

## Original Article

# Analysis of influencing factors of rehabilitation treatment effect in patients with first-episode stroke

Qianfeng Yan\*, Xiangming Wang, Yun Zhang, Huijun Zhang, Lipeng Zhao\*

Tongren Hospital Affiliated to Medical College of Shanghai Jiaotong University, Shanghai 200336, China. \*Equal contributors.

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**Abstract:** Objective: To explore the influencing factors of rehabilitation treatment effect in patients with first-episode stroke and provide a theoretical basis for clinical practice. Methods: The clinical data of patients with first-episode stroke who received rehabilitation treatment in our hospital from January 2015 to January 2019 were collected and analyzed retrospectively. The Modified Barthel Index (MBI) and Frenchay Activity Scale (FAS) were used to evaluate the rehabilitation treatment effect. Spearman rank correlation analysis was carried out to investigate the relationship between the data characteristics and rehabilitation treatment effect, and univariate and multivariate logistic regression analyses were conducted to explore the independent factors influencing the rehabilitation treatment effect in the first-episode stroke group. Results: In this study, 786 cases of 873 patients with first-episode stroke were included, with an effective inclusion rate of 90.0%. Univariate analysis showed that MBI and FAS scores were statistically different among patients with different ages, history of hypertension, the number of residual symptoms, depression status, attitude towards rehabilitation, starting time of rehabilitation, rehabilitation treatment duration, and family environment scores (all  $P < 0.05$ ). According to the Spearman rank correlation analysis, age, residual symptoms, depressive status, and starting time of rehabilitation were all negatively correlated with MBI score ( $r = -0.584, -0.683, -0.573, -0.783$ ) and FAS score ( $r = -0.438, -0.771, -0.552, -0.599$ ), while the scores of MBI ( $r = 0.683, 0.572, 0.662$ ) and FAS ( $r = 0.735, 0.603, 0.724$ ) were positively correlated with the scores of rehabilitation treatment attitude, rehabilitation treatment duration and family environment (all  $P < 0.05$ ). Moreover, according to multivariate logistic regression analysis, age, the number of remaining symptoms, depression status, attitude towards rehabilitation treatment, starting time of rehabilitation treatment, rehabilitation treatment duration, and family environment score could independently affect MBI and FAS scores of patients with stroke (all  $P < 0.05$ ). Conclusion: Age, the number of residual symptoms, depression status, attitude towards rehabilitation treatment, starting time of rehabilitation treatment, rehabilitation treatment duration, and family environment score are independent factors for rehabilitation treatment effect in patients with first-episode stroke.

**Keywords:** Stroke, rehabilitation treatment, first episode, modified Barthel index scale, frenchay activity scale

## Introduction

Cerebral stroke or cerebrovascular accident [1] is mainly categorized as ischemic stroke and hemorrhagic stroke. With clinical manifestations of transient or permanent brain dysfunction, it is a chronic non-communicable disease triggered by acute obstruction of blood circulation in the brain after cerebral artery stenosis, occlusion, or rupture due to various inducing factors [2]. Stroke is featured with high morbidity, disability, mortality, and recurrence rate. About 80% of survivors of stroke suffered different degrees of dysfunction, among which

40% were severe cases [3]. Such dysfunction may lead to pain, impaired life quality, huge economic burden, and mental pressure, which severely affect the patients' daily life.

The primary treatment for stroke is to control the condition and prevent its recurrence with medications with additional treatments to improve function and reduce disability. Previously, little attention has been paid to the rehabilitation exercise of patients with stroke [4]. However, with the continuous improvement of medical exploration, rehabilitation treatment has become an important area that captures

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great attention in academia. Based on the traditional treatment, numerous new therapeutic measures have emerged through extensive clinical practice [5, 6], which not only verifies the research results of human body function in neuroscience, but also provides new ideas for clinical rehabilitation treatment. Rehabilitation treatment is the main method to alleviate the functional impairment of stroke patients and enhance their self-care ability. Rehabilitation has become one of the most effective and indispensable treatments for stroke patients with various functional impairments, and serves as an essential part of the construction of stroke units [7, 8]. However, the effectiveness of rehabilitation treatment for stroke patients varies widely in practice, for which no systematic studies have yet been conducted. Accordingly, we herein examined the relevant factors to explore the most important influencing factors for stroke to further provide a clinical basis for corresponding treatment measures.

### Materials and methods

#### *Research population*

A retrospective analysis was conducted based on the clinical data of 873 patients with first-episode stroke who received rehabilitation treatment in our hospital from January 2015 to January 2019. All patients were diagnosed with stroke by imaging.

The inclusion criteria: (1) patients diagnosed as ischemic stroke or hemorrhagic stroke for the first time; (2) patients >18 years old; (3) patients with complete clinical data; (4) patients with numbness, weakness, facial palsy, slurred speech, and impaired consciousness on one side of the limb; (5) patients with transient dizziness and headache with frequent vomiting, complicated with upper gastrointestinal bleeding and coffee-like vomitus.

The exclusion criteria: (1) patients with recurrent ischemic stroke or hemorrhagic stroke; (2) patients without Modified Barthel Index (MBI); (3) patients with transient cerebral ischemia; (4) patients with mental disorders and unable to actively cooperate with the treatment; (5) patients with severe cognitive impairment or unclear consciousness [Glasgow Coma Scale (GCS)  $\leq 8$ ]; (6) patients who had received drug

or surgical treatment; (7) patients with expected survival time <3 months. All the subjects or their families signed the informed consent, and the study was approved by the ethics committee of our hospital, with the ethics approval number of 2014-12-19.

#### *Data collection and collation*

The survey was completed in the hospital by investigators who were trained in a unified way to master the correct and unified instruction and the methods of filling in and collecting the questionnaire. Specifically, the investigators distributed the questionnaire on-site and informed patients of the filling methods and precautions. The questionnaire can be filled by the patients themselves or their family members according to their situation. Assistance was also provided for filling the questionnaire by the researcher if needed. The questionnaire was collected on-site. Omissions and errors were modified in time to ensure the integrity of the data. The questionnaires included a self-made general data questionnaire, stroke knowledge, and patient attitude questionnaire, Hamilton Depression Scale (HAMD), social support rating scale, family environment rating scale, and daily life activity rating scale, all of which were collected one by one by specially-assigned medical staff.

#### *General and clinical data (questionnaire and scale)*

General information questionnaire: Based on a large amount of literature reviewed in the previous period, a general information questionnaire was developed, covering gender, age, education level, occupation, spouse, family income, the number of main caregivers, and clinical data including hemiplegic side, stroke type, history of hypertension, history of diabetes, history of hyperlipidemia, obesity, history of smoking, history of drinking, treatment factors, starting time of rehabilitation treatment, treatment duration, remaining symptoms and the number of symptoms.

Attitude questionnaire for rehabilitation treatment of patients with stroke: Based on the attitude of patients and their family members towards prevention of risk factors and towards adherence to rehabilitation exercise and treatment, a total of 15 items were developed to

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assess the treatment attitude of patients, with a total score of 45 points. An aggregate score less than 15 points refers to a low score; an aggregate score of 16-30 points refers to a medium score; an aggregate score of 31-45 points refers to a high score. The score is positively correlated with the attitude of patients and their families towards rehabilitation treatment. The HAMD is a common user-friendly and reliable clinical scale to evaluate depression, with a total of 17 items. The patients were assessed jointly by two trained assessors with high consistency in scoring after strict training. The score of HAMD can reflect the depression degree of the patient: A total score <7 points means normal; a total score between 7-17 points means mild depression; a total score between 18-24 points means severe depression.

**Family environment scale:** This scale adopts the family environment scale developed by Moss et al. [9] in 1981. With 90 right and wrong questions, it is divided into 10 subscales to evaluate 10 different characteristics of family society and environment respectively. The rating method of the scale is as follows: the questions meet the choice of "yes" of more than half of the family members, and "no" if not. The subscale mainly evaluates the following 10 aspects: intimacy, emotional expression, contradiction, independence, success, knowledge, entertainment, morality and religion, organization, and control. The scale can well reflect the family relationship and family support of patients. A total score <35 points means a low score; a total score between 36-68 points means a medium score; a total score between 69-90 points means a high score. A higher score indicates a better family environment.

### *Evaluation of rehabilitation treatment effect*

Activities of daily living (ADL) refers to the activities that people carry out in their daily life, which can be divided into basic activities of daily living (BADL) and instrumental or extended activities of daily living (IADL). Improving ADL after stroke is one of the most important goals of rehabilitation of patients with stroke. Therefore, in this study, MBI and Frenchay Activity Scale (FAS) were used to evaluate the BADL and IADL of patients with stroke [10, 11].

MBI covered defecation (0-10 points): 0 = incontinence or coma, 5 = occasional incontinence (less than once a week), 10 = controllable; urination (0-10 points): 0 = incontinence or coma or requirement of catheterization by others, 5 = occasional incontinence (less than once every 24 hours, once a week), 10 = controllable; grooming (0-5 points): 0 = in need of help, 5 = being able to wash face, comb hair, brush teeth, shave independently; toilet (0-10 points): 0 = in need of help entirely, 5 = in need of partial help, 10 = no need of help; eating (0-10 points): 0 = in need of help entirely, 5 = in need of partial help (including food, rice, cutting bread), 10 = no need of help; bed chair transfer (0-15 points): 0 = in need of help entirely and unable to sit, 5 = in need of many help (2 people) and able to sit, 10 = in need of little help (1 person) or guidance, 15 = no need of help; activities (0-15 points): 0 = being unable to move, 5 = being able to stand with the wheelchair alone, 10 = in need of assistance from others during walking (physical or verbal guidance), 15 = being able to walk independently (using assistive device); dressing (0-10 points): 0 = in need of help entirely, 5 = in need of help partially, 10 = no need of help (button opening, closing, pulling lock and shoes); going up and down stairs (0-10 points): 0 = being unable to do it, 5 = in need of help (physical or verbal guidance), 10 = no need of help; bathing (0-5 points): 0 = in need of help, 5 = no need of help. A lower score indicates worse ADL and worse rehabilitation effects.

FAS includes 15 items, covering three aspects of domestic work (cooking, grooming, laundry and light/heavy domestic work, gardening and car hygiene, etc.), work/leisure (work, reading, social activities, hobby activities), and outdoor activities (shopping, walking, driving, and traveling). Each item was rated as 1-4 points according to the actual frequency of activity completed by patients in the recent 3 or 6 months, among which 1 point indicated the lowest activity ability, so the total score ranged between 15-60 points.

### *Statistical analysis*

SPSS17.0 software was selected for analysis. The data were expressed as mean  $\pm$  standard deviation or rate. T-test,  $\chi^2$  test or one-way ANOVA was used to analyze the differences in

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**Table 1.** General information of patients with first-episode stroke

Items	Cases	%
<b>Gender</b>		
Male	485	61.7%
Female	301	38.3%
<b>Age</b>		
≤60 years old	401	51.0%
>60 years old	385	49.0%
<b>Education level</b>		
no	32	4.1%
primary school	65	8.3%
junior middle school	300	38.2%
high school	296	37.6%
university and above	93	11.8%
<b>Occupation</b>		
worker	159	20.2%
Farmer	98	12.5%
Staff	145	18.5%
Leader	126	16.0%
Individual	171	21.8%
Other	87	11.0%
<b>Spouse</b>		
Yes	587	74.7%
No	199	25.3%
<b>Monthly household income</b>		
<5000 rmb	143	18.2%
5000~10000 rmb	463	58.9%
>10000 rmb	180	22.9%
<b>Number of primary caregivers</b>		
1 people	227	28.9%
2 people	338	43.0%
3 people and above	221	28.1%
<b>Home environment score</b>		
Low grade	177	22.5%
Middle grade	461	58.7%
High grade	148	18.8%
<b>History of hypertension</b>		
Yes	491	62.5%
No	295	37.5%
<b>History of diabetes</b>		
Yes	403	51.3%
No	383	48.7%
<b>History of hyperlipidemia</b>		
Yes	433	55.1%
No	353	44.9%
<b>Obesity</b>		
Yes	358	45.6%
No	428	54.4%

MBI of patients with different data characteristics as appropriate, and the spearman rank correlation test was used to analyze the correlation between the data of patients with stroke and their MBI and FAS scores. In addition, the multivariate Logistic regression analysis method was used to analyze the main factors affecting the rehabilitation treatment effect in stroke patients, with MBI score as the dependent variable (Y) and the recurrence of significant data ( $P<0.05$ ) in univariate analysis as the variable (X) for multiple regression. In this study,  $P<0.05$  was considered statistically significant.

### Results

#### *Data characteristics of patients with first-episode stroke*

A total of 873 patients with first-episode stroke were included for analysis. Among them, 87 cases voluntarily drop out of the study, and 786 cases were finally enrolled in the study, with an effective inclusion rate of 90.0%. The average age of included patients was  $63.13\pm 12.94$  years old, as shown in **Table 1**.

#### *Univariate analysis results of rehabilitation treatment effect in patients with first-episode stroke*

Univariate analysis was conducted on MBI and FAS scores of first-episode stroke patients with different data characteristics. The results of general data analysis showed that there were significant differences in MBI and FAS scores among patients with different ages, history of hypertension, and the number of remaining symptoms (all  $P<0.05$ ). The MBI score of first-episode stroke patients with hyperlipidemia and drinking history was significantly lower than that of those without such a history, and the FAS score of patients with unilateral hemiplegia was also significantly lower than that of patients with a bilateral one ( $P<0.05$ ). In addition, there was no significant difference in MBI and FAS scores among patients with other different indexes (gender, education level, occupation, spouse, monthly household income, history of diabetes, obesity, history of smoking) (all  $P>0.05$ ), as shown in **Table 2**. According to the results of rehabilitation-related data analysis, there were statistically significant differences in MBI and FAS scores among patients with different depres-

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History of Smoking		
Yes	459	58.4%
No	327	41.6%
History of drinking		
Yes	492	62.6%
No	294	37.4%
Hemiplegic side		
Left side	317	40.3%
Right side	309	39.3%
Both sides	160	20.4%
Types of stroke		
Hemorrhagic stroke	517	65.8%
Ischemic stroke	269	34.2%
Remaining symptoms		
One	472	60.1%
Two	215	27.3%
Three and above	99	12.6%
Depressive state		
No	223	28.4%
Mild	496	63.1%
Severe	67	8.5%
Attitude towards rehabilitation		
Low grade	106	13.5%
Middle grade	396	50.4%
High grade	284	36.1%
Starting time of rehabilitation therapy		
≤2 weeks	597	75.9%
>2 weeks	189	24.1%
Duration of rehabilitation treatment		
≤1 month	245	31.2%
>1 month	541	68.8%

sion states, attitudes towards rehabilitation treatment, starting time of rehabilitation treatment, rehabilitation treatment duration, and family environment scores (all  $P < 0.05$ ), but there was no significant difference in MBI and FAS scores among patients with different number of primary caregivers ( $P > 0.05$ ), as shown in **Table 3**.

### *Correlation analysis of rehabilitation effect of patients with first-episode stroke*

This study analyzed the correlations of MBI and FAS scores with age, hypertension history, the number of remaining symptoms, history of hyperlipidemia, drinking history, hemiplegia side, depression, attitude to rehabilitation treatment, starting time of rehabilitation treatment, length of rehabilitation treatment, and

family environment score. The results showed that the MBI and FAS scores were negatively correlated with age, remaining symptoms, depression status, and starting time of rehabilitation treatment, and positively correlated with the scores of rehabilitation treatment attitude, rehabilitation treatment duration, and family environment, as shown in **Table 4**.

### *Multivariate correlation analysis of influencing factors on rehabilitation effect in patients with first-episode stroke*

Taking MBI and FAS scores of patients with first-episode stroke as dependent variables, variables with statistical significance and correlation with rehabilitation effect were selected by univariate analysis, with age, the number of remaining symptoms, depression state, attitude towards rehabilitation treatment, starting time of rehabilitation treatment, duration of rehabilitation treatment and family environment score as independent variables. Multivariate Logistic regression was used to analyze the data. The results showed that age, the number of remaining symptoms, depression status, attitude towards rehabilitation treatment, starting time of rehabilitation treatment, rehabilitation treatment duration, and family environment score were independent factors influencing the MBI and FAS scores of patients with stroke (all  $P < 0.05$ ), as shown in **Table 5**.

## Discussion

Previous studies have confirmed that rehabilitation treatment is effective in improving the prognostic function of patients with stroke. It is conducive to the reduction of disability and complication incidence and improvement of quality of life [12, 13]. Early rehabilitation exercises can significantly improve the prognosis of stroke patients and reduce the incidence of shoulder pain, joint contracture, muscle atrophy, and deep vein thrombosis [14]. Rehabilitation can also promote the recovery of various dysfunctions triggered by stroke, such as aphasia, dysphagia, cognitive impairment, limb movement, and sensory dysfunction, and thus improve the self-care ability and life of quality of patients, and shorten their recovery period [15-19]. However, there is still no systematic research on the influencing factors of rehabilitation effect. In this study, we sorted out factors influencing the rehabilitation treat-



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**Table 2.** Univariate analysis of MBI and FAS scores of first-episode stroke patients with different general data

Items	Cases	MBI score	t/F value	P-value	FAS score	t/F value	P-value
Gender			0.073	0.934		0.101	0.914
Male	485	75.34±16.42			45.28±6.09		
Female	301	79.04±13.36			47.88±5.95		
Age			12.438	0.002		16.241	<0.001
≤60 years old	401	78.81±12.41			49.42±9.32		
>60 years old	385	69.38±20.58			39.45±7.35		
Education level			0.932	0.427		0.672	0.691
no	32	68.29±13.24			45.37±6.23		
primary school	65	71.23±12.30			42.75±8.72		
junior middle school	300	75.63±19.04			47.51±7.75		
high school	296	74.52±17.88			47.83±8.93		
university and above	93	79.06±16.16			44.06±4.26		
Occupation			0.853	0.581		0.462	0.782
worker	159	79.46±20.64			44.82±5.53		
Farmer	98	75.98±16.39			42.74±4.96		
Staff	145	68.73±18.04			47.61±7.83		
Leader	126	71.26±14.73			48.66±7.04		
Individual	171	74.96±18.08			48.32±8.27		
Other	87	75.71±11.58			46.61±4.25		
Spouse			0.246	0.849		1.063	0.201
Yes	587	77.55±14.89			47.42±6.16		
No	199	76.09±21.42			43.98±9.92		
Monthly household income			1.063	0.104		0.763	0.297
<5000 rmb	143	69.84±18.83			42.74±5.59		
5000~10000 rmb	463	73.95±15.48			45.13±7.04		
>10000 rmb	180	77.93±21.73			46.96±6.87		
History of hypertension			6.341	0.037		9.042	0.015
Yes	491	70.44±14.94			40.13±8.09		
No	295	78.63±19.91			48.43±5.71		
History of diabetes			1.392	0.159		1.642	0.086
Yes	403	71.74±12.88			42.64±7.31		
No	383	76.49±19.18			47.09±5.37		
History of hyperlipidemia			4.293	0.028		1.352	0.099
Yes	433	70.23±18.16			41.53±6.41		
No	353	77.19±20.06			47.87±7.92		
Obesity			2.983	0.067		0.782	0.249
Yes	358	73.38±16.60			43.69±6.28		
No	428	77.97±19.28			46.44±7.25		
History of Smoking			1.394	0.108		1.125	0.127
Yes	459	73.16±16.68			44.25±4.92		
No	327	77.21±19.64			49.02±7.95		
History of drinking			5.391	0.033		0.925	0.185
Yes	492	70.45±19.27			43.28±6.22		
No	294	78.31±15.80			48.02±6.93		
Hemiplegic side			2.274	0.085		4.071	0.046
Left side	317	77.52±14.97			47.36±5.82		

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Right side	309	75.97±11.72			46.97±6.84		
Both sides	160	68.73±10.92			40.08±4.26		
Types of stroke			7.432	0.018		6.374	0.039
Hemorrhagic stroke	517	77.55±18.39			46.86±6.09		
Ischemic stroke	269	69.39±16.95			39.84±7.38		
Remaining symptoms			19.351	<0.001		14.083	<0.001
One	472	77.52±14.62			48.64±6.04		
Two	215	73.35±19.04			43.27±5.44		
Three and above	99	66.41±18.37			38.09±8.57		

**Table 3.** Univariate analysis of MBI and FAS scores of first-episode stroke patients with different rehabilitation-related data

Items	Cases	MBI score	t/F value	P value	FAS score	t/F value	P value
Depressive state			12.492	0.001		18.642	<0.001
No	223	76.99±16.82			50.02±5.59		
Mild	496	75.62±18.29			44.86±7.94		
Severe	67	69.08±13.91			38.72±6.82		
Attitude towards rehabilitation			19.052	<0.001		24.461	<0.001
Low grade	106	67.39±19.22			37.94±6.93		
Middle grade	396	74.85±13.88			44.86±7.02		
High grade	284	79.05±12.84			49.72±4.88		
Starting time of rehabilitation therapy			22.593	<0.001		17.452	<0.001
≤2 weeks	597	79.65±18.93			38.95±9.04		
>2 weeks	189	68.94±14.46			48.83±7.74		
Rehabilitation treatment duration			14.431	0.001		10.836	0.003
≤1 month	245	70.80±19.49			40.85±7.34		
>1 month	541	79.63±16.48			48.74±6.07		
Number of Primary Caregivers			1.253	0.096		0.352	0.845
1 people	227	70.92±15.29			46.62±5.86		
2 people	338	74.84±10.81			45.93±6.08		
3 people and above	221	78.02±20.19			45.96±7.39		
Family environment score			12.831	0.005		13.005	0.002
Low grade	177	67.42±18.36			39.09±8.72		
Middle grade	461	72.51±19.06			44.72±9.08		
High grade	148	78.89±14.39			48.63±4.32		

ment effect on patients with stroke according to the literature review of previous works and the results of preliminary investigation and selected MBI score and FAS score with relatively high application value as the evaluation indexes of rehabilitation treatment effect, with a focus on the influencing factors of their self-care ability after rehabilitation treatment, to find out their internal connection and systematically classify them, thus finding the theoretical basis for their application.

This study first analyzed the general data characteristics of the patients with first-episode stroke, and found that the majority of the

patients were the elderly population, with a higher incidence rate observed in male patients than that of females. Moreover, the average onset age of stroke was 63.13 years old, which was younger than that in the epidemiological survey of stroke [20]. The result suggests that the onset age of stroke presents a trend of decline, indicating a more obvious predisposition of young people to stroke. The results also revealed the correlations of age, history of hypertension, the number of remaining symptoms, history of hyperlipidemia, history of alcohol consumption, and hemiplegia side with the rehabilitation treatment effect in patients with first-episode stroke. Han J et al.

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**Table 4.** Analysis of the correlations of MBI and FAS scores with data characteristics of patients with first-episode stroke

Items	MBI			FAS score		
	<i>r</i>	<i>t</i>	<i>P</i>	<i>r</i>	<i>t</i>	<i>P</i>
Age	-0.584	5.482	0.018	-0.438	6.035	0.021
History of hypertension	-0.452	2.497	0.098	-0.491	4.399	0.043
Remaining symptoms	-0.683	7.942	0.003	-0.771	7.938	0.008
History of hyperlipidemia	-0.339	1.845	0.274	-0.136	0.483	0.825
History of drinking	-0.235	1.385	0.302	-0.103	0.462	0.831
Hemiplegic side	-0.131	0.864	0.739	-0.304	1.204	0.102
Depressive state	-0.573	6.659	0.008	-0.552	5.592	0.015
Attitude towards rehabilitation	0.683	7.082	0.004	0.735	8.836	0.006
Starting time of rehabilitation therapy	-0.783	9.027	0.001	-0.599	6.093	0.011
Duration of rehabilitation treatment	0.572	6.299	0.010	0.603	6.835	0.010
Home environment score	0.662	6.840	0.009	0.724	8.281	0.006

**Table 5.** Results of multivariate logistic regression analysis on MBI and FAS scores of patients with first-episode stroke

Items	MBI				FAS			
	OR	95% CI	Wald $\chi^2$	<i>P</i> value	OR	95% CI	Wald $\chi^2$	<i>P</i> value
Age	1.26	1.16-1.44	6.887	0.009	2.64	1.95-2.98	5.742	0.007
Remaining symptoms	2.65	1.84-3.27	5.764	0.016	2.98	2.64-3.44	6.938	0.004
Depressive state	1.61	1.43-1.88	7.438	0.006	3.08	2.52-3.49	3.872	0.013
Attitude towards rehabilitation	0.45	0.22-0.78	5.586	0.018	0.34	0.19-0.53	7.936	0.002
Starting time of rehabilitation therapy	2.56	1.32-3.81	6.182	0.013	3.77	3.07-4.26	5.082	0.008
Rehabilitation treatment duration	0.55	0.16-0.76	5.501	0.019	0.68	0.42-0.81	5.003	0.008
Family environment score	0.68	0.27-0.85	8.323	0.004	0.55	0.23-0.79	6.072	0.006

Abbreviations: MBI, Modified barthel index; FAS, Frenchay activity scale; GCS, Glasgow coma scale; HAMD, Hamilton depression scale; ADL, Activities of daily living.

[21] conducted a study on the influencing factors of patients with stroke returning to daily work and revealed that age, PWI-SF score, gender, and living arrangements of the caregiver were key factors. Similarly, this study chose whether to return to work as a judgment index. Patients with stroke over 60 years old are usually in a state of poor physical health, with a variety of complicated basic diseases, which results in a poor rehabilitation treatment effect after stroke. Studies have also found that patients with stroke are at higher risks of being complicated with basic diseases such as hypertension, diabetes, and hyperlipidemia, suggesting that basic diseases may play a promoting role in stroke, upon which a large number of studies have conducted in-depth discussions [22-24].

Furthermore, this study analyzed the environmental factors influencing patients with first-

episode stroke, including family economic income, the number of main caregivers, and family environment. According to analysis results, most of the patients had a middle family income, with more than 2 caregivers. In addition, they lived in a good upper middle-level family environment mostly and most of the patients in the survey believed that their biggest support was from families. The care from family members, especially spouses and children, will enable patients to obtain emotional sustenance and have the courage to overcome the disease and actively cooperate with the treatment, thereby improving their quality of life [25]. Family is a natural support system [26], which is of great significance for the rehabilitation treatment of patients with stroke. Positive family support will substantially improve the physical and mental health of patients, and thus play a positive role in reinforcing the rehabilitation treatment effect and



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quality of life of patients. Moreover, most patients in the survey admitted that it was family support that contributes to their persistence. One study has revealed that material assistance and spiritual support from relatives, friends, and colleagues are highly effective in changing patients' bad living habits [27].

The patient's psychological factors play a crucial role in the development and progression of the disease and prognosis and rehabilitation treatment after the attack, and also affect the attitude and behavior of patients to a large extent [28]. The results of this study showed that the depression status of hospitalized patients with stroke was also an independent risk factor, with a significant correlation with the rehabilitation treatment effect. In patients with depression, the rehabilitation treatment effect was critically compromised, which was mainly attributed to their pessimistic attitude towards the disease. Fiona et al. [29] have found that unhealthy mental health status will lead to a deviation in patients' cognition of health status, and an insignificant exercise effect will exacerbate their psychological status. Thus, appropriate psychological coping strategies can improve the ability of patients to participate in social activities and reinforce their confidence to tackle barriers during the treatment process.

Through the research on influences of the attitude towards rehabilitation, starting time of rehabilitation treatment and rehabilitation treatment duration on the rehabilitation effect, it was found that these indicators had significant correlations with the rehabilitation effect. Specifically, the rehabilitation treatment effect is mainly affected in two ways: direct influence and indirect influence through the intermediate variable self-efficacy. Bassett et al. [30] have pointed out that patients with a positive attitude towards rehabilitation exercises will show high compliance even without the supervision of rehabilitation doctors and family members. Rehabilitation treatment within 2 weeks after stroke can deliver better results, and many scholars have also proposed that early rehabilitation treatment for patients with stroke can improve the prognosis [31, 32]. The rehabilitation treatment effect can be further strengthened if the rehabilitation treatment duration of patients with stroke lasts over

1 month. Previous studies have suggested that a longer rehabilitation course gives rise to a better outcome of rehabilitation treatment. The recovery of neurological function reaches a peak within 3 months after stroke and is significantly slowed down after 1 year [33-35]. However, this study has some limitations. As a retrospective study, it cannot control factors with possible influences on the rehabilitation treatment effect, a multi-center, in-hospital, and out-of-hospital rehabilitation treatment might be needed.

To sum up, this study found that age, the number of remaining symptoms, depression status, attitude towards rehabilitation treatment, starting time of rehabilitation treatment, rehabilitation treatment duration, and family environment score were the independent factors influencing the rehabilitation effect of patients with first-episode stroke.

### Disclosure of conflict of interest

None.

**Address correspondence to:** Xiangming Wang, Department of Neurology, Tongren Hospital Affiliated to Medical College of Shanghai Jiaotong University, Office of Neurologist, 1111 Xianxia Road, Changning District, Shanghai 200336, China. E-mail: xiangming\_wang@163.com

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