

# MULTICOMPONENT EDUCATIONAL-REHABILITATION TREATMENT AND ITS IMPACT ON DEPRESSIVE SYMPTOMS IN STROKE SURVIVORS

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## Summary

**Background:** This study aimed to assess the efficacy of a multicomponent educational-rehabilitation intervention in mitigating the occurrence and intensity of depressive symptoms among stroke patients.

**Subjects and Methods:** A prospective, randomized clinical trial was conducted at the Clinic for Physical Medicine and Rehabilitation, University Clinical Center Tuzla. Seventy stroke patients were divided into two groups: the first group (N=40) underwent a multicomponent educational-rehabilitation treatment tailored to individual plans and programs, consisting of 45 minutes daily for five working days a week, totaling 20 sessions. The second group (N=30) did not receive the multicomponent educational-rehabilitation treatment. Both groups received conventional physical therapy methods (electrotherapy and individual kinesiotherapy) and speech therapy. The Beck Depression Inventory Second Edition instrument assessed the presence and severity of depressive symptoms at two time intervals: initially upon admission and finally after one month. The independent samples t-test was employed to identify differences between the initial and final testing across the groups.

**Results:** Patients who underwent the multicomponent educational-rehabilitation treatment exhibited a significant decrease in the presence and severity of depressive symptoms compared to those in the untreated group ( $t=-2.223$ ,  $P=0.030$ ).

**Conclusion:** The findings suggest that multicomponent educational-rehabilitation treatment holds promise in reducing the occurrence and intensity of depressive symptoms in stroke patients.

**Keywords:** depression, stroke, rehabilitation, educational-rehabilitation treatment

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## INTRODUCTION

Post stroke depression is one of the more frequent consequences on the stroke, and the prevalence of post stroke depression has ranged from 5 to 63% of patients in several cross-sectional studies, peaking three to six months after a stroke (Sinanović 2010, Hackett & Pickles 2014). Recognizing and treating depression in post-stroke patients is crucial for enhancing rehabilitation, fostering recovery, and improving the overall quality of life within this specific patient group (Haq et al. 2010). Left untreated, this condition can lead to significant cognitive impairments, adversely affecting the functional recovery of stroke survivors (Yang et al. 2010). Rehabilitation for individuals recovering from a stroke should be person-centered, striving to unlock their optimal physical, mental, and social potential. An individualized and holistic approach within educational-rehabilitation treatment, bolstered by a multidisciplinary team of experts, addresses the intricate motor and non-motor consequences of stroke

that impact both functional recovery and quality of life. The multicomponent educational-rehabilitation treatment for stroke survivors is grounded in the principles of brain neuroplasticity and motor learning.

Our study's primary objective was to assess the efficacy of the multicomponent educational-rehabilitation treatment in mitigating the occurrence and severity of depressive symptoms in stroke patients.

## SUBJECTS AND METHODS

### Subjects

A prospective, randomized clinical study was conducted at the Clinic for Physical Medicine and Rehabilitation, University Clinical Center Tuzla. The study enrolled 70 patients diagnosed with stroke, aged between 40 and 60 years. Inclusion criteria comprised patients with stroke within the last 6 months, confirmed by computed tomography findings, who were capable of understanding

and performing simple tasks, and were cooperative and communicative. Exclusion criteria included patients with stroke in a coma for more than 72 hours, recurrent stroke, pre-existing physical disabilities from other neurological, orthopedic, traumatic, or rheumatic diseases, psychotic disorders, aphasia, and quantitative impairment of consciousness.

Eligible patients were randomly assigned to two groups: one receiving the multicomponent educational-rehabilitation treatment (N=40) and the other without (N=30). Both groups underwent physical therapy methods (electrotherapy and individual kinesiotherapy) and speech therapy.

The first group received the multicomponent educational-rehabilitation treatment based on an individual plan and program, lasting 45 minutes per day, five working days a week, for a total of 20 sessions. Patients were assessed at two intervals: initially upon admission and finally after one month.

The randomization of patients was conducted through a simple random selection process. Once a patient met all the criteria for participation in the study, including inclusion and exclusion criteria, they were assigned an identifier to facilitate tracking throughout the research.

The implementation of random selection involved using a simple random method. In other words, from among 70 cards marked with either "G1" or "G2" indicating the subject's allocation to a specific group, one card was drawn. This card was then assigned to the patient who would be included in the study.

All patients provided written informed consent, and the study received approval from the local ethics committee.

## Methods

Depressive symptoms were assessed using the Beck Depression Inventory-II, consisting of 21 items with four response options each, scored on a 4-point scale (0 to 3). Participants selected the statement that best described their feelings over the past two weeks, with the highest score considered if multiple responses were marked. The total score ranged from 0 to 63, with higher scores indicating greater depressive symptoms. Score interpretation was as follows: normal mood fluctuations (1-10), mild mood disturbance (11-16), borderline clinical depression (17-20), moderate depression (21-30), severe depression (31-40), extreme depression (41-63). The questionnaire took 5 to 10 minutes to complete (Tomica & Matešić 2009).

## Intervention

The multicomponent educational-rehabilitation treatment (MERT) is one of the interventions applied within a multidisciplinary approach to stroke patients. This treatment is based on the model of brain neuroplasticity and the principles of motor skill learning, providing a holistic approach to rehabilitation. MERT consists of a series of key components: (1) Cognitive Function Training: This phase includes exercises focused on basic cognitive functions such as attention, memory, and perception, as well as higher-level cognitive functions like speech, language, and executive functions. (2) Motor Skill Training: Here, the focus is on motor re-education, the development of basic and advanced motor skills, and exercises that promote the functional use of hands and limbs. (3) Relaxation: This component involves relaxation techniques, including abdominal breathing exercises and calming breathing exercises that help patients cope with mood changes and tension. (4) Adaptive Skills Training: This phase encompasses life skills treatment with the aim of achieving an optimal level of independence in daily life, as well as social skills to encourage optimal socialization. (5) Task-Specific Skill Breakdown: Complex task-specific skills are broken down into smaller steps to facilitate learning and rehabilitation. Integration of isolated components into everyday activities uses one of three strategies: whole-task training, gradual linking, or reverse linking. (6) Patient Education and Counseling: Patients are provided with relevant information to improve their understanding of their health condition, promote a healthy lifestyle, take responsibility for their health, and address the emotional challenges they face. (7) Motivation: Motivation techniques are directed at actively engaging patients in the rehabilitation process, fostering a desire for change, and empowering patients to be active participants in achieving common goals. Conversations with patients play a key role in this process. (8) Metacognition: Using metacognitive abilities helps patients with self-regulation and self-monitoring. Various techniques, such as interactive learning, self-feeling analysis, keeping a learning journal, and various thinking methods, are used to encourage metacognitive skills (Glinac et al. 2022).

This comprehensive treatment combines various components to assist patients in the rehabilitation process after a stroke, with a specific emphasis on adapting therapy to the individual needs of each patient.

## Statistical methods

Statistical analyses, conducted using SPSS version 23, presented results as mean values and standard deviations. Chi-square and Fisher's exact tests assessed qualitative

differences, while the independent sample t-test analyzed differences in normally distributed independent groups. Significance was set at  $P < 0.05$ .

## RESULTS

Concerning the gender distribution within the sample, out of the 70 stroke patients, 40 were male participants, and 30 were female participants. The age range of the participants was 43 to 60 years, with a mean age of 53.5 ( $sd=4.5$  years). The average age of patients in the group that underwent educational-rehabilitation treatment was  $53.3 \pm 5.5$  years, whereas the average age of patients in

the group that did not receive educational-rehabilitation treatment was  $53.9 \pm 2.9$  years (Table 1).

The mean duration from the onset of stroke to the inclusion of patients in the initial educational-rehabilitation assessment was  $39 \pm 42.8$  days for the group receiving educational-rehabilitation treatment and  $45 \pm 43.8$  days for the group without educational-rehabilitation treatment. The assessment of mood disorders and the presence of depressive symptoms for both groups is outlined in Table 2.

The average scores on the BDI-II test did not exhibit a significant difference between the groups during the initial assessment. Nevertheless, there was a notably more substantial reduction in the presence and intensity of

**Table 1.** Baseline characteristics of stroke patients included in the treatment and non-treatment groups

Characteristics	Group 1	Group 2	P
	N=40	N=30	
Gender (Male/Female)	24/16	16/14	0.577a
Education (Primary School/Secondary School/Higher Education)	13/27/0	15/14/1	0.139a
Employment status (Employed/Unemployed/Retired)	13/18/9	9/16/5	0.752a
Marital status (Average/Below average)	38/2	27/3	0.645b
Marital status (Married/Other)	32/8	23/7	0.737a
Type of stroke (Ischemic/Hemorrhagic)	34/6	28/2	0.752b
Location of the lesion (Right hemisphere/Left hemisphere)	21/19	22/8	0.076b

Group 1: Patients who received educational-rehabilitation treatment; Group 2: Patients who did not receive educational-rehabilitation treatment; a Chi-square test; b Fisher's exact test

**Table 2.** Overview of mood disorders and presence of depressive symptoms in stroke patients

BDI-II	Scores	Group 1		Group 2	
		Initial testing	Final testing	Initial testing	Final testing
		N (%)	N (%)	N (%)	N (%)
Normal fluctuations in mood	1-10	13 (32.5)	18 (45.0)	8 (26.7)	9 (30.0)
Mild mood disorder	11-16	3 (7.5)	12 (30.0)	5 (16.7)	4 (13.3)
Borderline clinical depression	17-20	6 (15.0)	3 (7.5)	4 (13.3)	4 (13.3)
Moderate depression	21-30	9 (22.5)	4 (10.0)	5 (16.7)	6 (20.0)
Severe depression	31-40	9 (22.5)	3 (7.5)	8 (26.6)	7 (23.4)
Extreme depression	41-63	0 (0)	0 (0)	0 (0)	0 (0)

BDI-II (Beck's Depression Inventory – Second Edition); Group 1: Patients who received educational-rehabilitation treatment; Group 2: Patients who did not receive educational-rehabilitation treatment

depressive symptoms within the group of patients who underwent educational-rehabilitation treatment, as illustrated in Figure 1.

A t-test was conducted to assess the statistical significance of the difference in depression levels between the study groups at both the initial and final measurements. The results of the statistical analysis indicate no statistically significant difference in depression levels between the groups at the initial measurement ( $t=-0.072$ ,  $P=0.943$ ). This finding suggests homogeneity between the groups. However, the statistical analysis results reveal a significant difference in depression levels between the groups at the final measurement ( $t=-2.223$ ,  $P=0.030$ ).

## DISCUSSION

Post-stroke depression is frequently overlooked and inadequately addressed. Individuals who have survived a stroke commonly encounter sleep disturbances, low motivation, diminished self-esteem, and apprehensions about their future due to physical limitations and disability (Hart et al. 2003). These psychological changes and stressful circumstances contribute to the emergence of depressive symptoms and anxiety, impacting executive functioning, memory, speed, and motor processing (Verdelho et al. 2013).

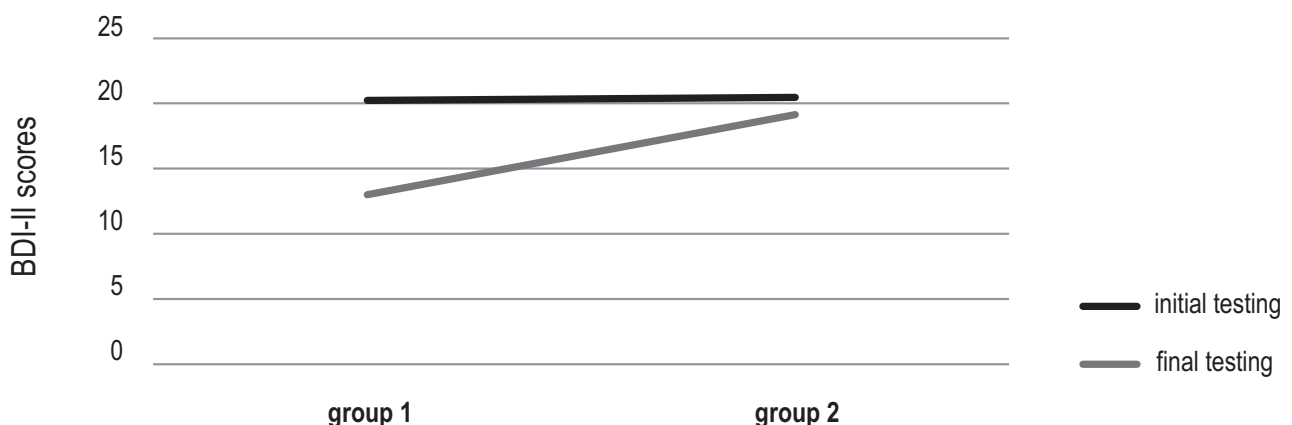
To the best of our knowledge, this study represents the inaugural prospective investigation exploring the impact of a comprehensive educational-rehabilitation treatment on the prevalence and intensity of depressive symptoms in stroke patients. Our findings indicate that the multicomponent educational-rehabilitation treatment

significantly reduces the occurrence and intensity of depressive symptoms in patients who underwent the treatment compared to those who did not.

Recognition of post-stroke depression is particularly crucial in the rehabilitation process, as depression can adversely affect participation and the efficacy of rehabilitation interventions, resulting in diminished outcomes in terms of mobility and independence (Gillen et al. 2001, Paolucci et al. 2012). As a prevalent neuropsychiatric complication of stroke, depression contributes to disability, functional dependence, diminished quality of life, restricted recovery and engagement in rehabilitation, prolonged hospital stays, impaired cognitive and language functions, diminished social involvement, an inability to resume work, and increased mortality (Pohjasvaara et al. 2001, Turner-Stokes & Hassan 2002, Kutlubaev & Hackett 2014, Towfighi et al. 2017, Huang et al. 2019).

Post-stroke depression is of paramount importance due to its direct repercussions on both the patient and their family, coupled with its association with unfavorable functional outcomes. Significantly addressing post-stroke depression within therapeutic contexts is imperative to mitigate its adverse effects (Cui et al. 2018). Timely intervention for depression has the potential to enhance motor, functional, and cognitive outcomes (Robinson & Jorge 2016).

The limitation of this research stems from the lack of detailed data on the severity and disability of stroke, such as NIHSS and mRS scales, making it challenging to assess the seriousness of the subjects' condition. Additionally, the absence of stroke phase analysis, particularly the differentiation between acute and subacute phases, restricts a deeper understanding of the dynamics of recovery



**Figure 1.** Comparison of average scores on the BDI-II questionnaire between groups

and the effectiveness of treatments during specific time intervals. For a more comprehensive understanding of the complexity of stroke, future studies should consider these aspects to enhance clinical guidelines. The average time from the onset of a stroke to the initial educational-rehabilitative assessment was 39 days for the group that underwent treatment, with the initial assessment typically commencing on the 13th day post-stroke. The earliest assessment started on the 6th day, and the latest occurred after 200 days. In the group without treatment, the average time to assessment was 45 days, typically starting on the 23rd day. The minimum time elapsed from the stroke to assessment was 10 days, and the maximum was 167 days. This difference may have potentially impacted the overall reduction of depressive symptoms, which should be considered in subsequent research.

## CONCLUSION

Based on the analysis, we conclude that post-stroke depressive symptoms pose a significant challenge in the rehabilitation of patients who have suffered a stroke. Although often underrecognized, these symptoms have serious consequences on the psychological well-being, functionality, and quality of life of patients. Our study, focused on the implementation of a multicomponent educational

and rehabilitation treatment, shows promising results in reducing the presence and intensity of depressive symptoms among patients who underwent this treatment compared to those who did not. Recognizing depression after a stroke is extremely important for the success of rehabilitation, as depression can significantly impede the effectiveness of interventions, resulting in poorer outcomes in mobility and independence. Additionally, post-stroke depression shows a strong correlation with a range of negative outcomes, including prolonged hospital stays, reduced cognitive functions, limited social engagement, and increased mortality.

**Ethical Considerations:** Does this study include human subjects? YES

Authors confirmed the compliance with all relevant ethical regulations.

**Conflict of interest:** No conflict of interest

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**Authors contributions:** Ms. Alma Glinac – Conception and design of the study, data collecting, interpretation of data, literature searches and analyses and manuscript writing. prof. Osman Sinanović – Interpretation of data, critical revision of the article and manuscript reviewing.

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