



Results of Audiovisual Stimulation and Psychotherapy in Psychological Correction of Emotional Disorders in Patients in the Late Recovery Period after an Ischaemic Stroke: a Prospective Randomized Study

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ABSTRACT

INTRODUCTION. Emotional and personality disorders that occur in patients after a stroke have a negative impact on the rehabilitation process, reducing its effectiveness, disrupting the motivation for treatment and quality of life. Today, comprehensive rehabilitation programs for patients in the late recovery period after acute cerebrovascular accident, aimed at psychological correction of emotional disorders, are becoming relevant.

AIM. To study the effectiveness of audiovisual stimulation and techniques of rational-emotive and body-oriented psychotherapy on the emotional state of patients in the late recovery period after an ischaemic stroke.

MATERIALS AND METHODS. The study included 40 patients after an acute cerebrovascular accident (ACVA) in the late recovery period (from 6 months to 2 years after ACVA) aged between 45 and 75 years, average age 61.6 [53.95; 68.1]. The patients were randomized into two groups. The main group included patients ($n = 20$ people, of which 7 men, 13 women, age — 62.09 [53.5; 68.6] years), who underwent a complex basic rehabilitation program, including audiovisual stimulation and psychotherapy techniques; the control group included patients ($n = 20$, including 6 men, 14 women, age — 61.1 [54.4; 67.5] years) who underwent a basic rehabilitation program. For psychological diagnostics, the Hospital Anxiety and Depression Scale (HADS) and the author's computer program were used to study the current emotional state. The statistical significance of differences before and after the treatment was determined using the nonparametric Wilcoxon test. To assess the statistical comparability of the two groups, the Mann-Whitney test was used ($p > 0.05$).

RESULTS. The use of audiovisual stimulation and techniques of rational-emotive and body-oriented psychotherapy in the psychological correction of emotional disorders in patients in the late recovery period after an ischemic stroke allows us to achieve a statistically significant effect in reducing state and trait anxiety, the level of chronic fatigue, as well as increasing the subjective comfort and quality of life ($p < 0.05$).

DISCUSSION. The study showed that patients in the late recovery period after a stroke before treatment experienced high levels of anxiety and depression and experienced a severe psycho-emotional stress. As a result of audiovisual stimulation and psychotherapy techniques, indicators of the negative emotional state of patients in the late recovery period after an ischemic stroke significantly decreased, mood improved, activity and tolerance to psychological stress increased.

CONCLUSION. A comprehensive rehabilitation of patients in the late recovery period after a stroke, aimed at psychological correction of emotional disorders, significantly improved the emotional background, increased tolerance to psychological stress, and also contributed to increased motivation for restorative treatment and rehabilitation.

KEYWORDS: anxiety, depression, state anxiety, trait anxiety, cognitive sphere, emotional and personal sphere, emotional disorders, psychological correction, ischemic stroke, rational-emotive psychotherapy, body-oriented psychotherapy, audiovisual stimulation.

For citation: Odarushchenko O.I., Kuzyukova A.A., Nuvakhova M.B., Yurova O.V., Yakovlev M.Y. Results of Audiovisual Stimulation and Psychotherapy in Psychological Correction of Emotional Disorders in Patients in the Late Recovery Period after an Ischaemic Stroke: a Prospective Randomized Study. Bulletin of Rehabilitation Medicine. 2023; 22(5): 15-21.

<https://doi.org/10.38025/2078-1962-2023-22-5-15-21>

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Received: 16.08.2023

Accepted: 25.09.2023

Published: 13.10.2023

Результаты применения аудиовизуальной стимуляции и психотерапии в психологической коррекции эмоциональных нарушений у пациентов в позднем восстановительном периоде ишемического инсульта: проспективное рандомизированное исследование

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РЕЗЮМЕ

ВВЕДЕНИЕ. Эмоциональные расстройства, возникающие у пациентов после инсульта, негативно отражаются на реабилитационном процессе, снижая его эффективность, нарушают мотивацию к лечению и качество жизни. На сегодняшний день становятся актуальными программы комплексной реабилитации пациентов в поздний восстановительный период после острого нарушения мозгового кровообращения, направленные на психологическую коррекцию эмоциональных нарушений.

ЦЕЛЬ. Изучение эффективности применения аудиовизуальной стимуляции и техник рационально-эмотивной и телесно-ориентированной психотерапии на эмоциональное состояние пациентов в позднем восстановительном периоде ишемического инсульта.

МАТЕРИАЛЫ И МЕТОДЫ. В исследование вошли 40 пациентов после острого нарушения мозгового кровообращения (ОНМК) в поздний восстановительный период (срок давности от 6 месяцев до 2 лет) в возрасте от 45 до 75 лет, средний возраст 61,6 [53,95; 68,1] года. Пациенты были рандомизированы на две группы. В основную группу вошли пациенты ($n = 20$ человек, из них 7 мужчин, 13 женщин, возраст — 62,09 [53,5; 68,6] года), у которых проводился комплекс базовой программы реабилитации, включающий аудиовизуальную стимуляцию и техники психотерапии; в контрольную группу вошли пациенты ($n = 20$, из них 6 мужчин, 14 женщин, возраст — 61,1 [54,4; 67,5] года), у которых проводилась базовая программа реабилитации. Для психологической диагностики использовались госпитальная шкала тревоги и депрессии (HADS) и авторская компьютерная программы для исследования актуального эмоционального состояния. Статистический анализ проводили с применением пакета прикладных программ SPSS 23. Статистическую значимость различий до и после лечения определяли с помощью непараметрического критерия Вилкоксона. Для оценки статистической сопоставимости двух групп использовали критерий Манна—Уитни ($p > 0,05$).

РЕЗУЛЬТАТЫ. Применение аудиовизуальной стимуляции и техник рационально-эмотивной и телесно-ориентированной психотерапии в психологической коррекции эмоциональных нарушений у пациентов в позднем восстановительном периоде ишемического инсульта позволяет получить статистически значимый эффект по снижению ситуативной и личностной тревожности, уровня хронического утомления, а также повышению субъективного комфорта и качества жизни ($p < 0,05$).

ОБСУЖДЕНИЕ. Проведенное исследование показало, что пациенты в позднем восстановительном периоде после инсульта до лечения переживали тревогу и депрессию высокого уровня, испытывали сильное психоэмоциональное напряжение.

Под влиянием аудиовизуальной стимуляции и техник психотерапии достоверно снизились показатели негативного эмоционального состояния пациентов в позднем восстановительном периоде ишемического инсульта, улучшилось настроение, повысилась активность и толерантность к психологическим нагрузкам.

ЗАКЛЮЧЕНИЕ. Комплексная реабилитация пациентов в позднем восстановительном периоде после инсульта, направленная на психологическую коррекцию эмоциональных нарушений, позволила существенно улучшить эмоциональный фон, повысить толерантность к психологическим нагрузкам, а также способствовала повышению мотивации к восстановительному лечению и реабилитации.

КЛЮЧЕВЫЕ СЛОВА: тревога, депрессия, ситуативная тревожность, личностная тревожность, эмоциональные нарушения, психологическая коррекция, ишемический инсульт, рационально-эмотивная психотерапия, телесно-ориентированная психотерапия, аудиовизуальная стимуляция.

Для цитирования: Odarushchenko O.I., Kuzuykova A.A., Nuvakhova M.B., Yurova O.V., Yakovlev M.Y. Results of Audiovisual Stimulation and Psychotherapy in Psychological Correction of Emotional Disorders in Patients in the Late Recovery Period after an Ischaemic Stroke: a Prospective Randomized Study. Bulletin of Rehabilitation Medicine. 2023; 22(5): 15-21. <https://doi.org/10.38025/2078-1962-2023-22-5-15-21>

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Статья получена: 01.09.2023
Статья принята к печати: 27.09.2023
Статья опубликована: 16.10.2023

INTRODUCTION

Cerebrovascular diseases remain one of the most socially significant problems of the present-day society. The death rate of the population in the Russian Federation due to cerebrovascular diseases was more

than 260 thousand people in 2018. [1]. We can predict an increase in the number of patients with this pathology, as the negative role of the following factors is increasing in the population: atherosclerosis, diabetes mellitus, arterial hypertension, which is confirmed by the data

provided by information bulletins of the WHO. Ischaemic stroke is one of the major causes of mortality, disability and pronounced disadaptation of patients, accounting for about 80 % of all types of acute cerebral circulatory events [2, 3].

For a long time, the main focus of medical rehabilitation of post-stroke patients has been the restorative treatment of motor disorders. At the same time, recent studies suggest the need to correct cognitive, emotional and behavioural disorders after a stroke [4, 5]. Emotional disorders not only have a negative impact on the recovery process after a stroke, reducing the motivation for treatment and the quality of life of patients, but also have a negative impact on death rates, regardless of the age of the patients [5].

Understanding the significance of the problem of emotional and behavioural disorders in patients after a stroke has prompted the introduction of a special section in the current clinical guidelines of many countries, which prescribes psychological diagnosis of these disorders for the timely diagnosis and commencement of treatment [5, 6].

All the above-mentioned causes the relevance of the development of complex rehabilitation programmes for patients in the late recovery period after the ACVA, aimed at psychological correction of emotional and behavioural disorders, increasing the effectiveness of medical rehabilitation, decreasing anxiety and depression, reducing psycho-emotional stress and increasing tolerance to psychological stress, forming a positive motivation for recovery and rehabilitation and improving the subjective comfort and quality of life of patients [7–11].

AIM

To study the effectiveness of audiovisual stimulation and techniques of rational-emotive and body-oriented psychotherapy on the emotional state of patients in the late recovery period after an ischaemic stroke.

MATERIALS AND METHODS

The study included 40 patients after an acute cerebrovascular accident (ACVA) in the late recovery period (from 6 months to 2 years after ACVA) aged between 45 and 75 years, 13 men and 27 women. The patients were treated in a research and clinical center (National Medical Research Center for Rehabilitation and Balneology, Moscow).

The patients were randomized into 2 groups. The control group included patients ($n = 20$, including 6 men, 14 women, age 61.1 [54.4; 67.5] years) who underwent a basic medical rehabilitation programme.

The basic programme included a special complex of exercise therapy for diseases of the central nervous system and brain, performed in a gym with a physical therapy instructor, No. 10; correction of motor function disorders using computer technologies of the DIEGO 3D system, No. 10; robotic mechanotherapy, No. 10; low-intensity laser radiation, No. 10; magnetic field treatment, No. 10; electrical stimulation, No. 10; therapeutic baths, No. 10; speleological therapy, No. 10; medical massage of the upper and lower extremities, No. 10.

The main group included patients ($n = 20$, including 7 men, 13 women, age 62.09 [53.5; 68.6] years) who underwent audiovisual stimulation and techniques of rational-emotive and body-oriented psychotherapy against the background of the basic medical rehabilitation programme.

For audiovisual stimulation we used «Hardware-software complex for correction of human psychosomatic state by means of programmed resonance-acoustic oscillations of ECG and/or EEG signals «ECRAN» («AKSMA» LLC, Russia). [10]. The operation mode of the device was adjusted to the programme «Relaxation», according to which the binaural exposure was effected in the mode of smooth readjustment from the state of beta-activity (15 Hz) down to theta-rhythm (7 Hz). The course of treatment included 10 procedures, and the length of one procedure was 22 minutes.

Rational-emotive (REPT) and body-oriented (BOPT) psychotherapy techniques were used to develop emotional response and emotional regulation. The REPT techniques were used for logical, empirical and pragmatic disputation aimed at changing the patient's erroneous beliefs about his/her health and condition. The session length was 30 minutes (10 sessions per course No. 10). Body-oriented psychotherapy techniques, including breathing techniques and relaxation techniques, were aimed at achieving self-regulation and maintenance by the patient of consistent relaxation of muscle groups of the whole body from head to feet. The session length was 30 minutes (10 sessions per course No. 10).

Psychological diagnostic methods included the Hospital Anxiety and Depression Scale (HADS), the author's computer programme for studying the current emotional state, which used the following scales: «State Scale», «State Anxiety Scale», «Trait Anxiety Scale», «Anxiety-Depressive Emotions Scale» and «Degree of Chronic Fatigue» scale [8], the Mini Mental State Examination test (Brief Mental Status Assessment Scale), and the Stroke Specific Quality of Life Scale (SS-QOL).

Statistical analysis was performed using the SPSS 23 software package. The Mann-Whitney test ($p > 0.05$) was used to assess the statistical comparability of the two groups. Statistical significance of differences before and after the treatment was measured using the nonparametric Wilcoxon test (the differences between the groups were considered statistically significant at $p < 0.05$).

RESULTS

When analyzing the indicators of the emotional sphere of 40 patients in the late recovery period after an ischaemic stroke before the rehabilitation measures, the following data were obtained.

According to the HADS (Hospital Anxiety and Depression Scale) test, subclinical anxiety and clinical anxiety were found in 24 (60.0 %) and 6 (15.0 %) patients of the two groups. Subclinical depression and clinical depression were found in 20 (50.0 %) and 8 (20.0 %) patients.

The State-Trait Anxiety Inventory (Spilberger-Khanin) showed a high level of state anxiety in 26 (65.0 %) patients, 5 (12.5 %) patients showed a borderline level of state anxiety, in which the patient could not cope with a

stressful situation and needed medication to correct the emotional state, 3 (8.0 %) patients showed a low level of state anxiety, indicating disorders in the motivational sphere. A trait anxiety according to the State-Trait Anxiety Inventory was observed in 27 (67.5 %) patients, in 12 (30.0 %) a borderline level was found, at which emotional and neurotic breakdowns are possible.

In the emotion profile, 34 (85.0 %) the patients in the two groups showed anxious and depressive emotions.

The quality of life according to the SS-QOL scale was reduced in 26 (65.0 %) and low in 4 (10.0 %) patients. One of the main factors reducing the patients' quality of life was negative psycho-emotional background found in 28 (70 %) patients.

According to the Mini Mental State Examination test, cognitive impairments were found in 22 (55.0 %) patients of the two groups.

Thus, the initial diagnostic indicators suggest pronounced disorders in the emotional, personal and cognitive spheres in patients in the late recovery period after an ischaemic stroke and the need to carry out psychological correction.

Assessment of the emotional state in the groups after the treatment demonstrated improvement in both the main group and the control group, but of different degrees of manifestation.

Thus, anxiety and depression scores on the HADS scale were significantly reduced in both the main group

and the control group ($p < 0.05$). At the same time, a significant decrease in state and trait anxiety on the Spilberger-Khanin scale (State-Trait Anxiety Inventory) and anxiety-depressive emotions on the emotion scale was achieved only in the main group ($p < 0.05$) (Table 1).

After the treatment, there was a statistically significant increase in the subjective comfort score on the state scale in the patients of the main group. A high level of the subjective comfort was found in 13 (65.0 %) patients, and an acceptable level of the subjective comfort was found in 7 (35.0 %) patients, indicating an improvement in well-being, increased activity, and interest in rehabilitation and restorative treatment in all patients in the main group ($p < 0.05$); while in patients in the control group, a high level of the subjective comfort was found in 4 (20.0 %) patients, and a low level of the subjective comfort was found in 16 (80 %) patients, which suggests an increase in the subjective comfort in individual patients in the control group, while in the group as a whole the subjective comfort indicator remained at the level of a low subjective comfort.

The level of chronic fatigue on the fatigue scale after the treatment significantly decreased in relation to the initial indicator also in the main group: 16 (80.0 %) patients of the main group had no signs of chronic fatigue, 4 (20.0 %) patients showed only initial signs of chronic fatigue ($p < 0.05$). In the control group, there was no significant decrease in the chronic fatigue indicator: 4

Table 1. Dynamic pattern of emotional state indicators (in points) in post-stroke patients when exposed to audiovisual stimulation and techniques of rational-emotive and body-oriented psychotherapy (Me [Q₁; Q₃])

Indicators	Group I (main), n = 20		Group II (control), n = 20	
	Before	After	Before	After
Anxiety and depression on the HADS scale				
Anxiety	9.0 [7.5; 10.0]	3.5 [2.0; 6.5]*	8.5 [7.5; 10.0]	3.0 [1.5; 5.0]*
Depression	8.0 [7.0; 9.5]	3.0 [2.0; 6.5]**	8.5 [7.5; 10.0]	8.0 [7.5; 9.5]#
State and trait anxiety on the Spilberger-Khanin scale				
State anxiety	47.5 [43.0; 58.0]	36.0 [34.5; 40.5]**	49.0 [45.0; 53.0]	34.0 [23.0; 38.0]##
Trait anxiety	49.5 [47.0; 65.5]	44.0 [34.5; 44.5]**	52.0 [47.0; 58.0]	45.0 [45.0; 50.0]##
Anxious-depressive emotions on the emotion scale				
Anxious and depressive emotions	23.0 [21.0; 27.0]	12.0 [12.0; 14.5]*	23.0 [21.0; 26.5]	21.0 [19.0; 24.5]#

Note. Differences were analyzed using the Wilcoxon test; * statistically significant difference before and after the treatment, $p < 0.05$; ** — $p < 0.001$; the significance of differences between the groups after the treatment was established by the Mann-Whitney test: # — $p < 0.05$; ## — $p < 0.001$.

Table 2. Dynamic pattern of indicators of the subjective comfort, level of chronic fatigue, quality of life, cognitive functions (in points) in post-stroke patients when exposed to audiovisual stimulation and techniques of rational-emotive and body-oriented psychotherapy (Me [Q₁; Q₃])

Indicators	Group I (main), n = 20		Group II (control), n = 20	
	Before	After	Before	After
Subjective comfort on the state scale				
Subjective comfort	34.0 [28.5; 39.0]	52.5 [49.0; 58.0]**	34.5 [30.5; 37.5]	41.0 [34.0; 48.5]*#
Level of chronic fatigue on the fatigue scale				
Chronic fatigue level	39.0 [32.5; 46.5]	16.5 [12.5; 18.0]*	38.0 [34.0; 43.5]	23.0 [18.0; 28.5]#
Quality of life on the SS-QOL scale				
The quality of life	193.0 [175.0; 211.0]	218.0 [207.0; 234.5]*	187.5 [175.3; 223.5]	185.5 [179.0; 226.5]#
Cognitive functions on the MMSE scale				
Cognitive functions	27.0 [24.0; 29.0]	28.0 [25.3; 28.0]	27.0 [26.0; 28.8]	28.5 [28.5; 29.8]

Note. Differences were analyzed using the Wilcoxon test; * — statistically significant difference before and after the treatment, $p < 0.05$; ** — $p < 0.001$. The significance of differences between the groups after the treatment was established by the Mann-Whitney test: # — $p < 0.05$; ## — $p < 0.001$.

(20 %) patients had no signs of chronic fatigue, 8 (40.0 %) patients showed initial signs of chronic fatigue and 8 (40.0 %) patients showed signs of pronounced chronic fatigue, when patients find it difficult to do anything; they feel tired all the time.

The quality of life indicator on the SS-QOL scale after the treatment changed in relation to the initial indicator also in the main group ($p < 0.05$), while no significant change in this indicator was found in the control group.

Assessment of the changes of the cognitive functions indicator on the MMSE scale in the groups after the treatment showed an improvement of the indicator in both the main group and the control group, but no statistically significant improvement of cognitive functions was achieved (Table 2).

The comparative analysis changes of the emotional state indicators in two groups when exposed to audiovisual influence and techniques of rational-emotive and body-oriented psychotherapy showed a significant decrease in high indicators of state and trait anxiety, a high level of chronic fatigue and increase in the subjective comfort in the patients of the main group ($p < 0.05$) (see Table 2).

DISCUSSION

The study showed that the patients during the late recovery period after a stroke were experiencing a high

level of anxiety and depression before the treatment, and were experiencing a severe psycho-emotional stress. This partly confirms the conclusions made by other researchers that anxiety, depression, impaired cognitive functions, mood, and mental state are among the most common problems of these patients [6, 7, 9, 11].

The results of the conducted study of the effect of a complex rehabilitation programme with the inclusion of audiovisual stimulation and techniques of rational-emotive and body-oriented psychotherapy on the emotional state of patients in the late recovery period after an ischaemic stroke indicate a significantly substantial decrease in anxiety and depression, a decrease in state and trait anxiety, and an increase in the subjective comfort. This confirms the findings of other researchers about the reduction of negative emotional state indicators after clinical application of audiovisual impact [12, 13], increases the possibilities of correction of anxiety-depressive disorders in patients in the late recovery period after a stroke by means of psychotherapy techniques.

It is important to emphasize that post-stroke patients during the late recovery period when exposed to audiovisual stimulation and techniques of rational-emotive and body-oriented psychotherapy improved mood, decreased psycho-emotional stress, increased activity and tolerance to psychological stress.

At the same time, under the influence of psychotherapy, the patients learnt adaptive coping-strategies that allowed them to avoid the recurrence of neurotic manifestations and promoted active inclusion of patients in the rehabilitation process [14, 15].

CONCLUSION

Psychological diagnostics of initial indicators of emotional state and cognitive functions, carried out in patients during the late recovery period after an ischaemic stroke, showed pronounced emotional disorders in 65.0 % of patients and the need for psychological correction of high indicators of anxiety and depression, high level of state and trait anxiety, a high level of chronic fatigue and low indicators of the subjective comfort.

1. Psychological correction of emotional disorders in post-stroke patients during the late recovery period, included in the complex programme of medical rehabilitation, contributed to the normalization of emotional state in 70.0 % of patients.
2. The use of audiovisual stimulation and techniques of rational-emotive and body-oriented psychotherapy enabled to significantly reduce state and trait anxiety, chronic fatigue, and increase the subjective comfort ($p < 0.05$) in patients during the late recovery period after a stroke.
3. A comprehensive rehabilitation programme with the inclusion of audiovisual stimulation, rational-emotive and body-oriented psychotherapy techniques contributed to a significant decrease in anxiety-depressive emotions and improved the quality of life of patients in the late recovery period after an ischemic stroke ($p < 0.05$).
4. The findings serve as a basis for the inclusion of audiovisual stimulation methods and psychotherapy techniques in the programmes of the complex medical rehabilitation of post-stroke patients.

ADDITIONAL INFORMATION

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Author Contributions. All authors confirm their authorship according to the international ICMJE criteria (all authors contributed significantly to the conception, study design and preparation of the article, read and approved the final version before publication). Special contributions: Odarushchenko O.I. — collection of research material, statistical processing and data analysis, review and analysis of publications on the topic of the article, writing the text of the manuscript; formulating conclusions; Kuzyukova A.A., Nuvakhova M.B. — significant participation in the development of the concept and design of the study, verification of the critical content of the article, scientific revision of the text of the manuscript, formulating conclusions; Yurova O.V., Yakovlev M.Yu. — a substantial contribution to the development of the concept and design of the study, the final approval of the manuscript for publication.

Funding. This study was not supported by any external funding sources.

Disclosure. Odarushchenko O.I., Kuzyukova A.A., Nuvakhova M.B. are co-authors (copyright holders) of the patent for invention RU 2772400 C1, 05/19/2022 (Application No. 2021121803 of 07/22/2021), in the development of which the results of the study were used. Yurova O.V. — Deputy Editor-in-Chief of the Bulletin of Rehabilitation Medicine. The other authors declare that they have no conflicts of interest.

Ethics Approval. The authors declare that all procedures used in this article are in accordance with the ethical standards of the institutions that conducted the study and are consistent with the 2013 Declaration of Helsinki. The study was approved by the decision of the Local Ethics Committee of the National Medical Research Center for Rehabilitation and Balneology (Protocol No. 10, 11.28.2022).

Data Access Statement. The data that support the findings of this study are available on reasonable request from the corresponding author.

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