Original Article

Study on the correlation between physical activity level and quality of life 1 year after stroke

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Background: This study sought to assess the correlation between the level of physical activity (PA) and quality on life 1 year after stroke.

Methods: The subjects for this study comprised 122 patients who had their first stroke and were admitted to our hospital from June 2019 to December 2020. The self-rating Stroke Impact Scale (SIS) was used to evaluate the impact of stroke on cognition. The SIS uses a total of 59 items across 8 different dimensions (i.e., strength, memory, emotion, communication, activities of daily living, activity ability, hand function, and participation ability) to assess patients' perceptions of the impact of stroke. All data were expressed as mean ± standard deviation, median (quartile), and the number of cases (percentage). The *t*-test was used to compare differences between groups, and the chi-square test was used to evaluate percentage differences. A multivariate logistic regression model was used to analyze the correlation between the PA level and the scores of different SIS dimensions.

Results: The average age of subjects in the active group [61.8 (10.7) years] was significantly lower than that of subjects in the inactive group [69.3 (9.3) years] (P=0.003); however, there was no significant difference in other baseline data. The likelihood of strength recovery, emotional recovery, mobility recovery, participation ability recovery, and stroke recovery was 3.48 [odds ratio (OR) =4.48, 95% confidence interval (CI): 2.18–5.76], 1.53 (OR =2.53, 95% CI: 1.92–3.91), 2.32 (OR =3.32, 95% CI: 2.79–5.81), 4.77 (OR =5.77, 95% CI: 3.19–6.92), and 7.57 (OR =8.57, 95% CI: 5.39–9.82) times higher in the active group than the inactive group, respectively (P<0.05 for all).

Conclusions: A significant positive correlation was found between the PA of stroke patients and the recovery of quality of life 1 year after stroke; thus, stroke patients are encouraged to increase their PA.

Keywords: Physical activity (PA); stroke; quality of life

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Introduction

Physical activity (PA) has many benefits to human health, such as reducing the risk of heart disease, cancer, and stroke (1). The level of adequate PA for adults is defined as at least 150 minutes of moderate-intensity aerobic exercise per week combined with regular strength training (2). Despite the promotion of PA all over the world (1), insufficient PA is still one of the 5 most preventable risk factors for stroke. Additionally, studies have shown that the PA level of patients after stroke is significantly lower than that of healthy controls (3). The symptoms of a stroke are diverse, and include reduced motor function, coordination, and sensory and cognitive functions (4). Studies have shown that task training in stroke rehabilitation can improve muscle strength, walking ability, and cardiopulmonary function (5-8). Studies have also found that high levels of PA alone can improve functional skills, such as walking ability, balance and physical fitness after stroke (9). However, research has also shown that physical function alone cannot explain the level of PA after stroke (10,11). Detecting clinical outcomes after stroke is a complex process. According to the International Classification of Function, Disability, and Health, a multidimensional examination of health is essential (12). Multidimensional measurement tools, such as the Stroke Impact Scale (SIS) (13,14), can check various functions, activity levels, and participation levels. Studies have also shown that personal perceptions of health are important (15), and support the use of self-assessment scales, such as the SIS.

An increase in PA has many physical and psychological benefits (16,17). However, studies have shown that stroke patients display greater physical exertion (18), and higher PA may lead to increased fatigue and ultimately aggravate the impact of stroke on patients' lives. Thus, it is important to understand the relationship between the degree of PA and the impact of stroke on life, as it may affect the formulation and selection of long-term recovery programs after stroke. The present study sought to evaluate the correlation between the level of PA and quality of life 1 year after stroke. We present the following article in accordance with the STROBE reporting checklist (available at http://dx.doi.org/10.21037/apm-21-962).

Methods

Research subjects

One hundred and twenty-two patients, who attended our hospital suffering from their first stroke from June 2019 to December 2020, were included in the study. To be eligible to participate in the study, patients had to meet the following inclusion criteria: (I) have received a first diagnosis of stroke; (II) show a functional decline of arms and hands after stroke, according to the Action Reach Arm Test (via a score ≤57 points); (III) have been admitted to a stroke center within 3 days of the stroke occurring; (IV) be aged ≥18 years; and (V) have completed the Saltin Grimby 6-Level Physical Activity Scale (SGPALS) and the SIS assessment 1 year after stroke. Conversely, patients were excluded from the study if they met the following exclusion criterion: (I) had upper limb dysfunction that had already existed before the stroke because of trauma or other conditions. All procedures performed in this study involving human participants were in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the Research Ethics Committee of the Cadre Sanatorium of Hainan and the Geriatric Hospital of Hainan (No.: 2018062) and informed consent was taken from all the patients.

Evaluation method

The SIS is a self-rating scale that is used to assess the impact of stroke on cognition (14). The SIS uses a total of 59 items across 8 different dimensions (i.e., strength, memory, emotion, communication, activities of daily living, activity ability, hand function, and participation ability) to assess patients' perceptions of the impact of stroke. Each item is scored (from 1–5 points), and a total score is aggregated. The SIS also includes a final question concerning overall stroke recovery (SR) with a score of 0–100. In this study, variable 1 (strength), variable 3 (emotion), variable 6 (mobility), variable 8 (participation), and SR were selected for analysis, as previous research has shown that these variables may be closely related to PA (18). At 1 year after stroke, the SGPALS was used to measure the PA level of the subjects in the past 6 months, and a 6-level ordered scale for PA was used for the self-assessment. Based on the PA level at 1 year, the study population was divided into two groups: an inactive group (equivalent to SGPALS 1–2) and an active group (equivalent to SGPALS 3–6) (19).

Statistical methods

All data are expressed as mean ± standard deviation, median (quartile), and the number of cases (percentage). A *t*-test

Table 1 Baseline data of patients with different levels of physical activity

Variables	Active group (n=62)	Inactive group (n=60)	P value
Age (year)	61.8 (10.7)	69.3 (9.3)	0.003
Male (n, %)	38 (61.3)	35 (58.3)	0.78
Cerebral ischemia (n, %)	36 (58.1)	34 (56.7)	0.353
Smoking (n, %)	28 (45.2)	31 (51.7)	0.08
Drinking (n, %)	30 (48.4)	35 (58.3)	0.21
Cardiovascular diseases (n, %)	25 (40.3)	27 (45)	0.13

was used to compare differences between the groups, and a chi-square test was used to evaluate percentage differences. A multivariate logistic regression model was undertaken to analyze the correlation between the PA level and the scores of different SIS dimensions. SAS software (version 9.4) was used, and a P<0.05 was considered statistically significant.

Results

Baseline data of subjects

As stated above, the subjects were divided into an active group (n=62) and an inactive group (n=60) according to their PA level at 1 year after stroke. The survey found that the average age of subjects in the active group [61.8 (10.7) years] was significantly lower than that of the inactive group [69.3 (9.3) years] (P=0.003). The active group comprised 38 males (61.3%), 36 cerebral ischemia patients (58.1%), 28 smoking patients (45.2%), 30 drinking patients (48.4%), and 25 cardiovascular disease patients (40.3%). There was no significant difference between the baseline date of the active and inactive groups. (all P>0.05; see *Table 1*).

Comparison of Stroke Impact Scale dimensions of subjects with different PA levels

The quality of life of subjects 1 year after stroke was evaluated according to different SIS dimensions. A comparison of the SIS assessments showed 47 *vs.* 38 cases of normal strength, 53 *vs.* 47 cases of normal emotions, 59 *vs.* 51 cases of normal mobility, 40 *vs.* 34 cases of normal participants, and 52 *vs.* 49 cases in which patients returned to normal after stroke for the active and inactive groups, respectively. The number of patients in the active group whose SIS dimensions returned to normal were significantly higher than the number of those in the inactive group (P<0.05 for all; see *Table 2*).

Table 2 Comparison of Stroke Impact Scale dimensions of subjects with different physical activity levels

SIS modules	Active group (n=62)	Inactive group (n=60)	P value
Strength			
Normal	47	38	0.007
Abnormal	15	22	
Emotion			
Normal	53	47	0.02
Abnormal	9	13	
Mobility			
Normal	59	51	0.001
Abnormal	3	9	
Participation			
Normal	40	34	0.003
Abnormal	22	26	
Stroke recovery			
Normal	52	49	0.01
Abnormal	10	21	

SIS, Stroke Impact Scale.

The correlation between PA (active group vs. inactive group) and quality of life

A logistic regression analysis of the correlation between PA (active group *vs.* inactive group) and quality of life found that the likelihood of strength recovery, emotional recovery, mobility recovery, participation ability recovery and SR was 3.48 [odds ratio (OR) =4.48, 95% confidence interval (CI): 2.18–5.76], 1.53 (OR =2.53, 95% CI: 1.92–3.91), 2.32 (OR =3.32, 95% CI: 2.79–5.81), 4.77 (OR =5.77, 95% CI: 3.19–6.92), and 7.57 (OR =8.57, 95% CI: 5.39–9.82) times higher in the active group than the inactive group, respectively (P<0.05 for all; see *Table 3*).

Stratified analysis of the correlation between PA (active group vs. inactive group) and quality of life

A further stratified analysis of the correlation between PA

Table 3 The correlation between physical activity (active group *vs.* inactive group) and quality of life

Variables	OR	95% CI	P value
Strength	4.48	2.18–5.76	<0.0001
Emotion	2.53	1.92–3.91	<0.0001
Mobility	3.32	2.79–5.81	<0.0001
Participation	5.77	3.19–6.92	<0.0001
Stroke recovery	8.57	5.39–9.82	<0.0001

OR, odds ratio; CI, confidence interval.

(active group *vs*. inactive group) and quality of life based on gender and age showed that in most subgroups, patients in the active group were more likely to achieve restored quality of life than patients in the inactive group (P<0.05). However, there were no statistically significant differences in the recovery status of the active group and the inactive group for the subgroup of patients aged ≥60 in relation to strength recovery, the subgroup of male patients in relation to emotional recovery, the subgroup of patients aged ≥60 in relation to mobility recovery, and the subgroup of patients aged ≥60 in relation to SR (all P>0.05; see *Table 4*).

Discussion

This study found that PA was significantly positively correlated with the recovery of patients' quality of life (as assessed by the SIS dimensions) 1 year after stroke. The results of the present study indicate that helping stroke patients become PA may have a positive impact on their lives, as PA is related to increased long-term participation ability after stroke.

A recent study confirmed that SIS-8 (i.e., a sense of participation) is sensitive to changes over time, and found that almost 50% of the study population showed a significant positive or negative change between 3 months and 1 year after stroke (20). Guidetti *et al*. found that SR (as assessed by the SIS) at 1 year after stroke was significantly better than SR at 3 months after stroke (21), and was independent of changes in age, gender, and other dimensions of the SIS. In this study, SR was independent of age, gender, stroke type, living habits, and past heart disease history. However, higher levels of PA were associated with better SR.

The recovery of the 5 dimensions of SIS investigated in this study confirmed that there is a correlation between

Table 4 Stratified analysis of the correlation between physical activity (active group vs. inactive group) and quality of life

Variables	OR	95% CI	P value
Strength			
<60 years old	4.51	2.29–6.03	<0.0001
≥60 years old	1.17	0.92–3.38	0.23
Male	4.23	3.14–5.81	<0.0001
Female	4.57	2.13–5.49	<0.0001
Emotion			
<60 years old	2.32	1.04–4.02	<0.0001
≥60 years old	2.61	1.87–4.18	<0.0001
Male	1.12	0.91–4.03	0.06
Female	3.07	1.89–3.87	<0.0001
Mobility			
<60 years old	3.07	2.69–5.92	<0.0001
≥60 years old	1.44	0.78–5.11	0.13
Male	3.15	2.63–4.99	<0.0001
Female	3.42	2.71–5.82	<0.0001
Participation			
<60 years old	5.79	3.21–6.03	<0.0001
≥60 years old	5.17	3.89–7.02	<0.0001
Male	5.21	4.09–6.19	<0.0001
Female	5.83	5.18–7.32	<0.0001
Stroke recovery			
<60 years old	8.77	6.02–9.98	<0.0001
≥60 years old	1.24	0.91–6.22	0.18
Male	7.32	6.91–9.91	<0.0001
Female	8.83	7.09–9.28	<0.0001

OR, odds ratio; CI, confidence interval.

higher PA levels and better recovery of quality of life in patients 1 year after stroke. As mentioned above, a previous study found that compared to healthy people, stroke patients expend more energy (21). However, the findings of the present study to not support this hypothesis. This study found that the higher the level of PA, the greater the energy expenditure and the more increased the fatigue, but the greater the positive effect on quality of life.

Studies have shown that multidisciplinary rehabilitation after stroke is necessary to minimize long-term symptoms

and restore social function through early participation in teamwork (22). Additionally, to improve the long-term PA level after stroke, individualized interventions are beneficial (23). The stroke rehabilitation process is very complicated. The findings of this study emphasize the importance of helping stroke survivors achieve sufficient PA levels.

It should be noted that this study had a number of limitations. First, other variables may affect the results, such as cultural and religious differences. Second, the sample size included in this study was limited, and thus more research needs to be conducted to support the conclusions. Finally, the population included in this study was middle-aged and elderly. However, the low PA level of this population hindered a full analysis of the correlation between higher PA levels and the recovery of quality of life after stroke.

In summary, this study found a significant positive correlation between the PA of stroke patients and the recovery of quality of life 1 year after stroke. Stroke patients should be encouraged to increase their PA to promote the improvement of the quality of life in terms of strength, emotion, mobility, participation, and SR.

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Footnote

Reporting Checklist: The authors have completed the STROBE reporting checklist. Available at http://dx.doi.org/10.21037/apm-21-962

Data Sharing Statement: Available at http://dx.doi.org/10.21037/apm-21-962

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at http://dx.doi.org/10.21037/apm-21-962). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study involving human participants were in accordance with the Declaration of Helsinki (as revised in 2013). The study was approved by the Research Ethics Committee of the Cadre Sanatorium of Hainan and the Geriatric Hospital of Hainan (No.: 2018062) and informed consent was taken from all the patients.

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