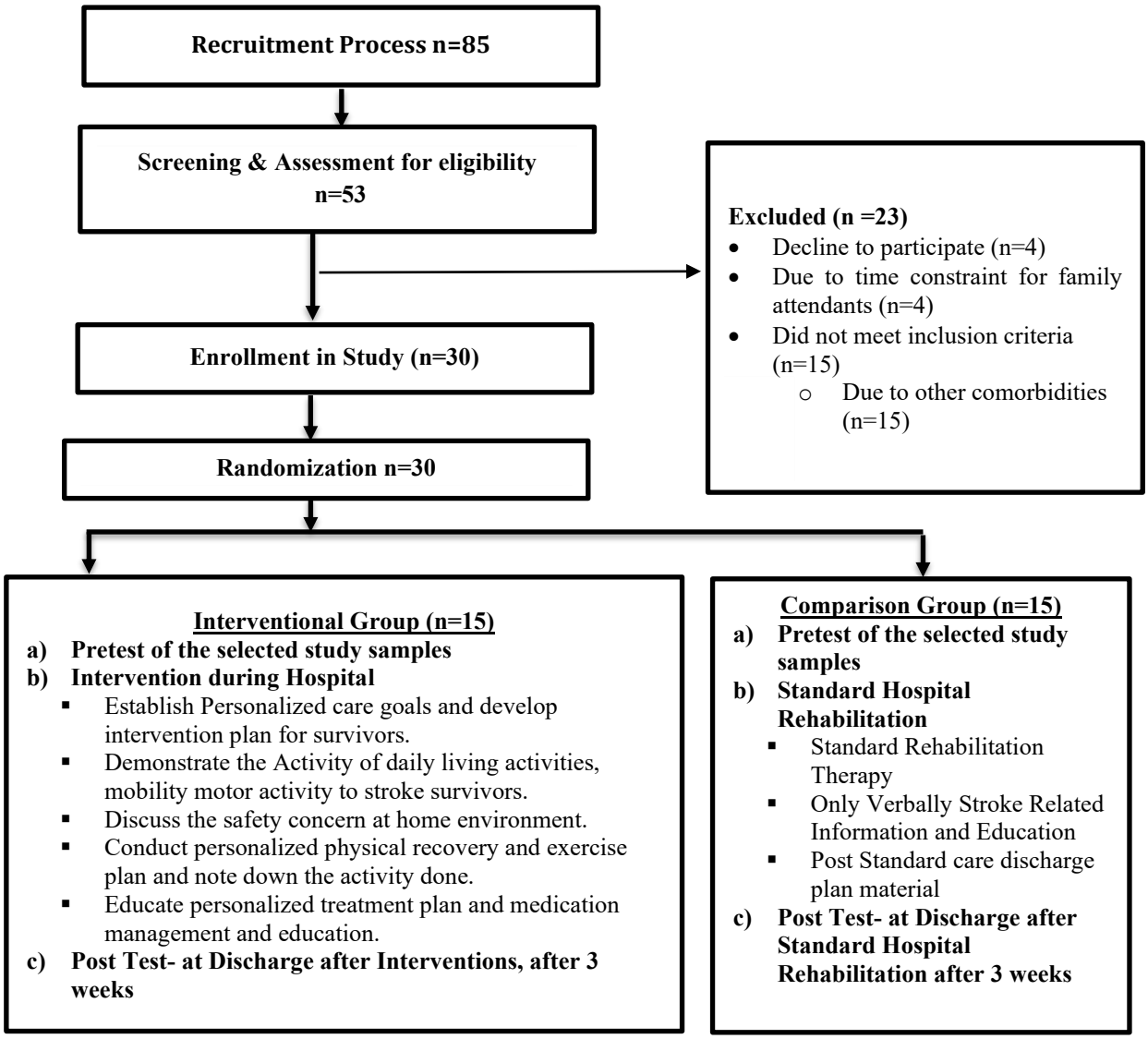

Figure 1: Flow of the study process

Table 1: Baseline characteristics of stroke survivors

S. No.	Baseline Characteristics	Interventional (n=15)		Comparison (n=15)	
1.	**Age**	**n (%)**	**Mean± SD**	**n (%)**	**Mean± SD**
	41-55	05(33.3%)		05(33.3%)	
	56-70	09 (60%)	59±7.78	10 (66.7)	58.8±6.50
	Equal and above 70	01 (6.7%)		00 (-)	
2.	**Gender**				
	Male	10(66.7%)	1.33±.488	11(73.3%)	1.27±0.458
	Female	05(33.3%)		04(26.7%)	
3.	**Marital Status**				
	Married	08(53.3%)	2.93±1.03	12 (80%)	2.40±0.828
	Widower /Widow	07(46.7%)		03 (20%)	
4.	**Religion**				
	Hindu	13(86.7%)	1.13±0.352	13(86.7%)	1.13±0.352
	Muslim	02(13.3%)		02(13.3%)	
5.	**Types of Family**				
	Joint	07(46.7%)	1.53±0.516	04(26.7%)	1.73±0.458
	Nuclear	08(53.3%)		11(73.3%)	
6.	**Area of Dwelling**				
	Rural	06 (40%)		08(53.3%)	
	Semi Urban	08(53.3%)	1.67±0.617	06 (40%)	1.53±0.640

S. No.	Baseline Characteristics	Interventional (n=15)		Comparison (n=15)	
	Urban	01 (6.7%)		01 (6.7%)	
7.	**Educational Status**				
	Illiterate	05(33.3%)		06 (40%)	
	Primary, Middle School Level	06 (40%)		05(33.3%)	
	Secondary and Higher Secondary School Level	02(13.3%)	2.20±1.32	03 (20%)	2.07±1.22
	Graduate and Above Level	02(13.3%)		01 (6.7%)	
8.	**Occupational Status**				
	Skilled	03(20%)	1.80±0.414	04(26.7%)	1.73±0.458
	Unskilled	12(80%)		11(73.3%)	
9.	**Total Monthly Family Income (Rs.)**				
	Less than 6000	01 (6.7%)		02(13.3%)	
	6001-18000	08(53.3%)	2.33±0.617	10(66.7%)	2.20±0.862
	18001-31000	06 (40%)		01 (6.7%)	
	31001-46000	00		02(13.3%)	
10.	**Total number of family members**				
	Three (3)	03 (20%)		02(13.3%)	
	Four (4)	09 (60%)	4±0.655	07(46.7%)	4.27±0.704
	Five and More than Five	03 (20%)		06 (40%)	
11.	**Any Insurance Facility available**				
	No other medical insurance	15 (100%)		12 (80%)	
	Govt Medical Insurance Scheme	00	-	02(13.3%)	3.47±1.12
	Private Insurance	00		01 (6.7%)	
12.	**Substance Abuse**				
	Tobacco	07(46.7%)		06 (40%)	
	Both Tobacco and Alcohol	06 (40%)	2.47±1.72	06 (40%)	2.80±1.89
	None of the above	02(13.3%)		03 (20%)	
Note: SD- Standard Deviation					

Table 1 showing the study participants, primarily aged 56-70, were compared in terms of sociodemographic characteristics. Significant differences were noted in marital status, education levels (higher illiteracy in the interventional group), and occupational distribution (mainly unskilled workers in both groups). Both groups had no medical insurance, high tobacco use, and similar income ranges. Family sizes were comparable, with differences in income distribution. While age and religion were similar, distinct variations were observed in marital status, family structure, and substance use. The majority in both groups were Hindu, with differences in family types and residential areas.

Table 2: Clinical characteristics of stroke survivors

S. No.	Clinical Characteristic	Interventional (n=15)		Comparison (n=15)	
1.	**Types of strokes**	**n (%)**	**Mean± SD**	**n (%)**	**Mean± SD**
	Ischemic Stroke	11 (73.7%)		12 (80%)	
	Haemorrhagic Stroke	04 (26.3%)	1.27±0.458	03 (20%)	1.20±0.414
2.	**Suffering from stroke since**				
	0-7 days	10 (66.7%)	1.33±0.488	10 (66.7%)	
	8-14 days	05 (33.3%)		05 (33.3%)	1.33±0.488
3.	**Location of any disability**				
	Right Upper Limb	03 (20%)		02 (13.3%)	
	Left Upper Limb	05 (33.3%)		09 (60%)	
	Right Upper and Lower Limb	01 (6.7%)	2.67±1.23	00 (-)	2.40±1.05
	Left Upper and Lower Limb	06 (40%)		04(26.7%)	
4.	**Severity of stroke as per clinical assessment**				
	Mild	02 (13.3%)	1.87±0.352	00 (-)	-
	Mild to Moderate	13 (86.7%)		15 (100%)	
5.	**Any Comorbidity**				
	Hypertension	04 (26.7%)		04 (26.7%)	
	Diabetes	00(-)	2.47±0.915	02 (13.3%)	2.33±0.901
	Hypertension and diabetes	11 (73.3%)		09 (60%)	
Note: SD- Standard Deviation					

In Table 2, clinical characteristics of stroke survivors in the experimental and comparison groups were compared. Ischemic stroke was more common in the comparison group (80%), while hemorrhagic stroke was prevalent in the interventional group (26.7%). Most participants had strokes within 0-7 days, with varied limb disabilities and severity levels. The interventional group showed unique disability patterns and higher hypertension, and diabetes rates compared to the comparison group.

Table 3: Analysis of activity of daily living effect sizes in interventional and comparison groups: Standard Deviation (SD), Point Estimation, and Mean (95% CI)

Paired Samples Effect Sizes						
Barthel Index			**Standardizer[a]**	**Point Estimate**	**95% Confidence Interval**	
					Lower	**Upper**
Pre-test	Interventional and Comparison Group	Cohen's d	0.261	0.816	0.217	1.393
		Hedges' correction	0.269	0.794	0.211	1.355
Post-test	Interventional and Comparison Group	Cohen's d	0.172	3.104	1.850	4.339
		Hedges' correction	0.177	3.020	1.800	4.222
a. The denominator used in estimating the effect sizes. Cohen's d uses the sample standard deviation of the mean difference. Hedges' correction uses the sample standard deviation of the mean difference, plus a correction factor.						

Table no 3 shows the effect sizes of the Barthel Index suggest, that the intervention had a small effect on the groups during the pre-test phase (Cohen's d = 0.261, Hedges' correction = 0.269), but after the intervention, the effect size increased to a large effect (Cohen's d = 0.172, Hedges' correction = 0.177). The 95% confidence intervals (CI) for the pre-test were relatively wide (Cohen's d: CI 0.217 to 1.393, Hedges' correction: CI 0.211 to 1.355), reflecting some uncertainty in the estimate. In contrast, the post-test confidence intervals were much narrower (Cohen's d: CI 1.850 to 4.339, Hedges' correction: CI 1.800 to 4.222), indicating greater precision and a stronger effect of the intervention.

Table 4: Standardiser (SD) and Point Estimation of the groups and Mean (95% CI) of Paired sample effect sizes between interventional and comparison groups on Rivermead Motor Function Assessment

Paired Samples Effect Sizes						
Rivermead Motor Function Assessment			**Standardizer[a]**	**Point Estimate**	**95% Confidence Interval**	
					Lower	**Upper**
Gross Function	Interventional Group	Cohen's d	0.162	-1.651	-2.428	-0.850
		Hedges' correction	0.166	-1.606	-2.362	-0.827
	Comparison Group	Cohen's d	0.132	-1.326	-2.015	-0.612
		Hedges' correction	0.135	-1.290	-1.961	-0.595
Leg and Trunk	Interventional Group	Cohen's d	0.191	-0.140	-0.646	0.371
		Hedges' correction	0.196	-0.136	-0.629	0.361
	Comparison Group	Cohen's d	0.219	-1.037	-1.658	-0.392
		Hedges' correction	0.225	-1.009	-1.613	-0.381
Arm	Interventional Group	Cohen's d	0.323	-1.337	-2.029	-0.620
		Hedges' correction	0.332	-1.300	-1.974	-0.603
	Comparison Group	Cohen's d	0.205	-1.276	-1.954	-0.575
		Hedges' correction	0.211	-1.242	-1.901	-0.559

Table 4 indicates small to moderate effect sizes for both the interventional and comparison groups. In Gross Function, the interventional group showed a small positive effect (Cohen's d: 0.162, Hedges' correction: 0.166) with wide confidence intervals (-2.428 to -0.850), suggesting variability in the results. The comparison group exhibited slightly smaller effect sizes (Cohen's d: 0.132, Hedges' 0.135) with CIs from -2.015 to -0.612, indicating minor improvements and variability. For Leg and Trunk assessments, both groups demonstrated small effects, with the interventional group having a Cohen's d of 0.191 (Hedges' 0.196) and the comparison group at 0.219 (Hedges' 0.225). The wide CIs (interventional: -0.646 to 0.371, comparison: -1.658 to -0.392) suggest substantial uncertainty in the outcomes. Regarding Arm function, the interventional group exhibited a moderate effect size (Cohen's d: 0.323, Hedges' 0.332) with broad CIs (-2.029 to -0.620), indicating variability in responses. The comparison group showed smaller effects (Cohen's d: 0.205, Hedges' 0.211) with CIs from -1.954 to -0.575.

Table 5: Standardiser (SD) and Point Estimation of the groups and Mean (95% CI) of independent sample effect sizes on barthel index, Rivermead motor function assessment score with Interventional and comparison group

Independent Samples Effect Sizes					
Barthel Index Scores and Rivermead Motor Function Assessment Scores		**Standardizer[a]**	**Point Estimate**	**95% Confidence Interval**	
				Lower	**Upper**
Post-Test Barthel Index	Cohen's d	1.818	-2.934	-3.968	-1.874
	Hedges' correction	1.868	-2.854	-3.861	-1.823
	Glass's delta	1.981	-2.692	-3.895	-1.457
Post-Test RMFA	Cohen's d	8.646	-0.062	-0.777	0.655
	Hedges' correction	8.887	-0.060	-0.756	0.637
	Glass's delta	8.093	-0.066	-0.781	0.651
a. The denominator used in estimating the effect sizes. Cohen's d uses the pooled standard deviation. Hedges' correction uses the pooled standard deviation, plus a correction factor. Glass's delta uses the sample standard deviation of the control group.					

Table 5 depicts the statistical analysis of independent samples effect sizes revealed a strong and statistically significant impact of the intervention on functional independence, as measured by the Barthel Index, with large effect sizes (Cohen's d = 1.818, Hedges' correction = 1.868, Glass's delta = 1.981) and confidence intervals excluding zero (-3.968 to -1.874 for Cohen's d). This suggests a consistent positive effect of the intervention on improving functional independence. Conversely, the Rivermead Motor Function (RMF) score exhibited extremely large effect sizes (Cohen's d = 8.646, Hedges' correction = 8.887, Glass's delta = 8.093); however, the confidence intervals (-0.777 to 0.655 for Cohen's d) included zero, indicating high variability in individual responses. While the intervention showed a strong impact on RMF scores on average, the inconsistent individual responses highlight the need for further investigation into factors influencing this variability. These findings suggest that while the intervention effectively improved functional independence, its effects on motor function outcomes were less uniform across participants.

Table 6: Comparative analysis on mean differences between Barthel Index Scores and RMFA scores using ANCOVA

Dependent Variable	**Group**	**F Test**		**Breusch- Pagan Test**	
		F- Test	**Significance**	**Chi-Square**	**Significance**
Barthel Index	Pre-test Score	0.052	0.822	0.044	0.834
	Post test Score	0.133	0.718	0.114	0.735
Rivermead Motor Function Assessment	Pre-test Score	0.070	0.794	0.041	0.840
	Post test Score	0.344	0.562	0.288	0.591

Table 6 depicts the comparative analysis of the mean difference between dependent variables (Barthel Index Scores and RMFA Score) using Analysis of Covariance (ANCOVA) showing that no significant heteroscedasticity is detected across all dependent variable and variance is stable between pretest and post scores. it can easily be concluded that observed changes in the dependent variables are not due to difference in variances but rather its actual differences in the scores themselves.

Table 7: Correlation between Barthel Index and Rivermead Motor Assessment Scores in Interventional and Comparison Groups of Stroke Survivors

Stroke Survivors Group	**Barthel Index**		**Changes in Barthel Score**	**Rivermead Mobility Motor Assessment**		**Changes in Rivermead**	**Pearson Correlation**
	Pre-test	**Post-test**		**Pre-test**	**Post-test**		
Interventional	241	326	85	668	821	153	**0.98**
Comparison	209	246	37	686	813	127	

Table 7 predicts the high Pearson correlation of 0.98, indicates a very strong positive relationship between the changes in Barthel Index and the changes in the Rivermead Mobility Motor Assessment across both groups. This suggests that improvements in functional independence (Barthel Index) are highly associated with improvements in mobility and motor function (Rivermead Mobility Motor Assessment), likely reflecting a general trend of recovery or improvement in physical abilities in both groups.

DISCUSSION

The study on Nurse-Led Rehabilitation Intervention as Mirror Therapy interventions for stroke survivors presents significant findings regarding the enhancement of motor function and daily living

activities. This research study has followed the CONSORT (Consolidated Standards of Reporting Trials) guidelines. The results indicate that the interventional group experienced a substantial improvement in Barthel Index scores, suggesting that targeted rehabilitation can significantly enhance functional independence among stroke survivors [3]. This underscores the potential of innovative rehabilitation strategies, such as Mirror Therapy, to optimize recovery outcomes.

The implications of this study are multifaceted. Firstly, the positive outcomes support the integration of Mirror Therapy into standard rehabilitation protocols for stroke survivors, particularly in settings where traditional therapies may be limited. The strong correlation between improvements in Barthel Index scores and motor function assessments highlights the importance of addressing both mobility and daily living skills in rehabilitation programs [3]. Furthermore, the findings advocate for personalized rehabilitation approaches tailored to individual patient needs, which could lead to more effective recovery strategies across diverse demographics [1].

Additionally, the study emphasizes the necessity for ongoing research into the long-term effects and cost-effectiveness of Mirror Therapy. Understanding these aspects could facilitate broader implementation and acceptance of such interventions in clinical practice, ultimately benefiting a larger population of stroke survivors [1].

Despite the promising results, the study has notable limitations. The sample size was relatively small, with only 30 participants, which may limit the generalizability of the findings[1]. Additionally, the demographic representation was restricted, primarily involving individuals aged 56-70, which may not reflect the broader stroke survivor population. The study also noted significant differences in sociodemographic characteristics, such as education levels and marital status, which could influence rehabilitation outcomes [2, 5].

Moreover, the lack of a control group receiving a placebo intervention raises questions about the specific efficacy of Mirror Therapy compared to other rehabilitation methods. Future studies should aim to include larger, more diverse samples and control groups to validate these findings and explore the long-term sustainability of the observed benefits [1, 3].

The rising burden of non-communicable diseases, particularly stroke, necessitates a dual-pronged approach encompassing both primary prevention and post-event rehabilitation. While rehabilitation interventions aim to restore mobility, motor function, and activities of daily living among stroke survivors, primary prevention through awareness programs targeting adolescents plays an equally vital role in reducing future stroke incidence. A cross-sectional study conducted on effectiveness of educational interventions in improving knowledge and self-reported practices regarding the harmful effects of tobacco and alcohol. Two major modifiable risk factors for stroke. This highlights the need to incorporate health education in early life stages to promote lifelong healthy behaviors. When viewed together, these studies underscore the importance of a comprehensive public health strategy that integrates preventive education in youth with effective rehabilitation post-stroke, thereby addressing the continuum of care from prevention to recovery [17].

A research study indicates that a significant statistical difference ($p<0.001$) in motor recovery, spasticity, and hand-related functionality prior to and following the intervention between the Standard therapy and Mirror therapy groups. The findings demonstrate a notable improvement in the Mirror therapy group compared to those who received conventional therapy. Previous research suggests that Mirror therapy (MT) could potentially assist chronic stroke patients in restoring neurological function in their affected arm within just two weeks. individuals with chronic paralysis and limited upper limb function due to sensorimotor deficits can experience improvements following two weeks of Mirror Therapy (MT) treatment [18].

Mirror therapy exercise activity activates the premotor cortex in the brain, supporting the recovery of nerve function in the weaker hands and arms. Additionally, the motor imagery technique encourages patients to mentally envision their impaired hand and arm moving as they would normally [19].

The findings demonstrate that structured mirror therapy substantially improves motor function and independence compared to conventional physiotherapy, with benefits persisting over 24 weeks. The superiority of mirror therapy was evident across functional and motor outcomes, and early initiation further enhanced recovery in ischemic stroke cases. These results suggest that mirror therapy facilitates neuroplasticity and may serve as a cost-effective, scalable adjunct in stroke rehabilitation. Broader implementation could reduce caregiver burden and promote long-term quality of life [20].

CONCLUSION

In conclusion, the study demonstrates that Nurse-Led Rehabilitation Intervention as Mirror Therapy is an effective intervention for enhancing motor function and improving daily living activities among stroke survivors. The significant improvements observed in Barthel Index scores and Rivermead Motor Mobility assessments indicate that this innovative rehabilitation strategy can lead to greater functional independence in this population. The strong positive correlation between enhancements in daily living activities and motor

function further underscores the interconnectedness of these outcomes, suggesting that targeted rehabilitation approaches like Mirror Therapy can optimize recovery processes.

However, while the findings are promising, the study also highlights the need for further research to explore the long-term effects and cost-effectiveness of Mirror Therapy, as well as to validate these results across larger and more diverse populations. By addressing these areas, the potential of Mirror Therapy can be fully realized, ultimately benefiting a broader range of stroke survivors and improving overall rehabilitation outcomes.

OTHER INFORMATION

Authorship

Brijesh Kumar was responsible for the original draft preparation, data curation, methodology design, conceptualization of the study, funding acquisition, and conducting the investigation as well as managing resources for the research. Anjana Chandran helped in reviewing and editing process. Ranjeet Kumar Sinha, Dinesh Selvam S and Pankaj Hans contributed to statistical analysis, software implementation, provided supervision, validated the findings, conducted formal analysis, and ensured the overall smooth operation of the study. Manoj Kumar Sharma contributed to proof reading. They significantly contributed to the successful execution of the study. All authors read and approved the final manuscript.

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Conflict of Interest

The authors declare no conflict of interest related to this study.

Ethical Approval & Consent

- The study was approved by the Institutional Ethical Committee, Patna Medical College, Patna (Approval Letter No. EC/15, dated 02.06.2022).
- The research study was registered with the Clinical Trials Registry of India (CTRI) under the number CTRI/2023/07/054998, dated 10.07.2023.
- A written consent was obtained from all participants before enrollment in the study.

Disclaimer

The views expressed in this research study are solely those of the author and do not represent the opinions or perspectives of the funding agencies or institutions involved.

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