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博 士 論 文

論文題目

Relationship between apathy/post-stroke depression and gait training in patients with stroke

(脳卒中患者におけるアパシー/脳卒中後うつと歩行訓練の関連)

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Relationship between apathy/post-stroke depression and gait training in patients with stroke

Running title: Gait and apathy/post-stroke depression

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Abstract

Background: We examined the effect of gait training on apathy/post-stroke depression (PSD) in patients with walking disorder after stroke, and the effect of apathy/PSD on gait reacquisition in subacute stroke.

Methods: Fifty-five participants with gait disorders after stroke underwent gait training for 6 weeks. Outcome measurements included Apathy Scale (AS), Center for Epidemiologic Studies Depression Scale (CES-D), Mini-Mental State Examination, Lower Extremity Function of Stroke Impairment Assessment Set, and Functional Independence Measure-TRANSFER and -WALK scores. These scores of the participants were divided into groups with or without apathy based on AS scores for statistical analysis.

Results: Both groups showed significant differences in all outcomes after gait training. In addition, even if the participants had apathy at baseline, there were no significant differences in outcomes other than AS/CES-D between the two groups after gait training. Logistic regression analysis showed that only Mini-Mental State Examination and Lower Extremity Function of Stroke Impairment Assessment Set scores affected the reacquisition of independent walking (odds ratio: 1.332, $p = 0.015$; odds ratio: 1.364, $p = 0.005$, respectively). AS and CES-D scores had no effects on gait reacquisition.

Conclusion: Gait training may be beneficial for both physical impairment and psychiatric symptoms in patients with stroke and may prevent poor functional recovery caused by apathy and PSD. As opposed to previous studies that have shown a negative impact of apathy and PSD on functional recovery, our results suggest that apathy/PSD may not affect functional recovery negatively when gait training is conducted in subacute stroke.

Keywords: apathy, gait training, post-stroke depression, stroke

INTRODUCTION

Patients with stroke not only have physical dysfunction but also psychiatric symptoms, such as apathy defined as a lack of motivation, and post-stroke depression (PSD).^{1–3} Incident rates of apathy and PSD after stroke vary across previous studies. Some studies have shown that 20–40% of patients may develop apathy after stroke,^{4–6} while others have reported that 50–60% of patients may develop PSD.^{7–8} In addition, the rates of patients with overlapping apathy and PSD are higher than 50%.⁹

Marin defined apathy as a syndrome that meets the following criteria: diminished goal-directed overt behaviour, goal-directed cognition, and emotional concomitants of goal-directed behaviour.¹⁰ Apathy is associated with cognitive decline¹¹ and is common in patients with stroke.^{6,12} Meanwhile, according to the World Health Organization's international classification of disease, depression is defined as “a syndrome consisting of permanent abnormal mood and marked diminished interest or pleasure and decreased energy”, including symptoms, such as a loss of confidence, excessive guilt, poor concentration, sleep disturbance, anorexia, and a loss of interest and pleasure.¹³ PSD includes depressive symptoms resulting from stroke.^{3,6–8} Some studies have shown that apathy and PSD negatively affect physical function after stroke and that patients with stroke who develop severe apathy and PSD tend to have poor functional recovery.^{6,14,15} Although apathy and PSD often have overlapping symptoms, differentiating symptoms as distinct conditions is more useful.^{9,14} For example, patients with depression often show features of dysphoric affection characterised by pessimism, hopelessness, and negativism. Those features are not seen in apathy, which is defined as a lack of emotional distress.¹⁶ There are some reports that pharmacological treatment for PSD is not effective with apathy,¹⁷ that patients with PSD take deliberate avoidance behaviours against interventions,¹⁶ and that patients with apathy normally conform to

interventions.^{2,18} Therefore, when rehabilitation staff provide their interventions toward such patients, it is important to consider the complications of those neuropsychiatric symptoms.

Regaining the acquisition of walking function is a major goal for patients who have developed hemiparesis as a sequela of stroke.¹⁹ According to a previous study,²⁰ a period from approximately 7 days after onset of stroke to 6 months is defined as the subacute phase and is critical for improving physical function. Increasing the amount of lower extremity exercise for stroke-caused paraplegia is recommended to achieve that goal.^{21,22} Physical exercises have also been shown to improve self-efficacy, depression, and mood in patients with stroke^{23–26}; however, those studies have not focused on participants who have dependent walking or hospitalised subacute patients. It was also reported that goal setting, planning strategy training, and cognitive rehabilitation were effective for apathy,^{27,28} although no specific exercise or gait training was included in those studies. The effect of physical exercise on apathy and PSD in hospitalised and subacute patients who have walking disability due to stroke still remains unclear. In clinical settings, walking itself may be impossible in subacute stroke. To date, it has not been elucidated how early gait rehabilitation, which is provided using assistive devices (e.g., robotics) for patients with stroke and difficulty walking, affects their psychiatric symptoms. It is also unclear to what extent apathy and PSD affect functional recovery in patients who undergo gait training.

This study aimed to examine whether early gait rehabilitation, which is considered effective for physical functions, is also effective for psychiatric symptoms, such as apathy and PSD in patients who have difficulty walking in subacute stroke, and to investigate the effect of apathy and PSD on functional recovery among hospitalised non-ambulatory patients with stroke. Though previous studies have suggested that patients with apathy may have worse functional prognoses than those with PSD,^{14,29} there are only few reports on the effects of exercise on apathy. Thus, in this study, we

divided the participants according to those with or without apathy to investigate the difference from PSD.

METHODS

This study was conducted at the Itsukaichi Memorial Hospital in Hiroshima, Japan. This study was performed in accordance with the Declaration of Helsinki and was approved by the Ethics Review Committee of Kobe University Graduate School of Health Science (No. 989) and of Itsukaichi Memorial Hospital (No. 21-2). Written informed consent was obtained from all participants or their family caregivers.

Participants

We recruited 67 patients after stroke in this trial between April 2021 and December 2023. As the incidence of apathy after brain dysfunction considerably varies from 26% to 60%,^{30,31} we could not anticipate in advance how many participants would be assigned to either with or without apathy group. Thus, the sample size was based on the reports of Mikami et al.³² and Santa et al.¹⁴ As they studied approximately 60 patients with stroke to examine the course of physical and cognitive recovery by dividing them into two groups (with or without apathy), we decided to recruit more than 60 participants following those previous studies. The inclusion criteria were as follows: (1) diagnosis of cerebrovascular disease, (2) within 30 days of admission to a convalescent ward, (3) lower-limb dysfunction due to stroke, and (4) need for assistance in standing or walking. The first 3 months after stroke onset is a critical period for rehabilitation that brings about neuroplastic changes and functional recovery.³³ To investigate the influence and progress of neuropsychiatric symptoms at earlier stages, participants within 30 days after stroke were recruited. Participants were excluded if they met the following: (1) severe cognitive or communicative disorders, (2) able to walk at admission, (3) unstable condition, and (4) a history of psychotic disorders before the onset of stroke. The

demographic data are shown in Table 1.

Intervention

The gait training intervention was provided by well-trained physical therapists for 6 weeks to all participants. We set the intervention period at 6 weeks to ensure adequate gait training within the first 3 months after stroke onset, which is especially crucial for functional recovery.³³ Each participant underwent a maximum of 1 h/day of physical therapy programs to obtain at least 20 min of gait training per day. Each participant also received standard physical therapy, such as muscle strengthening, loading on the affected leg, sensory stimulation, neurodevelopment techniques, and standing up from a chair, in the remaining time after gait training.

Depending on the physical function of the participants, each physical therapist provided gait training with appropriate tools or therapeutic assistance, such as the gait exercise assist robot WelWalk (Toyota, Toyota City, Japan), orthosis, and a cane. To avoid adverse events, such as falls, the participants were allowed to rest for a few minutes, as necessary, during gait training. If their gait ability improved during the intervention period, the physical therapists decided to provide different methods of gait training. Participants also received upper-limb functional training and speech therapy from each occupational or speech therapist in charge, as necessary.

Measurements

The following assessments were evaluated before and after the 6-week intervention as psychiatric and functional outcomes. The Japanese version of the Apathy Scale (AS) and the Center for Epidemiological Studies Depression Scale (CES-D) were administered as measurements of apathy/PSD. The AS was used to determine whether participants developed apathy.^{5,34} The AS consists of 14 items with a maximum score of 56 and participants whose AS score was 16 points or more were classified as having apathy.³⁵

The CES-D is a self-reported depression rating scale consisting of 20 items³⁶ with maximum score of 60 and 16 points or more indicating the state of depression.³⁷ Given that Itsukaichi Memorial Hospital does not have a department of psychiatry, it is difficult to make a definite diagnosis of PSD. Therefore, we substituted the assessment of CES-D as the presence of PSD. After completing all interventions, based on the baseline AS scores, the participants were divided into two groups; those with apathy and those without apathy.

Global cognitive function was evaluated using the Mini-Mental State Examination (MMSE)-Japanese version.³⁸ Physical function was evaluated using the Brunnstrom Recovery Stage (BRS), the Stroke Impairment Assessment Set (SIAS), and the Functional Independence Measure (FIM). The BRS is a test to investigate hemiparesis of extremity function, which is scored on six recovery grades.³⁹ The BRS of the lower limbs was used in this study. The SIAS is a comprehensive functional evaluation scale of stroke severity that consists of 22 items.⁴⁰ We used only three items of lower-limb function scores (SIAS-L) in this study because we focused on lower-limb functions (maximum 15 points). The FIM is an observational, multicategory summative rating scale that evaluates the degree of assistance or independence of patients in daily activity.⁴¹ In this study, only two motor items, “Transfer: bed, chair, wheelchair” and “Locomotion,” were used (maximum 14 points). “Locomotion” was evaluated using the FIM-Walk score to explore the degree of change of assistance required for gait.

Statistics

After classifying participants into with or without apathy based on the baseline AS scores, each outcome and clinical characteristics of the two groups were compared. From the results of the Shapiro–Wilk test for all ordinal scales, Student’s t-test or the Mann–Whitney U test was used for intergroup comparisons, and the paired t-test or Wilcoxon signed-rank test was used for intragroup comparisons. The nominal scales were

compared using Fisher's exact probability test.

A multiple logistic regression analysis was used to elucidate the effects of apathy/PSD on physical function. The dependent variable was whether the participants achieved the level of walking according to their FIM-Walk scores after the intervention. That is, participants who had FIM-Walk scores of 6 points or more were considered as participants achieving independent walk. The participants' age and gender, the scores of AS, CES-D, MMSE, and SIAS-L at baseline were used as independent variables. Forward-backward stepwise regression was used to select significant variables. Finally, Spearman's correlation analysis was conducted for each measurement. For all the tests, the significance level was set at 5% using a two-tailed test. SPSS 29 software (IBM, Armonk, NY) was used for all statistical analyses.

RESULTS

Sixty-seven participants were enrolled in the study, but 12 participants dropped out (discharge; $n = 7$, recurrence; $n = 4$, withdrawal; $n = 1$). Regardless of whether they had apathy or PSD at baseline, 55 participants (not including the 12 participants who dropped out) completed all gait training sessions over the course of 6 weeks. We included all participants who had completed the whole process (18 participants with apathy, 37 without apathy at baseline) in the analysis. There were no significant differences between the groups except for age and AS and CES-D scores at baseline (Table 1).

The values of each measurement after training and the intra and intergroup differences are presented in Table 2. The 6-week gait training resulted in significant differences in all measurements in both groups. When comparing the outcomes after training between two groups, there were no significant differences except for AS and CES-D.

According to the results of the multiple logistic regression analysis, only MMSE (odds ratio [OR]: 1.332, 95% confidence interval [CI]: 1.058–1.677, $p = 0.015$) and SIAS-

L (OR: 1.364, 95% CI: 1.097–1.696, $p = 0.005$) affected reacquisition of independent walking. This study showed that apathy and PSD at baseline in addition to age and gender did not influence restitution of independent walking.

Table 3 shows the results of Spearman's correlation analysis. The correlation between the AS and CES-D at baseline ($r = 0.402$) and after training ($r = 0.591$) was moderate (both $p < 0.01$). Although The AS at baseline correlated negatively with FIM after training ($r = -0.325$, $p < 0.015$), MMSE and SIAS-L at baseline showed fairly strong correlation coefficients with FIM after training (Table 4; $r = 0.432$, 0.568 , respectively, $p < 0.001$).

DISCUSSION

The results of this study demonstrate that early gait training for 20 min or longer improves both physical impairments and neuropsychiatric symptoms in patients with subacute stroke, regardless of whether they have apathy or not at baseline. In addition, apathy and PSD had no effects on whether participants could recover their gait disorder up to independent walking after gait training. These results suggest that early gait training for patients with stroke could be effective in treating apathy, PSD, and physical disabilities. Furthermore, mental symptoms, such as apathy/PSD, may not necessarily negatively affect gait acquisition after stroke. It is suggested that early gait training may reduce the negative impact of apathy/PSD on functional recovery.

The participants showed an overall improvement in apathy and PSD after the gait training. Some studies have reported the effective rehabilitation of patients with apathy and PSD.^{27,28,42} Skidmore et al.²⁷ reported that goal setting and planning/strategy training were effective in treating apathy after stroke. Further, it was also stated that gait restoration was a major goal for patients with stroke.⁴³ Based on these reports and our results, early gait training may help patients with apathy to recognize the goal of reacquisition of independent walking, even if they are at a stage

where they need assistance for walking due to stroke. In addition, high-intensity exercise is effective for PSD,⁴² and it is possible that early gait training conducted at subacute phase positively affected PSD. While apathy and PSD have different characteristics,¹⁶⁻¹⁸ overlapping analogous symptoms have also been observed.⁴⁴ Early gait training may also have positive effects on those overlapping symptoms.

Based on previous studies,^{2,6,15} we predicted that AS/CES-D scores would affect recovery of walking ability. Indeed, the AS score at baseline was negatively correlated with the FIM after training. However, the results of logistic regression analysis showed that apathy and PSD at baseline did not affect the reacquisition of independent walking. We assume that this opposing result to previous studies may be related to two factors: the gait training intervention itself and the features of the training. Regarding the intervention itself, previous studies^{2,6,14,15} have examined the association between apathy/PSD and functional recovery without gait intervention. However, our study differs from those studies in that we examined the relationships between apathy/PSD and gait intervention. We suggest that we may have shown new insights by examining the effect of gait intervention. Furthermore, we presume that the features of gait training may be related to the opposing results. Some studies have recommended task-oriented/task-specific training for patients with stroke^{45,46} and reported that locomotion training is a task-specific training that improves gait performance.⁴⁷ In addition, Chen et al.⁴⁸ showed that a motor-relearning program based on task-specific training was effective in preventing apathy. It was also reported that patients who received rehabilitation within 3 months after stroke tended to reduce the incidence of PSD.⁴⁹ Thus, we believe that early gait training could be a helpful intervention in which patients with subacute stroke can recognize the goal of reacquiring independent walking by its task specificity and may be able to eliminate the negative effects of apathy/PSD on gait recovery. Thus, it is suggested that the prognosis of independent walking is more closely related to physical and cognitive function than psychiatric aspects in patients with stroke.

We did not find that apathy/PSD have negative effects for participants who implemented early gait training on gait recovery. This indicates that apathy/PSD are not necessarily associated with poor outcomes and gait training may relieve the negative effects of apathy/PSD by improving psychiatric symptoms. Gait training may promote brain-derived neurotrophic factor (BDNF) expression, which plays an important role in cognitive functions and mood behavior. BDNF is a neurotrophin that is abundantly expressed throughout the central nervous system and has been suggested to affect emotional and cognitive functions, which would be downregulated by depression and stroke.^{50,51} Exercise has also been shown to enhance BDNF upregulation.⁵¹ For example, Ashcroft et al. suggested that high-intensity aerobic exercise for patients with stroke can increase BDNF concentration⁵²; therefore, early gait training may have had a similar effect in our study. It has also been reported that patients tend to be depressed due to their awareness of their disabilities.^{53,54} In this study, patients with PSD may have had a better understanding of their own functional disabilities. Therefore, such participants may have actively participated in gait training. There are no definite exercise protocols on how to treat for apathy and PSD, especially for patients with subacute stroke who have difficulty in walking. However, we found for the first time that gait training may be effective for patients with apathy/PSD and that apathy/PSD did not influence the gait reacquisition in patients with stroke. We believe that our findings indicate that early task-specific gait training for patients with stroke may counteract the negative effects of apathy/PSD by making them recognize the definite goal of gait reacquisition and by improving mood through BDNF enhancement. Furthermore, we can expect that early gait training may have interactive positive effects on both physical function and mental status.

In this study, the results of logistic regression analysis showed that only SIAS-L and MMSE scores at baseline were identified as predictors. In addition, the FIM after training correlated more strongly with the MMSE and SIAS-L at baseline than the AS score at baseline. These results suggest that cognitive and physical impairments may

be more influential than apathy and PSD as factors associated with improvement of functional recovery. Many previous studies have stated that the severity of physical and cognitive functions caused by stroke predicts prognosis.⁵⁵⁻⁵⁷ Heruti et al. stated that the MMSE is important for post-stroke outcomes because many rehabilitation techniques require cognition and cooperation.⁵⁷ Thus, it is rational to speculate that SIAS and MMSE scores may influence whether patients with stroke can regain independent walking. Both apathy and PSD did not directly affect gait reacquisition in this study. However, the results showed the subtle differences that AS scores at baseline were negatively correlated with the FIM after training, whereas there was no correlation between the CES-D scores at baseline and the FIM after training (Table 3). This suggests that apathy and PSD may have slightly different effects on the FIM. As noted in previous studies that apathy has a more negative effect than PSD on functional prognosis,^{10,16} our correlation analysis results might be consistent with those results.

This study had some limitations. First, it was difficult to determine the required sample size for each group in advance. We therefore determined the sample size with reference to previous studies, but the final sample was somewhat lower than previous studies. Second, we did not compare our results with a non-gait training group. As a group without gait training would be likely to experience a loss of functional recovery, we could not ethically create such a control group. Third, this study did not survey subjective assessments (e.g. satisfaction and level of difficulty of gait training) for gait recovery so it is unclear how participants felt for their functional and psychiatric improvement. Fourth, the CES-D is a self-administered questionnaire and shows only a depressive state, which differs from a trained psychiatrist's diagnosis. Finally, we could not conduct follow-up studies. We should investigate the process of physical, cognitive and mental improvements in patients with stroke after discharge.

CONCLUSION

This study suggests that early gait training may improve physical functioning and psychiatric symptoms in hospitalised patients with subacute stroke and gait disorders. Furthermore, neither apathy nor PSD negatively affected the reacquisition of independent walking in patients with stroke different from previous studies. It is suggested that early gait training for those patients improves motivation and leads to active and positive participation in rehabilitation during hospitalisation.

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AUTHOR CONTRIBUTIONS

TM contributed to the conceptualisation, study conduct, data collection, data analysis, and manuscript writing. KS contributed to conducting the study, recruiting subjects and data, and reviewing the manuscript. TO contributed to the recruitment of subjects and data and reviewed the manuscript. YM contributed to the recruitment of subjects and data and reviewed the manuscript. AH contributed to the conceptualisation and interpretation of the data, critical revision of the manuscript, and supervision. All authors have approved the manuscript and agree with its submission to the journal.

DECLARATION OF CONFLICTING OF INTEREST

The authors have no potential conflicts of interest to disclose.

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TABLES

Table 1. Characteristics of participants divided into apathy and non-apathy groups at baseline

	With apathy, n = 18 (32.73%)	Without apathy, n = 37 (67.27%)	p-value
Age, mean $\pm$ SD (years) [†]	74.11 $\pm$ 10.687	66.27 $\pm$ 17.223	0.044
Sex, male/female [§]	11/7	18/19	0.407
Type, haemorrhage/infarction/others [§]	7/11	21/14/2	0.204
Lesion side, right/left/others [§]	7/9/2	18/17/2	0.658
Days since onset, mean $\pm$ SD [†]	36.50 $\pm$ 14.226	33.97 $\pm$ 14.110	0.537
AS, mean $\pm$ SD [†]	21.00 $\pm$ 3.430	10.22 $\pm$ 3.155	< 0.001
CES-D, mean $\pm$ SD [†]	20.67 $\pm$ 8.246	15.35 $\pm$ 6.828	0.014
With PSD/without PSD [§]	12/6	19/18	0.387
MMSE, mean $\pm$ SD [‡]	24.06 $\pm$ 3.400	25.92 $\pm$ 3.782	0.064
BRS, median (IQR) [‡]	5.00 (3.00 – 5.00)	4.00 (3.00 – 5.00)	0.181
SIAS-L, mean $\pm$ SD [†]	8.61 $\pm$ 4.408	8.59 $\pm$ 3.905	0.989
FIM, mean $\pm$ SD [‡]	7.11 $\pm$ 2.220	7.25 $\pm$ 2.148	0.682

Abbreviations: AS, Apathy Scale; CES-D, Center for Epidemiological Studies Depression Scale; PSD, post-stroke depression; MMSE, Mini-Mental State Examination-Japanese; BRS, Brunnstrom Recovery Stage; SIAS-L, Stroke Impairment Assessment Set (lower-limb function score); FIM; Functional Independent Measure (summation of two items; FIM-transfer and FIM-walk).

†: Values of Student's t-test

‡: Values of Mann–Whitney U test

§: Fisher's exact probability test for categorical variables.

Bold figures: p < 0.05.

Table 2. Values of the outcome measures at baseline and after gait training and comparisons of intra and intergroup

	With apathy (n = 18)		Without apathy (n = 37)		p-value [§] (Between groups after gait training)
	Baseline	After gait training	Baseline	After gait training	
AS, mean $\pm$ SD	21.00 $\pm$ 3.430	13.83 $\pm$ 4.878 [†]	10.22 $\pm$ 3.155	6.32 $\pm$ 3.930 [‡]	< 0.001
CES-D, mean $\pm$ SD	20.67 $\pm$ 8.246	16.00 $\pm$ 12.029 [‡]	15.35 $\pm$ 6.828	8.41 $\pm$ 4.862 [‡]	< 0.001
MMSE, mean $\pm$ SD	24.06 $\pm$ 3.400	26.41 $\pm$ 3.299 [†]	25.92 $\pm$ 3.782	27.67 $\pm$ 3.389 [‡]	0.111
BRS, median (IQR)	5.00 (3.00 – 5.00)	5(4.00 – 5.00) [‡]	4.00 (3.00 – 5.00)	5(4.00 – 5.00) [‡]	0.405
SIAS-L, mean $\pm$ SD	8.61 $\pm$ 4.408	11.17 $\pm$ 3.682 [†]	8.59 $\pm$ 3.905	11.76 $\pm$ 2.671 [‡]	0.772
FIM, mean $\pm$ SD	7.11 $\pm$ 2.220	10.61 $\pm$ 2.146 [‡]	7.25 $\pm$ 2.148	11.19 $\pm$ 1.868 [‡]	0.303

Abbreviations: AS, Apathy Scale; CES-D, Center for Epidemiological Studies Depression Scale; MMSE, Mini-Mental State Examination-Japanese; BRS, Brunnstrom Recovery Stage; SIAS-L, Stroke Impairment Assessment Set (lower-limb function score); FIM; Functional Independent Measure (summation of two items; FIM-transfer and FIM-walk).

†: Values of t-test for the difference of intragroup comparison and $p < 0.05$

‡: Values of Wilcoxon's signed-rank test for the differences of intragroup comparison and $p < 0.05$.

§: Values of Mann–Whitney U test. Bold figures: $p < 0.05$.

Table 3. Correlation coefficient with each measurement

	AS[b]	CES-D[b]	AS[a]	CESD[a]	MMSE[a]	SIAS[a]	FIM[a]
AS[b]	1	0.402**	0.729**	0.514**	-0.204	-0.239	-0.325*
CES-D[b]		1	0.343*	0.574**	-0.128	-0.208	-0.223
AS[a]			1	0.591**	-0.171	-0.250	-0.329*
CES-D[a]				1	-0.168	-0.157	-0.358**
MMSE[a]					1	0.217	0.510**
SIAS-L[a]						1	0.675**
FIM[a]							1

Abbreviations: AS, Apathy Scale; CES-D, Center for Epidemiological Studies Depression Scale; MMSE, Mini-Mental State Examination-Japanese; SIAS-L, Stroke Impairment Assessment Set (lower-limb function score); FIM; Functional Independent Measure (summation of two items; FIM-transfer and FIM-walk). [b] at baseline, [a] after gait training.

*p < 0.05, **p < 0.01

Table 4. Correlation coefficient between MMSE/SIAS-L/FIM at baseline and FIM after training

	FIM[a]
MMSE[b]	0.432**
SIAS[b]	0.568**
FIM[b]	0.668**

Abbreviations: MMSE, Mini-Mental State Examination-Japanese; SIAS-L, Stroke Impairment Assessment Set (lower-limb function score); FIM; Functional Independent Measure (summation of two items; FIM-transfer and FIM-walk).

[b] at baseline, [a] after gait training.

**p < 0.01