

## Review Article

# Effect of progressive rehabilitation training combined with acupuncture on rehabilitation and daily living ability of stroke patients

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**Abstract:** This study intended to analyze the role of progressive rehabilitation with acupuncture on the rehabilitation and daily living of patients recovering from stroke. Altogether 126 stroke patients were grouped into the research group (RG) (69 patients received progressive rehabilitation with acupuncture) and the control group (CG) (57 patients received progressive rehabilitation). The therapeutic effects were compared, including edema, dysphagia, changes in self-efficacy and recovery of upper limb function, psychological status and neurological recovery, prognosis, QOL and incidence of adverse reactions. The rehabilitation effect of the RG was higher. Edema and dysphagia of the RG were reduced ( $P<0.05$ ), and self-efficacy and upper limb function recovery were increased ( $P<0.05$ ). After treatment, the psychological status of the RG was better ( $P<0.05$ ), and the recovery of neurological function was better ( $P<0.05$ ). The QOL in the RG was higher ( $P<0.05$ ), and the incidence of adverse reactions in the RG was lower ( $P<0.05$ ). Progressive rehabilitation with acupuncture can improve rehabilitation effects, recovery of neurological function, and daily living ability; all of which are important factors, thus making combination treatment worthy of promoting in the clinic.

**Keywords:** Progressive rehabilitation training, acupuncture, stroke, rehabilitation, quality of life

## Introduction

At present, the rise of global population aging has become more and more serious, and the incidence of cardiovascular and cerebrovascular diseases (CCVd) is also increasing [1]. As one of the most common cardiovascular and cerebrovascular diseases, stroke has a high rate of disability and death [2, 3]. Stroke is caused by cerebral hemorrhage or cerebral ischemia with sudden onset and extremely rapid progress [4], resulting in a high disability, mortality and incidence rate, and it seriously threatens people's life and safety [5]. Stroke is mainly a brain tissue injury caused by sudden rupture or blockage of cerebral blood vessels in patients, which results in blood flow occlusion [6]. It can cause serious neurological impairment. Most stroke patients will have disability in motor function, language, cognitive mood and behavioral disorders, and the speed of recovery

and degree of healing are relatively low [7]. The QOL is also seriously affected. Therefore, targeted rehabilitation training acts by restoring neurological function and ameliorating sequelae of patients.

Rehabilitation training refers to promoting the maximum recovery or reconstruction of the potential or residual abilities of patients with dysfunction through effective and scientific theories, methods and technical means, so that the patients can better return to their families and society after discharge [8]. With the continuous progress of medicine, rehabilitation training is also constantly developed [9]. Progressive rehabilitation training aims to adjust the content of rehabilitation training in real time according to the patient's tolerance and the body's recovery in different periods, so as to achieve better results [10]. In recent years, acupuncture has been found to have better clinical

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effects on the rehabilitation of stroke patients [11]. Acupuncture has a history of thousands of years of therapeutic effects, which can dredge meridian systems, activate qi and remove blood stasis [12]. Studies have shown that acupuncture can also promote the release, and biochemical effects, of neurotransmitters and polypeptide substances in the brain and spinal cord [13]. Therefore, we speculated that the combination of the two therapies may produce better curative effects in the rehabilitation treatment of stroke patients, but at present there is little research on this combined therapy. In order to verify our conjecture, this experiment provides effective references and guidance for rehabilitation treatment of stroke patients in clinic by exploring gradual rehabilitation training combined with acupuncture on the rehabilitation situation and daily living ability of stroke patients.

### Data and methods

#### *General data*

Altogether 126 stroke patients from February 2017 to February 2019 were selected as the research participants, 69 of whom received progressive rehabilitation training combined with acupuncture treatment as the research group (RG). Another 57 patients received only progressive rehabilitation training and were regarded as the control group (CG). This study was approved by the Ethics Committee of Guangdong Second Provincial General Hospital. All the above research subjects have signed informed consent forms.

#### *Inclusion and exclusion criteria*

Inclusion criteria: all participants were diagnosed in Guangdong Second Provincial General Hospital and were given rehabilitation treatment; all patients were treated in Guangdong Second Provincial General Hospital after diagnosis; participants with complete case data; participants who cooperated with the medical staff in Guangdong Second Provincial General Hospital; the patients or their immediate family members signed the informed consent form.

Exclusion criteria: patients who had other malignant tumors, multiple chronic diseases, other cardiovascular and cerebrovascular dis-

eases, organ dysfunction, drug allergies, mental diseases or physical disabilities and could not take care of themselves; or patients transferred from another hospital.

#### *Methods*

The two groups of patients were treated with routine neurology therapy, including neurotrophic nerve treatment, intracranial pressure reduction, lipid regulation, antiplatelet and other drugs. Patients complicated with hypertension and diabetes were given conventional antihypertensive and hypoglycemic treatment, and antibiotics were taken to prevent infection. The control group received progressive rehabilitation training at the same time. With the recovery of the disease, the patients were instructed to carry out language and cognitive function training, motor function training, antispasmodic movement treatment with active movement or active-passive movements. The antispasmodic mode consisted of shoulder abduction, external rotation, shrugging and shoulder shaking. Attention was paid to full extension of the elbow joint and anterior flexion of the shoulder joint. Forearm pronation and supination, wrist dorsiflexion and raising of clasped hands, were all carried out. The healthy upper limb was used to drive the movement of the affected upper limb. Through the course of the activity, movement gradually reached the full range of joint activity. In the process of rehabilitation training, patients were encouraged to actively exercise the recovering limbs and healthy limbs to recover the limb movement, 1~2 times a day for about 30 min. The RG was treated with acupuncture in addition to treatment in the CG. The method of regulating yin and yang, dredging meridian systems, refreshing the brain and regulating the mind was adopted. For patients with upper limb dysfunction, the Shou San Li, Wai Guan, Jian Zhen, Jian Jing points were selected. For lower limb dysfunction, Tai Chong, Huan Tiao and other acupuncture points were selected. Acupuncture points such as Di Cang, Ying Xiang, Cheng Jiang and Jia Che were selected for patients whose eyes could not be closed and patients with deviation of the mouth and eyes. For those who have poor speech, acupoints such as Yu Ye, Tong Li, Jin Jin and Lian Quan were selected. Specific acupuncture method: the patient took a supine position, was given routine disinfection of skin, and had bilat-

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**Table 1.** General data table [n (%)]

	Research group (n=69)	Control group (n=57)	t or $\chi^2$	P
Age (years)	66.3±6.6	67.2±7.5	0.716	0.475
BMI (KG/cm <sup>2</sup> )	24.52±3.05	24.46±4.72	0.086	0.932
Gender			0.255	0.613
Male	43 (62.32)	33 (57.89)		
Female	26 (37.68)	24 (42.11)		
Residence			0.144	0.704
Urban	47 (68.12)	37 (64.91)		
Rural	22 (31.88)	20 (35.09)		
Education level			0.276	0.599
< high school	49 (71.01)	38 (66.67)		
≥ high school	20 (28.99)	19 (33.33)		
Smoking history			0.062	0.803
Yes	51 (73.91)	41 (71.93)		
No	18 (26.09)	16 (28.07)		
Drinking history			0.006	0.941
Yes	48 (69.57)	40 (70.18)		
No	21 (30.43)	17 (29.82)		
Family history			0.538	0.463
Yes	27 (39.13)	26 (45.61)		
No	42 (60.87)	31 (54.39)		
Nationality			0.13	0.718
Han	59 (85.51)	50 (87.72)		
Minorities	10 (14.49)	7 (12.28)		

**Table 2.** Therapeutic effect of both groups

	Research group n=69	Control group n=57	$\chi^2$	P
Markedly effective	48 (69.57)	24 (42.11)		
Effective	20 (28.99)	26 (45.61)		
Ineffective	1 (1.45)	7 (12.28)		
Total effective rate%	68 (98.55)	50 (87.72)	6.159	0.013

eral acupuncture points for treatment. The acupuncture points on the affected side were placed, the needle was retained for 20-25 min after the arrival of Qi, and the needle was applied once every 5 min.

### Outcome measures

Main outcome measures: therapeutic effect [14]; edema (edema is evaluated by swelling degree [15]); dysphagia (Watian drinking water test score [16]); self-efficacy (self-efficacy score [17]); upper limb function (Fugl-Meye score [18]) recovery before and after treatment; quality of life (QOL) score [19].

Secondary outcome measures: Hamilton Anxiety Scale (HAMA) score; Hamilton Depression Scale (HAMD) [20] score; the National Institutes of Health Stroke Scale (NIHSS) score; Mini-mental State Examination (MMSE) score; modified Barthel Index Rating Scale (BI) score [21]; and adverse reactions.

### Statistical methods

SPSS 22.0 statistical software was applied for statistical analysis on the data results. Graphpad7 was applied to illustrate the figures. The counting data were expressed by (rate). Chi-square test was applied for comparison between groups. The measurement data were expressed as (mean ± standard deviation), and the comparison between groups was done with a t test. P<0.05 was regarded as a statistical significant difference.

### Results

#### General data comparison

First of all, we collected the general data of the two groups of patients when they were admitted to hospital. Then we compared the age, BMI, gender, living environment, educational level, smoking history, drinking history, family history and ethnic status between the two groups, and found that there was no significant difference (P>0.05). See **Table 1**.

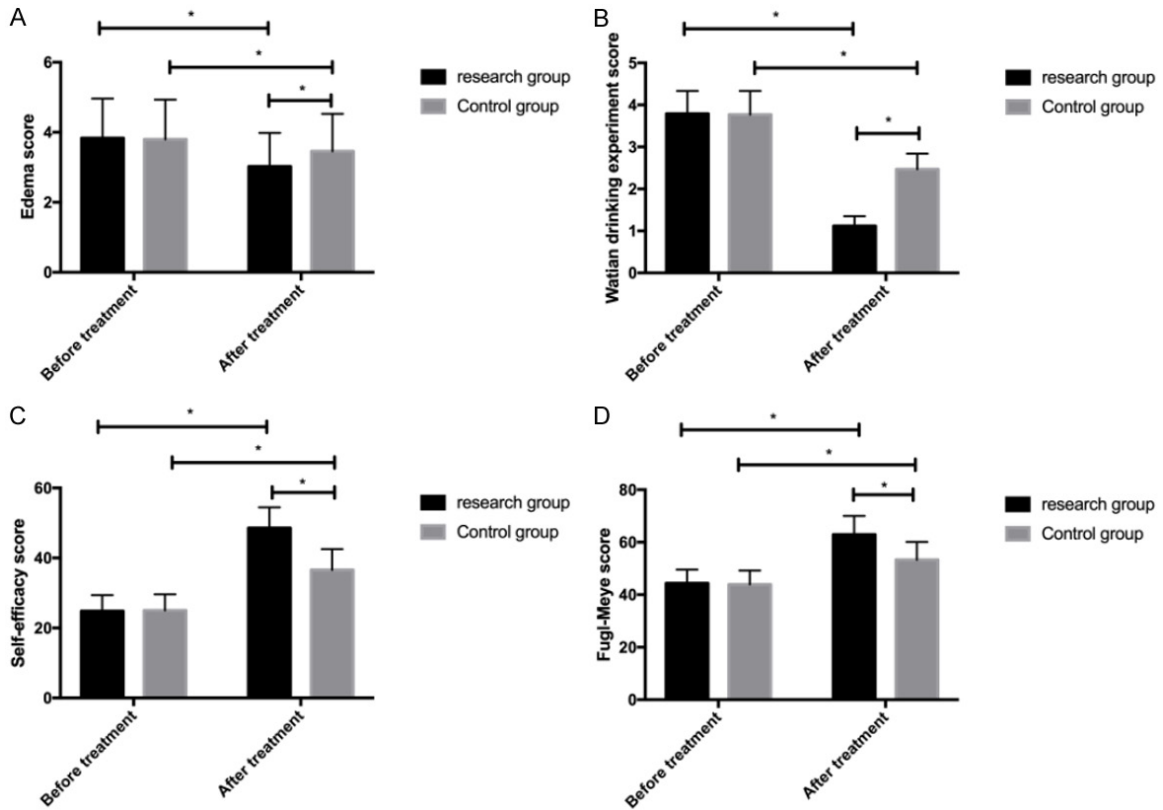
#### Therapeutic effect of two groups

Observing the therapeutic effect of the two groups of patients, the results showed that the total effective rate of the research group was 98.55, and that of the control group was 87.72. The treatment effect in the research group was significantly higher than that of the control group (P<0.05). See **Table 2**.

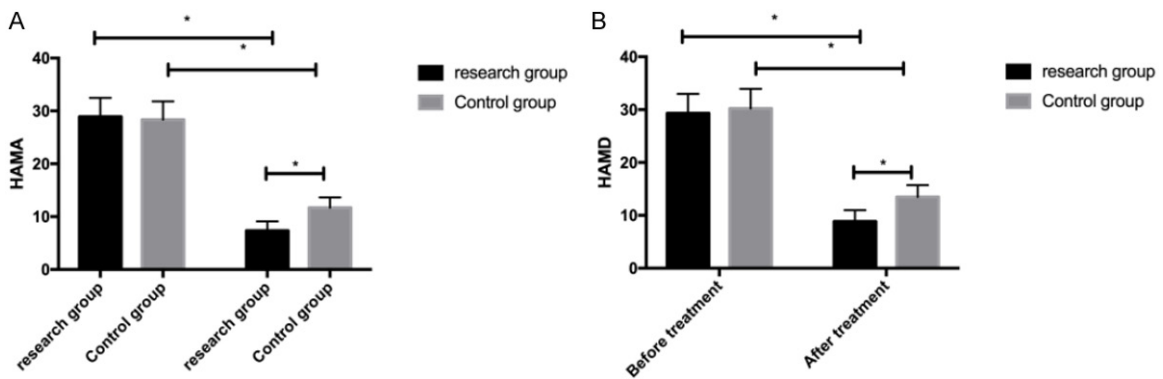
#### Edema, dysphagia, changes in self-efficacy and upper limb function recovery before and after treatment

Before treatment there was no evident difference the in assessed measures between the two groups (P>0.05). After treatment, edema,

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**Figure 1.** Edema, Watian drinking experiment, self-efficacy and Fugl-Meye scores before and after treatment in the two groups of patients. A. Edema score before and after treatment in both groups. B. Watian drinking experiment scores before and after treatment in both groups. C. Self-efficacy scores of the two groups before and after treatment. D. Fugl-Meye scores before and after treatment in both groups.



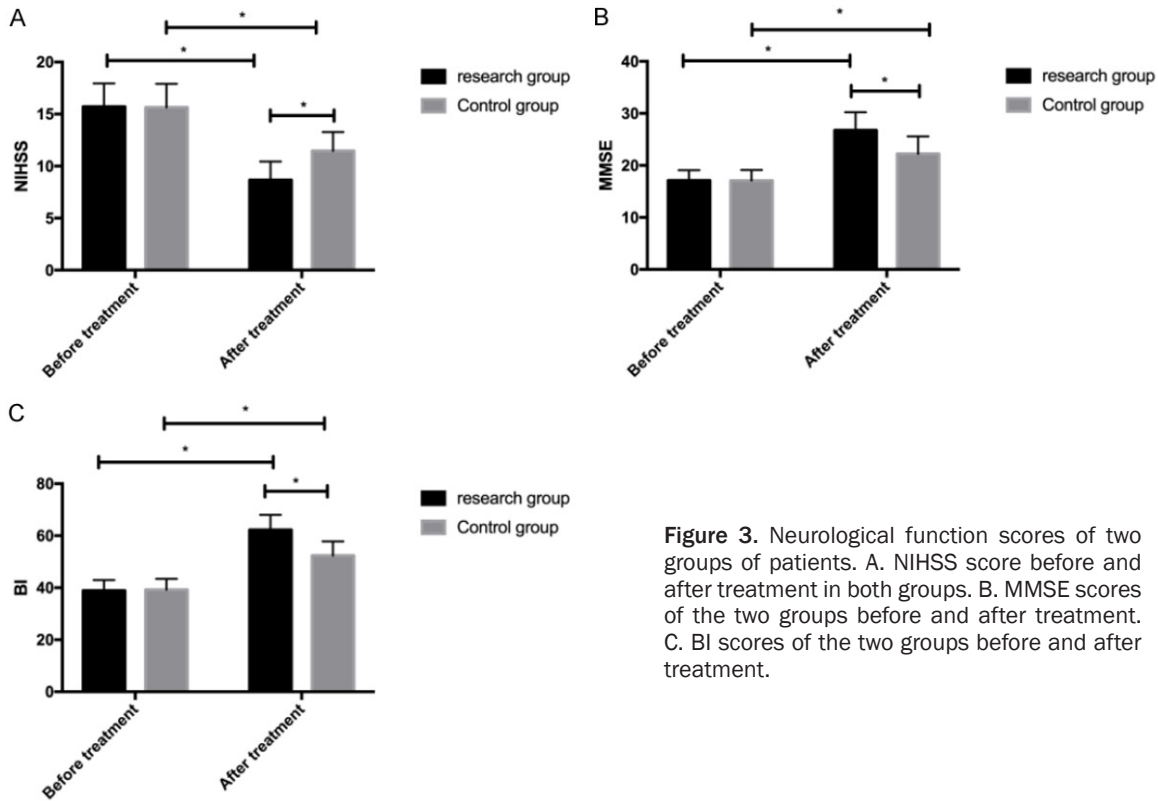
**Figure 2.** Psychological status of two groups of patients. A. HAMA scores of the two groups of patients before and after the intervention were observed. B. HAMD scores of the two groups before and after the intervention were observed.

dysphagia, self-efficacy changes and upper limb function recovery of the two groups were improved ( $P < 0.05$ ). Moreover, edema and dysphagia of the patients in the RG were both reduced compared with CG ( $P < 0.05$ ), and self-efficacy and upper limb function recovery were increased ( $P < 0.05$ ). See **Figure 1**.

### *Psychological status of two groups of patients*

There was no evident difference between the groups in HAMA and HAMD scores before the intervention ( $P > 0.05$ ). After the intervention, the scores of the two groups were reduced and the HAMA and HAMD scores of the patients in

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**Figure 3.** Neurological function scores of two groups of patients. A. NIHSS score before and after treatment in both groups. B. MMSE scores of the two groups before and after treatment. C. BI scores of the two groups before and after treatment.

**Table 3.** Comparison of quality of life between both groups

	Research group n=69	Control group n=57	t value	P value
Body	92.32±4.22	84.36±4.15	10.620	<0.001
Role	82.51±3.25	67.28±3.11	26.690	<0.001
Emotion	88.63±3.33	70.85±3.42	29.470	<0.001
Cognition	91.45±3.64	80.59±3.56	16.830	<0.001
Society	63.19±3.10	51.76±3.24	20.180	<0.001

the RG were clearly lower than those in CG (P<0.05). See **Figure 2**.

### Neurological function score of two groups

There was no evident difference in NIHSS, MMSE and BI between the GG and CG before treatment (P>0.05). After treatment, NIHSS, MMSE and BI were improved, and NIHSS score of the RG was lower than that of CG (p<0.05), while MMSE and BI scores were higher than that of the CG (P<0.05). See **Figure 3**.

### Prognosis and quality of life in two groups of patients

We followed the two groups of patients for half a year. The follow-up was conducted in the form

of hospital reexamination and the quality of life of the patients was investigated. The results showed that all scores for the dimensions of; body function, role, emotion, cognition and societal function for quality of life in the RG were significantly better than those in the CG after treatment (P<0.05). See **Table 3**.

### Adverse reactions of two groups

We counted the occurrence of adverse reactions from admission to discharge of the two groups of patients, and compared the adverse reactions of the two groups of patients. The results showed that the incidence rate of adverse reactions in the RG was 5.80%, while that in the CG was 20.37%. The incidence rate of adverse reactions in the RG was significantly lower than that in the CG (P=0.014). See **Table 4**.

### Discussion

Stroke is presently a common disease throughout the world and its incidence rate is increasing daily [22]. In the clinical treatment of stroke, besides actively controlling the conditions of the disease and saving the patient's life to the greatest extent, it is also particularly important

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**Table 4.** Comparison of adverse reactions between both groups

	Research group (n=69)	Control group (n=57)	$\chi^2$	P
Urinary system infection	1 (1.45)	2 (3.51)		
Pulmonary infection	0 (0.00)	1 (1.75)		
Deep venous thrombosis of lower limb	1 (1.45)	2 (3.51)		
Constipation	1 (1.45)	4 (7.02)		
Hospital acquired pressure ulcer	1 (1.45)	2 (3.51)		
Incidence of adverse reactions (%)	4 (5.80)	11 (20.37)	6.008	0.014

to restore the patient's function, reduce the degree of neurological impairment and enhance their ability to return to society and family [23]. However, stroke patients often face a relatively long rehabilitation process after receiving treatment, which seriously affects the QOL [24]. An effective rehabilitation plan is of great significance to stroke patients. Therefore, we explored the effect of progressive rehabilitation training with acupuncture on the rehabilitation of stroke patients, providing a theoretical basis for clinical treatment.

The effective rate in the research group by applying progressive rehabilitation training combined with acupuncture was significantly better than that of CG. Edema and Watian drinking experiment scores of the RG were reduced compared with the CG, and self-efficacy and Fugl-Meye scores were also increased. This suggested that gradual rehabilitation training with acupuncture can improve the rehabilitation effect and greatly reduce the harm from stroke. This was also consistent with the effect of acupuncture on rehabilitation of stroke patients mentioned in previous studies [25]. For example, studies by Wayne PM et al [26], indicated that acupuncture combined with rehabilitation training improves the recovery of stroke patients. Zheng J [27] proposed that acupuncture combined with conventional rehabilitation had better effects on the early pain of shoulder-hand syndrome after stroke. All of these have proved the results of this experiment. After investigation, the psychological anxiety and depression of the patients in the RG were better than those in the CG. This result further support our above-mentioned experiments, which also suggested that progressive rehabilitation training combined with acupuncture treatment can improve the rehabilitation effect of patients, significantly ameliorate the sequelae endangering the normal life of patients, reduce the negative psychological emo-

tions of patients, further improve the treatment compliance of patients; all of which have important significance for the rehabilitation of stroke patients. Progressive rehabilitation training aims to improve rehabilitation training in real time according to the patient's tolerance degree and the body's recovery in different periods, so as to enhance nerve conduction, promote the reorganization or recovery of the nervous system, and achieve the effect of limb motor function rehabilitation [28]. According to effective individualized training, blood circulation of limbs can be promoted, swelling degree of limbs can be reduced, muscle strength can be enhanced, adhesion of adjacent tissues around the limbs can be avoided, and adverse situations such as venous thrombosis, muscle atrophy, pressure sores, and joint stiffness can be prevented [29]. Compared with conventional rehabilitation training, it is more targeted and effective. It not only strengthens the coordination and comfort of patients, but also improves the self-management awareness of patients and speeds up the rehabilitation process [30]. Acupuncture treatment, which has a long history, can effectively promote the recovery of nerve function [31]. According to the theory of traditional Chinese medicine, sequelae of stroke are often caused by imbalance of yin and yang of kidney, spleen and liver and adversity of qi and blood, and the main cause of the disease is blocked meridians [32]. Accordingly, acupuncture therapy can stimulate the regulation of blood vessels. According to research, acupuncture can expand blood vessels in brain and limbs, thus promoting the establishment of collateral circulation of cerebral vessels and promoting the functional recovery of upper and lower motor neurons [33]. However, these experiments indicated that the neurological function scores of the RG were better than those of the CG, which further revealed that gradual rehabilitation training combined with

acupuncture could effectively reduce the neurological deficit of patients and improve their daily living ability. We further investigated the prognosis and QOL of patients, and found that the QOL of the RG was better than that of the CG, which further supported the application value of progressive rehabilitation training combined with acupuncture treatment for stroke patients. Finally, we observed the incidence of adverse reactions in the RG and CG, and the results were the same, revealing that through combination treatment, the rehabilitation of stroke patients achieved improved results and is more effective for better prognosis of patients, so it is worth popularizing in the clinic.

As there were limited experimental conditions, the study still has deficiencies. For example, there are many rehabilitation methods in clinical practice, but there is still great controversy over the selection of the best treatment mode for stroke rehabilitation. In this study, only gradual rehabilitation training was used as a control, and it was not excluded that the application of gradual rehabilitation training combined with acupuncture intervention may differ from our results when compared with other rehabilitation modes. Moreover, this study did not deal with stroke patients with different degrees of illness, which still requires further experimental analysis. We will expand the sample size and the experimental period of the study as soon as possible and conduct more detailed and comprehensive experimental analysis to obtain better experimental results.

To sum up, gradual rehabilitation training combined with acupuncture treatment can enhance the rehabilitation effect, improve the recovery of neurological function of patients, and effectively improve the daily living ability of stroke patients, which is worthy of clinical application.

### Disclosure of conflict of interest

None.

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