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Original Article

Relationship between therapists' years of experience and Functional Independence Measure gain and efficiency in stroke rehabilitation

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ABSTRACT
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Objective: This study aimed to clarify whether or not the years of experience of physical therapists (PTs) and occupational therapists (OTs) influences rehabilitation treatment results as quantified using the Functional Independence Measure (FIM).
Methods: The subjects were PTs and OTs who took care of 354 cerebrovascular accident (CVA) patients. With motor FIM gain and motor FIM efficiency as the evaluation scales, the following three combinations were evaluated: 1) FIM gain and efficiency on transfers, locomotion, and stairs, and PTs' years of experience; 2) FIM gain and efficiency in eating, grooming, bed bath, dressing, toilet behavior, urination management, and defecation management, and OTs' years of experience; and 3) motor FIM gain and motor FIM efficiency on all items and years of experience (PTs' + OTs'). Results were analyzed using simple regression, multiple regression, and stratified simple regression.
Results: A weakly positive relationship was observed between a PT's years of experience and motor FIM gain in moderately impaired patients. No relationship was observed between an OT's years of experience and motor FIM gain. There was no relationship between years of experience and motor FIM efficiency.
Conclusion: These results suggest that activities of daily living involving the lower limbs are influenced by a PT's years of experience.
Key words: years of experience, motor FIM gain, quality of rehabilitation

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Introduction

It has been reported that rehabilitation outcomes are influenced by increased amounts of training by practitioners [1, 2]. Few reports have evaluated the influence of the difference in years of experience on treatment results in the study of rehabilitation skills. Regarding the relationship between years of experience of physical therapists (PTs) and occupational therapists (OTs) and rehabilitation outcomes in CVA patients, our clinical experience leads us to believe that therapists who have several years' experience achieve a greater degree of improvement in patients' activities of daily living (ADL) and suggests that the outcomes of CVA patient rehabilitation could be influenced by the therapists' years of experience. We conjectured that the greater the number of years of experience, the better the rehabilitation treatment results.

In actual clinical settings, although we actively work on therapists' education and instruction in an attempt to achieve consistent quality of rehabilitation, the effectiveness of such attempts is not clear. Moreover, the family members of patients sometimes

express the hope that a therapist with extensive clinical experience will take care of their relatives.

A previous study has shown no difference between qualified physiotherapists and physiotherapy assistants in the recovery of arm function after stroke [3]. For other disease states, it has been reported that therapists classified as experts by their treatment results showed no difference according to years of experience, sex, or specialized degree [4] and no difference in terms of years of experience, continuing education, and professional training [5]; no relationship exists between a PT's years of experience and his or her clinical results [6]. Another study has shown no relationship between therapist-related factors such as years of experience or specialized qualifications and outcomes of patients with low back pain who underwent an intervention program of manipulation or stabilization, indicating that such factors are inadequate as measures of expertise [7]. To our knowledge, there is no report demonstrating a difference in treatment effect due to years of experience.

The purpose of this study was to determine the difference in the effect of rehabilitation according to a therapist's years of experience to achieve consistent quality of rehabilitation. By treating a therapist's years of experience as a skill, we examined how this would influence CVA patient outcomes using motor FIM.

Methods

The subjects were PTs and OTs who took care of 354 CVA patients discharged from the convalescent rehabilitation ward during the period from April 2007 to March 2009. The characteristics of the patients were as follows: age 71 ± 13 years (mean ± SD) 216 men and 138 women; period from onset to hospitalization 23 ± 16 days; rehabilitation period 82 ± 35 days; motor FIM scores on admission 41 ± 25; motor FIM scores at discharge 65 ± 25; motor FIM gain (motor FIM score at hospital discharge minus motor FIM score on admission) 24 ± 19; motor FIM efficiency (motor FIM gain divided by days of rehabilitation) 0.32 ± 0.25 per day; rate of return to home 66%; total PT-OT training volume 465 ± 214 units; and PT-OT training volume per day 5.69 ± 1.03 units. The mean number of years of experience of therapists was as follows: PT 3.8 ± 2.8 years (1−2 years, 10 persons; 3−4 years, 5 persons; 5−10 years, 5 persons); OT 3.6 ± 2.6 years (1−2 years, 7.5 persons; 3−4 years, 4 persons; 5−10 years, 5.5 persons). Patients are arbitrarily allocated to therapists by principal ward therapists in consideration of the number of patients each therapist has.

FIM motor items were divided into two groups: PT items−transfers, locomotion, and stair climbing; and OT items−eating, grooming, bed bath, dressing, toilet behavior, urination management, and defecation management.

With patient outcomes as motor FIM gain and efficiency for an evaluation scale, we used multivariate analysis to retrospectively examine the degree of influence that the multiple explanatory variable *years of experience* had on the objective variables *motor FIM gain/efficiency*. We considered motor FIM scores on admission among multiple factors that influence prognosis.

We created three combinations as follows: 1) FIM gain and FIM efficiency for transfers (bed, chair, wheelchair), locomotion, and stairs (5 PT items) and PTs' years of experience; 2) FIM gain and FIM efficiency for eating, grooming, bed bath, dressing (upper and lower body), toilet behavior, urination management, and defecation management (8 OT items) and OTs' years of experience; and 3) motor FIM gain and motor FIM efficiency for 13 items (PT items + OT items) and years of experience (PTs' years of experience + OTs' years of experience). The rehabilitative prescription rate of PTs and OTs was 100%. We used the following three methods to assess the relationship between years of experience and motor FIM gain and efficiency:

Simple regression analysis: We assessed the relationship between years of experience and motor FIM gain and efficiency without considering the size of FIM scores on admission.

Multiple regression analysis: The following multiple regression model was used to investigate the influence of years of experience and motor FIM scores on admission, including the size of motor FIM scores on admission, on FIM gain and efficiency: $y = \alpha + \beta_1 x_1 + \beta_2 x_2$ (y: motor FIM gain/efficiency; x_1: years of experience; x_2: motor FIM scores on admission).

Stratified simple regression analysis: We divided motor FIM scores on admission into three groups and conducted a stratified analysis on years of experience and motor FIM gain and efficiency using a simple regression analysis. Grouping for the stratified analysis resulted in the following: Group 1 (severely impaired patients), Group 2 (moderately impaired patients), and Group 3 (mildly impaired patients).

Group 1: Each item of the motor FIM scores on admission was either 1 (total assistance) or 2 (maximal assistance) and the total score was 13−26 (≥50% assistance).

Group 2: Each item of the motor FIM scores on admission was either 3 (moderate assistance) or 4 (minimal assistance) and the total score was 39−52 (<50% assistance).

Group 3: Each item of the motor FIM scores on admission was either 5 (provisional supervision), 6 (limited independence), or 7 (complete independence), and the total score was 65−91 (supervision and/or independence level).

The variables used for analysis were motor FIM gain and efficiency as the objective variables and years of experience as the explanatory variables. For motor FIM gain (score) and motor FIM efficiency (score/

days), we used 5 PT items, 8 OT items, and 13 motor FIM items. For years of experience, we used years as a PT, years as an OT, and the sum of years of PT and OT experience. For statistical processing, we used JMP statistical analysis software, and the significance level was $p < 0.05$. The present study was examined and approved by the Ethics Review Board at this facility.

Results

(1) Years of experience and motor FIM gain

In a simple regression analysis on years of experience and motor FIM gain without considering the size of motor FIM score on admission, a significant relationship was found in PT and PT + OT. However, a simple regression analysis on years of experience and motor FIM on admission suggested that therapists who have more experience tend to take care of severely impaired patients with low motor FIM scores on admission. Motor FIM gain was high when motor FIM score on admission was high (Table 1). In other words, FIM scores on admission influence both years of experience and motor FIM gain. Therefore, to examine the direct relationship between years of experience and motor FIM gain, the influence of FIM score on admission must be adjusted using multiple regression analysis. Once this adjustment was made, the relationship between years of experience and motor FIM gain was not significant (Table 2). Stratified simple regression analysis was then performed as a definite method of adjustment of FIM on admission. Patients were divided into three groups: mildly, moderately, and severely impaired, and single regression analysis was performed for each group. This analysis showed a significantly positive relationship between a PT's years of experience and motor FIM gain in moderately impaired patients. However, the relationship was not significant for mildly or severely impaired patients. There was no significant relationship between an OT's years of experience and motor FIM gain in any impairment

Table 1. Simple regression analysis of motor FIM gain and years of experience n = 354

	Objective variable: motor FIM gain Explanatory variable: years of experience		Objective variable: motor FIM score on admission Explanatory variable: years of experience	
	Regression coefficient	*p*-value	Regression coefficient	*p*-value
PT	0.32	0.018*	−0.46	0.0064*
OT	0.51	0.052	−0.71	0.038*
PT+OT	0.75	0.0071**	−1.1	0.0029**

Table 2. Multiple regression analysis of motor FIM gain n = 354

	x_1: years of experience		x_2: motor FIM score on admission	
	Regression coefficient	*p*-value	Regression coefficient	*p*-value
PT	0.2	0.13	−0.27	<.0001**
OT	0.3	0.22	−0.3	<.0001**
PT+OT	0.46	0.08	−0.26	<.0001**

Table 3. Stratified simple regression analysis of motor FIM gain

	Grouping		Objective variable: motor FIM gain Explanatory variable: years of experience		Objective variable: motor FIM score on admission Explanatory variable: years of experience	
	Group	n = 354	Regression coefficient	*p*-value	Regression coefficient	*p*-value
PT	1	216	0.14	0.44	0.057	0.4
	2	82	0.42	0.019*	−0.14	0.24
	3	56	−0.059	0.7845	0.039	0.84
OT	1	180	0.72	0.0815	−0.18	0.2
	2	72	−0.11	0.8	−0.13	0.59
	3	102	−0.11	0.55	0.25	0.21
PT+OT	1	195	0.6	0.18	−0.07	0.65
	2	83	0.7	0.024*	−0.45	0.048*
	3	76	0.12	0.6	0.19	0.38

Group 1 (severely impaired patients), Group 2 (moderately impaired patients), and Group 3 (mildly impaired patients).

group (Table 3).

(2) Years of experience and motor FIM efficiency

In single regression analysis without considering the size of motor FIM score on admission, there was no significant relationship between years of experience and motor FIM efficiency (Table 4). No significant relationship was observed in multiple regression analysis (Table 5) or in stratified simple regression analysis (Table 6).

Discussion

We examined the relationship between years of experience, which is regarded as a therapist's skills, and motor FIM gain and efficiency, which are measures of patient outcome. We noted a weak relationship between a PT's years of clinical experience and the FIM gain in lower limb function centered on transfers in moderately impaired patients. We conjectured that the greater the number of years of experience, the higher the motor FIM gain and/or efficiency, but motor FIM gain was related only to the PT items of transfer, locomotion, and stair climbing, and we found no relationship with motor FIM efficiency. Regarding the FIM motor items, previous studies have reported that the degree of difficulty of independence is divided into four stages [8–12]. Eating, grooming, urination/defecation control, and motion in a wheelchair are items in which independence is accomplished easily; dressing the upper body, transfers between the toilet or wheelchair and bed are intermediate-level skills. Toilet behavior, dressing the lower body, and walking are rather difficult items; bathing, bed bath, transfer to bathtub, and climbing up or down stairs are the most difficult items. Transfer activities relate to the recovery of upper limb function and higher brain dysfunction. The feature common to improving locomotion and stair climbing is upgrading lower limb and trunk function related to walking; without improved lower limb and trunk muscle strength, patients cannot walk.

Table 4. Simple regression analysis of motor FIM efficiency and years of experience n = 354

	Objective variable: motor FIM efficiency Explanatory variable: years of experience		Objective variable: motor FIM score on admission Explanatory variable: years of experience	
	Regression coefficient	*p*-value	Regression coefficient	*p*-value
PT	0.0031	0.16	−0.46	0.0064**
OT	0.00068	0.83	−0.71	0.038*
PT+OT	0.0044	0.23	−1.1	0.0029**

Table 5. Multiple regression analysis of motor FIM efficiency n = 354

	x_1: years of experience		x_2: motor FIM score on admission	
	Regression coefficient	*p*-value	Regression coefficient	*p*-value
PT	0.0035	0.11	−0.27	<.0001**
OT	−0.0005	0.87	−0.3	<.0001**
PT+OT	0.0042	0.25	−0.26	<.0001**

Table 6. Stratified simple regression analysis of motor FIM efficiency

	Grouping		Objective variable: motor FIM efficiency Explanatory variable: years of experience		Objective variable: motor FIM score on admission Explanatory variable: years of experience	
	Group	n = 354	Regression coefficient	*p*-value	Regression coefficient	*p*-value
PT	1	216	0.0037	0.092	0.057	0.4
	2	82	0.0014	0.82	−0.14	0.24
	3	56	0.0054	0.4245	0.039	0.84
OT	1	180	0.0032	0.5	−0.18	0.2
	2	72	−0.001	0.91	−0.13	0.59
	3	102	−0.0046	0.31	0.25	0.21
PT+OT	1	195	0.0054	0.28	−0.07	0.65
	2	83	0.01	0.17	−0.45	0.048*
	3	76	−0.006	0.38	0.19	0.38

Group 1 (severely impaired patients), Group 2 (moderately impaired patients), and Group 3 (mildly impaired patients).

Although occupational therapy chiefly aims at improving upper limb function, ADL and higher brain dysfunction, including skilled activities, lower limb function is also involved as the difficulty of activities increases. Transfers and locomotion are items in which improvements in FIM gain are expected by the amount of training because training is offered by teams of nurses and care workers as ADL training in the ward besides training offered by PTs and OTs. Eating, grooming, and dressing are items offered to a lesser degree with ADL training in the ward, improvement in FIM gain by the amount of training is not likely.

Severely impaired patients with lower motor FIM scores on admission often have complications such as impaired consciousness, dementia, higher brain dysfunction, paralysis, sensory disturbance, decline in motivation, and disuse syndrome. The greater the inhibitory factors of ADL, the less the expected rehabilitation effect by autonomous training and positive ADL training. Mildly impaired patients with lower motor FIM scores on admission have ADL levels of supervision or independence and have less therapist involvement. We thought that motor FIM scores of mildly impaired patients with lower motor FIM scores on admission were possibly influenced by a ceiling effect. Since moderately impaired patients have paralysis, we expected prosthesis management and therapists' skills to affect rehabilitation.

A previous study showed no difference in the recovery of arm function after stroke with years of physiotherapists' experience [3]. It is likely that therapists' years of experience had no effect because arm function is susceptible to impaired consciousness, dementia, higher brain dysfunction, paralysis, sensory disturbance, and psychological factors such as motivation.

Years of experience are not as significant as multidimensional knowledge from professional education, clinical experience, specialty work, colleagues, patients, continuing education, individual experience, and educational experience [5]. Expert therapists' skills are augmented by a patient-centered approach to cooperative problem solving, expanding patients' rights, and nurturing the patient-therapist relationship, and more years of experience are not as significant as depth of knowledge [5]. Therapists who have more years of experience are skilled in developing a trusting relationship with patients. A therapist's years of experience may enable him or her to draw out a patient's motivation using vocal approaches and could possibly affect the improvement of simple activities such as lower limb muscle strength and ambulation. It is believed that therapists having more experience can offer superior rehabilitation in part because of their ability to network with other staff and share information.

To perform appropriate physical therapy for CVA patients requires a certain way of thinking. It is necessary to be well informed about the impairment and its etiology, progress, and prognosis and then propose hypotheses from the results of evaluation and solve problems by proving or disproving these hypotheses. An accurate understanding of the current conditions is needed to forecast the future as accurately as possible based on experience, and to set realistic goals, thereby developing physical therapy [13]. One study found that individual patient-centered care is strengthened by knowledge including clinical reasoning, techniques of prognosis prediction, and introspection [5] and assumes that the knowledge and abilities increase with clinical experience.

The present study has some limitations. We did not consider background factors such as the training content, therapists' individual abilities, patients' motivation, provision of rehabilitation by people other than the therapists, duration of rehabilitation, or disease focus. The focus of CVA rehabilitation at this hospital is to increase the amount of training mainly through training in standing in the ward and training room. Our hospital offers a rehabilitation program composed primarily of training to stand, focused on orthotic treatment from early in the hospitalization, and does not adopt specific manipulative techniques. However, since programs and time allocations differ slightly among therapists, unifying them is an issue. The effect of a therapist's ability will differ depending on physical therapy techniques, and there is the possibility of different results using another technique. Therapists' communication ability and treatment skills vary among individuals, and it is necessary to examine the ability of individual therapists and physical therapy procedures.

Patients' motivation is one of the factors affecting the training effect, and rehabilitation conducted by people other than the therapist, such as nurses and the patients themselves, as well as disease focus and the period of rehabilitation, are factors that may greatly influence patient outcomes.

In the present study, we evaluated the ADL outcome in the recovery stage of CVA rehabilitation using FIM as the ADL evaluation index, and we did not evaluate the physical therapy procedures. The results of this study suggest that a PT's years of experience slightly influences lower limb ADL. Regarding motor FIM efficiency, the lack of differences by years of experience can likely be explained by individual and environmental factors that greatly influence the length of hospital stay. The statistical power of the present study is weak, and because the difference in the years of experience was not significant enough to affect patients' treatment results, we believe that the consistency of rehabilitation quality has been maintained without great deviation in the present system. A previous study reported that designs in which the therapist's choice of intervention and patient's progress are determined are needed to further

investigate the potential relationship between years of experience and patient outcomes [7]. Further examination of the individual factors of patients and other measures besides years of experience and FIM gain and/or efficiency is necessary to assess rehabilitation skills [14]. To improve the quality of rehabilitation, improvement in training techniques and systematic rehabilitation treatment as well as construction of educational systems and perfect management control is necessary for effective evidence-based rehabilitation.

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