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TARGETING EMOTIONAL DYSFUNCTION AFTER STROKE: THE ROLE OF PSYCHOMOTOR THERAPY ASSESSED BY THE HOSPITAL ANXIETY AND DEPRESSION SCALE

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Abstract. *Stroke is a leading cause of long-term disability, often accompanied by significant psychoemotional disturbances. This study aimed to evaluate the effectiveness of psychomotor therapy in reducing anxiety and depression in post-ischemic stroke patients using the Hospital Anxiety and Depression Scale (HADS). A prospective randomized controlled study included 100 patients divided into two groups: psychomotor therapy plus standard rehabilitation (n=50) and standard rehabilitation alone (n=50). After 8 weeks, anxiety scores (HADS-A) decreased from 12.1 to 4.9 in the intervention group, compared to 9.94 in the control group. Depression scores (HADS-D) decreased from 12.62 to 5.2 versus 10.38, respectively. Mixed-design ANOVA revealed significant time × group interactions ($p<0.001$) with large effect sizes ($\eta^2p=0.62$ for anxiety; $\eta^2p=0.53$ for depression). These findings indicate that psychomotor therapy provides a significant additional benefit in improving psychoemotional outcomes after stroke.*

Keywords: *stroke, psychomotor therapy, rehabilitation, anxiety, depression, HADS, neurorehabilitation*

Introduction. Stroke remains one of the leading causes of long-term disability worldwide and continues to pose a substantial burden on healthcare systems and society. According to global epidemiological data, more than 12 million new stroke cases occur annually, and a significant proportion of survivors experience persistent functional and psychosocial impairments that require prolonged rehabilitation [4]. Despite advances in acute stroke management, the focus of modern neurology has increasingly shifted toward optimizing recovery and improving quality of life in the post-stroke period.

Among the various consequences of stroke, emotional disturbances-particularly anxiety and depression-are highly prevalent and clinically significant. It is estimated that up to one-third of stroke survivors develop post-stroke depression, while anxiety disorders may affect approximately 20-25% of patients [1, 5]. These conditions not only reduce patient motivation and participation in rehabilitation but are also associated with poorer functional outcomes, increased dependency, and higher mortality rates [7]. Therefore, addressing emotional dysfunction is now considered a critical component of comprehensive stroke rehabilitation.

The Hospital Anxiety and Depression Scale (HADS) has been widely used as a reliable and valid instrument for assessing anxiety and depression in medical populations, including stroke patients. Its sensitivity to changes in emotional status and its applicability in clinical settings make it particularly suitable for evaluating rehabilitation outcomes [8, 2]. The use of standardized tools such as HADS allows for objective monitoring of psychometric changes during the recovery process.

In recent years, growing attention has been directed toward rehabilitation approaches that integrate not only motor recovery but also cognitive and emotional dimensions. Psychomotor therapy, grounded in principles of sensorimotor integration and embodied cognition, represents a promising multidimensional intervention. This approach emphasizes body awareness, movement coordination,

postural control, and the interaction between motor and emotional processes, thereby facilitating both physical and psychological recovery [6]. By engaging patients in structured, goal-directed movement experiences, psychomotor therapy may enhance neuroplasticity and contribute to improved emotional regulation.

Although conventional rehabilitation strategies have demonstrated effectiveness in improving motor function, their impact on emotional outcomes remains limited and often insufficient. Emerging evidence suggests that interventions incorporating body-oriented and integrative therapeutic components may provide additional benefits in reducing anxiety and depressive symptoms [3]. However, high-quality controlled studies specifically evaluating the effectiveness of psychomotor therapy in post-stroke emotional recovery are still scarce.

Given the close interaction between motor and emotional systems in the central nervous system, it can be hypothesized that targeted psychomotor interventions may positively influence both domains simultaneously. Understanding this relationship is essential for developing more effective, patient-centered rehabilitation programs.

Therefore, the aim of this study was to evaluate the effectiveness of psychomotor therapy in reducing anxiety and depression in patients after ischemic stroke, using the Hospital Anxiety and Depression Scale (HADS) as a primary outcome measure.

Materials and Methods. This study was designed as a prospective controlled clinical study aimed at evaluating the effectiveness of psychomotor rehabilitation in patients after ischemic stroke. The research was conducted in cooperation with the neurology department and specialized rehabilitation centers in Tashkent, Uzbekistan.

All procedures were performed in accordance with international ethical standards for biomedical research involving human participants. Participation in the study was voluntary, and all participants provided written informed consent before inclusion.

Patients received standard neurorehabilitation therapy according to clinical practice guidelines. In addition, patients in the intervention group underwent structured psychomotor rehabilitation sessions conducted by trained rehabilitation specialists.

Participants. A total of 130 individuals were initially screened for participation in the study. Among them, 100 patients with ischemic stroke met the inclusion criteria and were included in the final statistical analysis, while 30 healthy individuals were recruited as a control group for baseline comparison.

Patients with ischemic stroke were randomly assigned into two groups using a simple randomization method (Table 1):

Psychomotor rehabilitation group (n = 50) - psychomotor therapy combined with standard rehabilitation

Control rehabilitation group (n = 50) - standard rehabilitation only

Healthy volunteers (n = 30) were included as a reference control group.

Table 1.

Distribution of participants across study groups

Group	Number of participants
Psychomotor rehabilitation	50
Standard rehabilitation	50
Healthy control	30
Total	130

Participant inclusion and exclusion were determined according to the following predefined criteria (Table 2.)

Table 2.

Inclusion and exclusion criteria for participant selection

Inclusion criteria	Exclusion criteria
confirmed diagnosis of ischemic stroke	recurrent stroke
age 30–70 years	severe somatic or psychiatric disorders
post-stroke rehabilitation stage	severe cognitive impairment
NIHSS score 5–20	epilepsy or uncontrolled cardiovascular disease
preserved cognitive ability	inability to participate regularly
stable neurological condition	absence during final evaluation
written informed consent	-

After applying these criteria, 30 patients were excluded, leaving 100 patients for final analysis.

Clinical and instrumental assessment. The diagnosis of ischemic stroke was confirmed using magnetic resonance imaging (MRI) and computed tomography (CT). MRI examinations included DWI, FLAIR, T1-weighted and T2-weighted sequences to identify ischemic lesions.

Additional diagnostic procedures included Doppler ultrasonography of the brachiocephalic arteries, electrocardiography (ECG), and echocardiography (EchoCG). These examinations were carried out to further clarify the etiology of ischemic stroke and to identify possible comorbid cardiovascular conditions that could influence the clinical course of the disease and the rehabilitation process.

Distribution of stroke localization. Stroke localization was classified according to vascular territory using MRI findings (Table 3, Figure 1).

Table 3.

Distribution of ischemic stroke localization

Localization	Psychomotor group (n=50)	Control group (n=50)
Left hemisphere (ACA + MCA)	11 (22%)	13 (26%)
Right MCA territory	17 (34%)	18 (36%)
Vertebrobasilar territory	22 (44%)	19 (38%)

No statistically significant differences between groups were observed at baseline ($p > 0.05$).

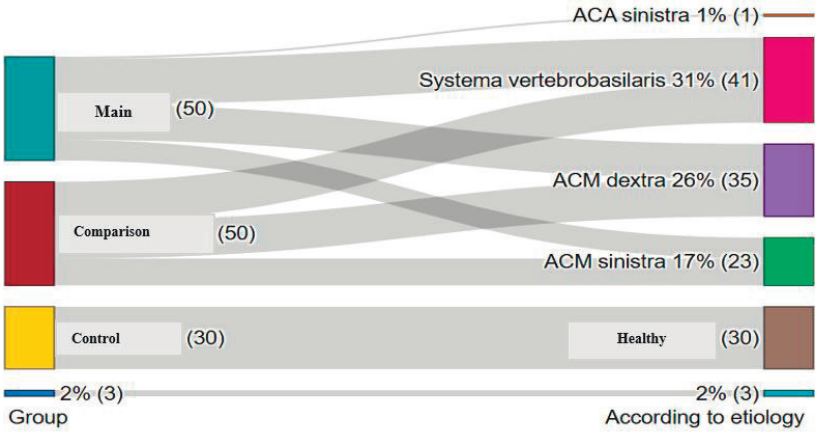


Figure 1. Distribution of stroke localization by vascular territory

Rehabilitation protocol. All participants received standard rehabilitation therapy including therapeutic exercises and functional training.

Patients in the intervention group additionally underwent psychomotor rehabilitation sessions consisting of:

- sensorimotor integration exercises
- coordination training
- rhythmic motor exercises
- task-oriented movement training
- body awareness exercises

The rehabilitation program lasted 8 weeks, with four sessions per week, each session lasting 60 minutes (Table 4).

Table 4.

Psychomotor rehabilitation protocol

Parameter	Value
Session duration	60 minutes
Sessions per week	4
Program duration	8 weeks
Total sessions	32

Recommended diagram structure:

- Warm-up (10 min)
- Sensorimotor exercises (15 min)
- Coordination and balance training (15 min)
- Task-oriented motor exercises (15 min)
- Relaxation and body awareness (5 min)
- Functional Outcome Measures

To comprehensively evaluate the effectiveness of the rehabilitation program, functional and psychoemotional outcomes were assessed using standardized and widely validated clinical scales. These instruments were selected to capture multiple domains of recovery, including functional independence, motor performance, balance, and emotional status.

Functional independence in daily activities was assessed using the Barthel Index (BI), which reflects the patient's ability to perform essential self-care tasks. Motor and sensory recovery were evaluated with the Fugl-Meyer Assessment (FMA), a stroke-specific scale sensitive to changes in motor control. Balance and postural stability were measured using the Berg Balance Scale (BBS), which is particularly relevant for assessing fall risk and mobility.

Special attention was given to the evaluation of psychoemotional status using the Hospital Anxiety and Depression Scale (HADS). This scale is specifically designed for patients with somatic conditions and allows for reliable detection of emotional disturbances without being confounded by physical symptoms.

HADS consists of two independent subscales assessing:

- Anxiety (HADS-A)
- Depression (HADS-D)

Each subscale includes 7 items, with scores ranging from 0 to 21. Higher scores indicate greater severity of symptoms. The use of separate domains enables a more precise evaluation of emotional changes during rehabilitation (Figure 1.).

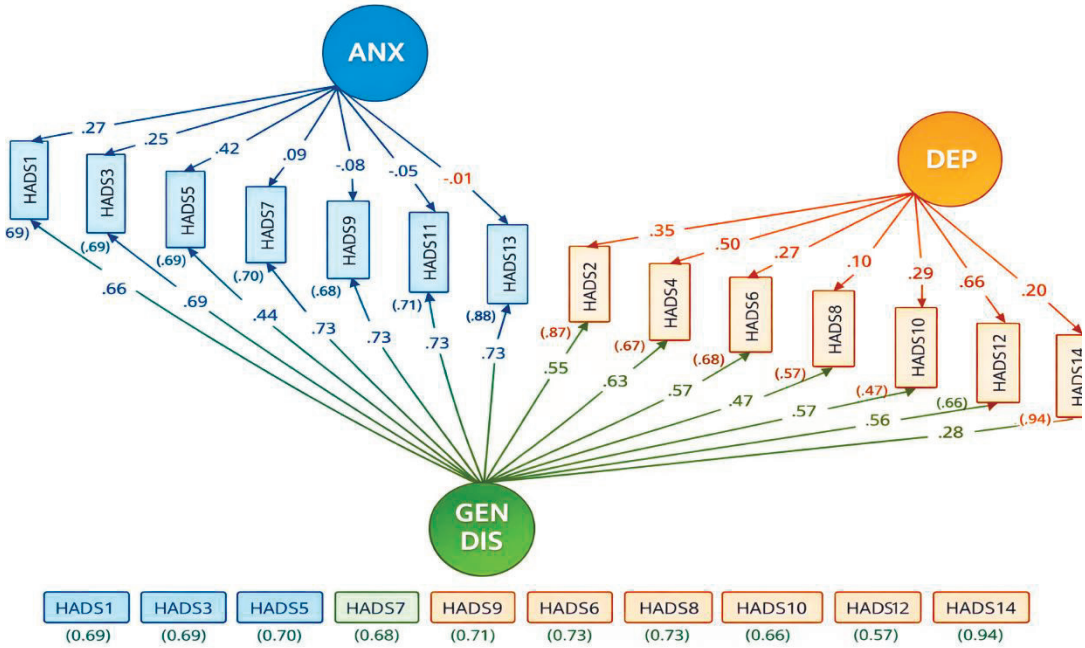


Figure 2. Factor Structure of the Hospital Anxiety and Depression Scale (HADS): Three-Domain Model (Anxiety, Depression, and General Distress)

All outcome measures were administered twice: at baseline (before the start of rehabilitation) and after completion of the 8-week intervention period. This allowed for the assessment of both within-group changes and between-group differences over time.

Statistical Analysis. Statistical analysis was performed in accordance with the study design, with a significance level set at $p < 0.05$. Descriptive statistics were used to summarize baseline characteristics, with continuous variables expressed as mean ± standard deviation and 95% confidence intervals, and categorical variables as frequencies and percentages.

Due to the ordinal nature of clinical scales and potential non-normal distribution, baseline comparisons between groups were conducted using the Mann-Whitney U test. Categorical variables were analyzed using the chi-square test.

To evaluate changes over time and differences between groups, a two-way mixed-design ANOVA was applied, with time (pre- and post-intervention) as a within-subject factor and group (psychomotor therapy vs. standard rehabilitation) as a between-subject factor. The primary focus was on the interaction effect (time × group), reflecting the effectiveness of the intervention.

Effect sizes were calculated using partial eta squared (η^2p) to assess the magnitude of observed effects. All analyses were performed using standard statistical software.

Results. The dynamics of psychoemotional status were assessed using the anxiety (HADS-A) and depression (HADS-D) subscales of the Hospital Anxiety and Depression Scale.

At baseline, anxiety levels were identical in both groups, with a mean score of 12.1, indicating a comparable initial psychoemotional state. Following the rehabilitation program, anxiety scores decreased in both groups; however, the magnitude of improvement differed substantially.

In the psychomotor therapy group, anxiety levels decreased from 12.1 to 4.9, reflecting a marked clinical reduction in symptoms. In contrast, the control group showed a more modest decrease from 12.1 to 9.94, suggesting partial persistence of anxiety symptoms. The overall sample demonstrated a reduction from 12.1 to 7.42.

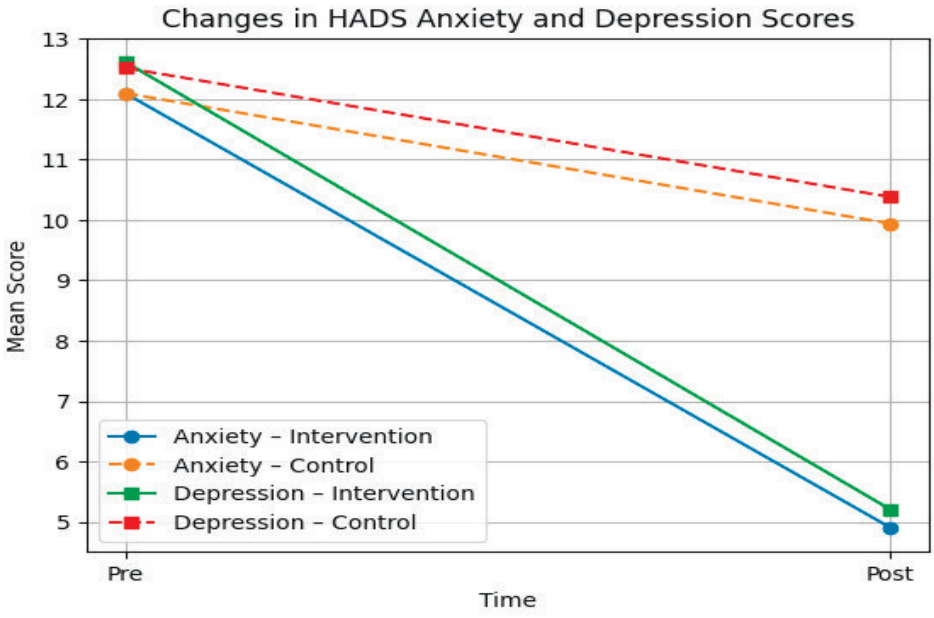


Figure 3. Changes in HADS-A (anxiety) scores over time in the intervention and control groups

To further examine these changes, a mixed-design ANOVA was conducted. The results revealed a highly significant main effect of time ($F(1,98)=543.79$, $p<0.001$, $\eta^2p=0.85$), indicating a substantial overall reduction in anxiety levels. A significant group effect was also observed ($F(1,98)=64.16$, $p<0.001$, $\eta^2p=0.40$), suggesting differences between the intervention and control groups. Importantly, the time × group interaction was highly significant ($F(1,98)=157.67$, $p<0.001$, $\eta^2p=0.62$), confirming that the reduction in anxiety was significantly greater in the psychomotor therapy group (Table 5.).

Table 5.

Mixed-design ANOVA results for HADS-A (anxiety)

Source of Variation	Sum of Squares	df	Mean Square	F	p-value	η^2	η^2p
Time (pre vs post)	1095.12	1	1095.12	543.79	<0.001	0.45	0.85
Group	317.52	1	317.52	64.16	<0.001	0.13	0.40
Time × Group	317.52	1	317.52	157.67	<0.001	0.13	0.62
Error (between subjects)	484.96	98	4.95	—	—	—	—
Error (within subjects)	197.36	98	2.01	—	—	—	—

A similar pattern was observed for depressive symptoms. At baseline, depression scores were comparable between groups (12.62 in the intervention group vs 12.52 in the control group). After rehabilitation, the intervention group demonstrated a pronounced decrease to 5.2, while the control group showed a smaller reduction to 10.38. The overall sample decreased from 12.57 to 7.79 (Figure 3.).

Mixed ANOVA results confirmed a significant main effect of time ($F(1,98)=366.95$, $p<0.001$, $\eta^2p=0.79$), as well as a significant group effect ($F(1,98)=24.72$, $p<0.001$, $\eta^2p=0.20$). The interaction effect was also statistically significant ($F(1,98)=111.93$, $p<0.001$, $\eta^2p=0.53$), indicating that depressive symptoms decreased more substantially in the psychomotor therapy group (Table 6).

Table 6.

Mixed-design ANOVA results for HADS-D (depression)

Source of Variation	Sum of Squares	df	Mean Square	F	p-value	η^2	η^2p
Time (pre vs post)	1142.42	1	1142.42	366.95	<0.001	0.34	0.79
Group	322.58	1	322.58	24.72	<0.001	0.09	0.20
Time × Group	348.48	1	348.48	111.93	<0.001	0.10	0.53
Error (between subjects)	1278.94	98	13.05	—	—	—	—
Error (within subjects)	305.10	98	3.11	—	—	—	—

Discussion. The present study provides evidence that the inclusion of psychomotor therapy in post-stroke rehabilitation has a significant impact not only on functional recovery but also on psychoemotional outcomes. The observed results demonstrate a clear and consistent pattern across both anxiety and depression domains, with significantly greater improvements in the intervention group compared to standard rehabilitation alone.

One of the most notable findings is the strong time × group interaction effect observed in both HADS subscales. This suggests that while rehabilitation itself contributes to general improvement, the addition of psychomotor therapy accelerates and amplifies psychoemotional recovery. The magnitude of effect sizes (η^2p ranging from 0.53 to 0.85) further indicates that these changes are not only statistically significant but also clinically meaningful.

The reduction in anxiety symptoms may be explained by several mechanisms inherent to psychomotor therapy. First, the emphasis on body awareness and sensorimotor integration likely contributes to improved internal regulation and reduced physiological arousal. Second, structured movement experiences may enhance the patient's sense of control and self-efficacy, which are known to play a crucial role in anxiety reduction. Finally, the relational aspect of therapy-often described as a "body-mediated therapeutic interaction"-may provide an additional layer of emotional support.

Similarly, the observed decrease in depressive symptoms appears to be linked to both neurophysiological and psychological mechanisms. Engagement in purposeful movement, gradual restoration of functional abilities, and positive feedback during therapy sessions may collectively improve mood and motivation. These findings are consistent with the broader concept of embodied cognition, where motor activity and emotional processes are closely interconnected.

It is also important to note that although standard rehabilitation led to some improvement in both anxiety and depression, the magnitude of change remained limited. This suggests that conventional approaches, while effective for motor recovery, may not sufficiently address the psychoemotional dimension of post-stroke rehabilitation.

From a clinical perspective, these results highlight the importance of integrating multidimensional interventions into rehabilitation programs. Addressing emotional disturbances alongside physical deficits may not only improve patient well-being but also enhance overall rehabilitation outcomes, including adherence and long-term recovery.

At the same time, several limitations should be considered. The study was conducted in a single center, which may limit the generalizability of the findings. The open-label design introduces a potential risk of performance bias, as blinding was not feasible due to the nature of the intervention. In addition, long-term follow-up was not performed, making it difficult to assess the sustainability of the observed effects.

Despite these limitations, the study provides strong evidence supporting the role of psychomotor therapy as an effective adjunct to standard neurorehabilitation. Future research should focus on multicenter trials, longer follow-up periods, and the inclusion of neurophysiological markers to further elucidate the mechanisms underlying these effects.

Conclusion. The findings of this study demonstrate that the inclusion of psychomotor therapy in post-stroke rehabilitation leads to clinically meaningful improvements in psychoemotional outcomes, particularly in reducing anxiety and depression.

Quantitatively, anxiety levels (HADS-A) in the intervention group decreased from 12.1 to 4.9 points, corresponding to an average reduction of 8.5 points, whereas the control group showed a smaller decrease to 9.94 points. Similarly, depressive symptoms (HADS-D) declined from 12.62 to 5.2 points in the psychomotor therapy group (a reduction of 8.91 points), compared to a more modest decrease to 10.38 points in the control group. These differences were supported by statistically significant time × group interaction effects, with large effect sizes ($\eta^2p = 0.62$ for anxiety and $\eta^2p = 0.53$ for depression), indicating a substantial additional benefit of psychomotor therapy beyond standard rehabilitation.

Importantly, while both groups demonstrated improvement over time, the magnitude and clinical relevance of change were considerably greater in the intervention group. This suggests that psychomotor therapy not only enhances recovery but also accelerates the normalization of psychoemotional status in post-stroke patients.

Overall, the results support the integration of psychomotor therapy into комплекс rehabilitation programs as an effective approach for addressing both functional and emotional deficits after ischemic stroke. Future studies should aim to confirm these findings in larger, multicenter cohorts and evaluate the long-term sustainability of these effects.

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