ANIMAL ASSISTED THERAPY

Influence of Animal Assisted Therapy Using Dog for Patients with Stroke and Examination of Nursing Care

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ABSTRACT

Purpose: **Japan's ageing society exhibits high rates of cerebrovascular disease. Animal Assisted Therapy (AAT) for patients with stroke may be an effective means by previous research. The objective of this study was to examine the nursing care effects of AAT, using dogs handled by nurses, with patients following stroke.**

Method: **23 patients underwent mood examinations before and after AAT. Additionally, we measured changes in physical function, the total time required for each behaviour during AAT, and nursing outcomes over the 4-week experimental period.**

Results: **At baseline, between weeks 1 and 4, and post-AAT we observed no statistically significant between-group differences in 'change in mood' and 'behaviour during AAT'd Both the AAT group and the waiting group exhibited significant change in FIM and SIAS scores between weeks 1 and 4. The AAT group exhibited a significant change over the study period, compared with the waiting group on the Nursing outcomes Classification (NOC) index.**

Conclusion: **There was a significant improvement in nursing outcomes as assessed by NOC indices. AAT is an effective means of delivering nursing care for patients with stroke.**

KEY WORDS

animal assisted therapy, stroke, nursing care, dog, alternative therapy

INTRODUCTION

Animal-assisted therapy (AAT) is an adjunctive therapy and alternative therapy, carried out by medical staff, involving contact between animals and patients in medical settings. AAT seeks to improve patient independence and adaptation, emotional stability, sense of autonomy and motivation and socialisation while helping patients acquire social and daily routine skills. A key component of AAT is recovery of the patient's basic life rhythm by utilising his or her relationship with living things[1-3)].

AAT is practised throughout Europe and the United States, in hospitals and other medical facilities, with patients ranging in age from very young to elderly, with acute to chronic disease profiles. Current estimates indicate that AAT reduces medical costs by approximately 3 to 7 million dollars[4-9)]. In contrast, animal-assisted activity (AAA) is used in Japan. The results of these programmes are occasionally reported as AAT in Japan; however, the Companion Animal Partnership Program and AAA differ from AAT and, in actuality, AAT (as it occurs in Europe and the United States) is not used in Japan[10-20)]. In Japan, For people who enjoy the company of animals, AAT may serve as an effective adjuvant/alternative therapy, with more an emphasis on sustained patient activity, continuous physical improvement and psychological or social change compared with AAA.

Among Japanese citizens aged 65 and older, rates of cerebrovascular disease requiring hospitalisation are high. Consequently, the costs of treating cerebrovascular diseases are considerable and pose a major burden on Japan's long-term care insurance system[21)]. Internationally, the World Health Organization (WHO) reported that the second leading cause of death worldwide in 2015 was stroke. Over the past 15 years, stroke has continued to be a leading cause of death in the world[22)].

AAT may be able to improve mood in patients with cerebrovascular disease and mental sequelae due to disorders such as paralysis. Additionally, AAT may help improve patient communication, emotional stability and social engagement. From a standpoint of physical rehabilitation, it may possible to improve daily living skills and patient motivation via AAT. Because AAT seeks to enhance autonomy and facilitate patient adaptation, it may also be able to restore physical function. Because nurses are intimately involved in the daily and psychological lives of patients, nursing may be able to effectively implement AAT within medical settings.

AAT is recognised by the Nursing Interventions Classification (NIC) of the North American Nursing Diagnosis Association (NANDA)[23)], but there are no studies investigating which evaluation items in the Nursing Outcomes Classification (NOC) index are affected. AAT is not currently practised as a form of nursing care in Japan; hence, Japanese nurses do not recognise AAT. Therefore, the purpose of this research was to verify the nursing care effects on patients attributable to AAT. Here AAT was delivered by nurses and dogs in medical settings, to patients following stroke.

MATERIALS AND METHODS

Study design and setting

This was a quasi-experimental research study (non-randomised controlled trial) conducted from May to November, 2007. Participants were

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Table 1. Change in mood (VAS) of patients in AAT 1-4 weeks (cm)

	Before AAT			After AAT			Difference before and after AAT		
	Percentile			Percentile			Percentile		
Week	25	50 (Median)	75	25	50 (Median)	75	25	50 (Median)	75
1	4.7	5.0	6.3	6.4	7.2	8.5	1.5	2.3	3.2
2	5.1	5.4	6.7	5.9	7.8	8.9	0.2	1.2	3.0
3	3.6	4.5	5.6	6.3	8.3	9.1	0.8	2.6	4.6
4	4.3	5.2	5.8	7.6	8.4	8.8	1.0	3.5	4.4
p		0.363			0.921			0.408	

Table 2. Change in behavior in AAT 1-4 weeks (second)

	Talking (Handler)			Talking (Therapy dog)			Watching			Touching		
	Percentile			Percentile			Percentile			Percentile		
week	25	50 (Median)	75	25	50 (Median)	75	25	50 (Median)	75	25	50 (Median)	75
1	14.0	36.4	158.1	0.0	0.0	0.2	22.5	84.5	120.3	0.0	2.5	15.4
2	13.4	42.2	128.0	0.0	0.0	4.8	12.1	67.3	90.4	0.0	0.0	27.7
3	2.5	37.1	186.7	0.0	0.0	2.3	56.5	95.3	197.8	0.0	2.2	32.0
4	7.3	75.2	121.8	0.0	1.7	8.2	20.1	100.2	169.3	0.0	4.8	54.0
p		0.840			0.038a			0.525			0.694	

a: Significant difference talking (Therapy dog) between 2nd and 4th week (Wilcoxon test)

randomly assigned to either the AAT intervention group or the waiting/control group. Criteria for inclusion were 1) history of stroke, presently in good (stable) condition; 2) physician determination that AAT intervention was appropriate; 3) favourable opinion of dogs; 4) patients agreeable to taking part in AAT; 5) functional communication skills; 6) residing in hospital during the study period; and 7) provision of informed consent to participate in research.

Assignment of intervention group and waiting group

This was a single-site study, involving one ward of a general hospital with 340 beds and a recovery ward with 40 beds. The patients who agreed to participate were randomly assigned to either the AAT or waiting group. Assignment was carried out according to order of presentation, alternately assigned to the AAT or waiting group. All participants in the waiting group were offered AAT following the study period.

Prescription of AAT by doctor

A nurse who also handled the therapy dog provided AAT to patients after a physician's prescription. These prescriptions were directed at improvement of 1) watching, 2) touching (manual contact with dog), 3) brushing or 4) walking.

Nursing AAT Intervention

Nurses drafted a nursing care plan, which was implemented and evaluated using nursing diagnoses based on NANDA-NIC-NOC linkages[24]. The primary nurse drafted and evaluated the nursing plans for both groups. For the AAT group, the observation and the aid items included AAT. The waiting group was not exposed to AAT during the study period. The nursing AAT records were recorded by the nurse who was also the dog handler.

AAT

The handler nurse performed AAT on weekday afternoons, involving approximately 10 min of one-on-one contact between a therapy dog and patient. The 10-min duration was determined on the basis of the average duration of therapy dogs' concentration, limited opportunities for AAT activities in the afternoon and a preliminary survey of patient involvement with AAT. The handler nurse took a therapy dog and went to the patient's room where AAT was performed with the patient in bed, or seated at bedside. The handler nurse performed AAT in accordance with NIC procedures, with goals directed as per the physician order. AAT was conducted using the same therapy dog every time. The handler completed all tasks related to therapy dog excretion, daily training, cleansing and oral care prior to AAT administration each day.

Therapy Dog and Handler

The therapy dog had passed the Yamanashi Therapy Dog Club therapy dog certification programme and was disease free and current on all vaccinations. The dog used was an English Cocker Spaniel named Orb, aged 2 y and 5 months.

The handler was hired by the hospital to work as both a handler and nurse. She possessed 5 y of nursing experience and typically completed her nursing work in the ward during the mornings and performed AAT on weekday afternoons. The handler was trained in implementation of AAT activities and was certified by the Yamanashi Therapy Dog Club.

Survey

The following (1) to (4) surveys were conducted with participants over the 4-week study period. In the AAT group, all four surveys were administered, and two surveys [(3) and (4)] were administered to the waiting group. Only the intervention group was administered (1) and (2) once per week, with the psychological aspect evaluated by AAT. (3) and (4) conducted an investigation in both groups, (3) evaluated the physical aspect and (4) conducted a survey on nursing outcomes. We comprehensively investigated the effects of AAT from 2 perspectives: those of patients and nursing.

Mood changes

Changes in patient mood, before and after AAT, were evaluated using visual analogue scales (VAS). We standardised the response stimulus as, 'Please tell us your mood at the present time'i and were careful not to influence the patient's response at any time. VAS measures were taken eight times per patient, for 4 weeks, once per week involving one assessment before and another after AAT. We specifically focused on mood changes before and after AAT in the AAT group.

Behaviour during AAT

We analysed participant behaviours during AAT via video analysis.

Table 3. Changes in motor function and cognitive function by FIM at the start and end of AAT in intervention group and waiting group

			Before AAT			After AAT			Difference before and after			
			Percentile			Percentile			Percentile			p
			25	50 (Median)	75	25	50 (Median)	75	25	50 (Median)	75	
interven-tion group	motor function	meal	1.0	5.0	5.0	1.0	5.0	5.0	0.0	0.0	0.0	0.317
		cosmetic	1.0	4.0	5.0	1.0	4.0	5.0	0.0	0.0	1.0	0.102
		cleansing	1.0	3.0	4.0	1.0	3.0	4.0	0.0	0.0	0.0	0.317
		dressing / upper body	1.0	3.0	3.0	1.0	3.0	4.0	0.0	0.0	1.0	0.102
		dressing / Lower body	1.0	1.0	3.0	1.0	2.0	4.0	0.0	0.0	1.0	0.102
		toilet action	1.0	1.0	5.0	1.0	1.0	5.0	0.0	0.0	1.0	1.000
		urination management	1.0	3.0	6.0	1.0	5.0	7.0	0.0	0.0	0.0	0.180
		defecation management	1.0	5.0	6.0	1.0	6.0	6.0	0.0	0.0	0.0	0.317
		bed/chair/wheelchair	1.0	4.0	5.0	2.0	4.0	5.0	0.0	1.0	1.0	0.024
		toilet	1.0	1.0	4.0	1.0	4.0	5.0	0.0	0.0	1.0	0.059
		bathtub/shower	1.0	1.0	4.0	1.0	2.0	4.0	0.0	0.0	0.0	0.414
		walking	0.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	0.157
		wheelchair	0.0	1.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	1.000
		stairs	1.0	1.0	1.0	1.0	1.0	1.0	0.0	0.0	0.0	0.180
	cognitive function	understanding	3.0	4.0	5.0	3.0	5.0	6.0	0.0	0.0	2.0	0.059
		expressing	3.0	5.0	6.0	3.0	5.0	6.0	0.0	0.0	1.0	0.066
		social exchange	3.0	4.0	5.0	4.0	4.0	6.0	0.0	0.0	0.0	0.157
		problem solution	1.0	1.0	5.0	1.0	2.0	5.0	0.0	0.0	0.0	0.180
		memory	1.0	2.0	3.0	1.0	3.0	4.0	0.0	0.0	2.0	0.034
waiting group	motor function	meal	4.0	5.5	6.0	4.3	6.0	6.0	0.0	0.0	0.0	0.157
		cosmetic	2.0	5.0	5.8	2.0	5.0	7.0	0.0	0.0	1.0	0.059
		cleansing	1.0	4.0	5.0	1.0	5.0	6.0	0.0	0.0	1.0	0.063
		dressing / upper body	2.3	5.0	6.8	2.3	5.0	7.0	0.0	0.0	0.0	0.157
		dressing / Lower body	2.0	4.0	6.8	2.0	5.0	7.0	0.0	0.0	1.0	0.059
		toilet action	1.3	4.5	6.8	2.0	5.0	6.8	0.0	0.0	0.8	0.102
		urination management	1.0	5.0	7.0	1.0	5.5	7.0	0.0	0.0	0.0	0.317
		defecation management	1.0	4.5	6.8	1.0	6.0	6.8	0.0	0.0	0.0	0.180
		bed/chair/wheelchair	1.8	5.0	5.8	2.8	5.0	7.0	0.0	0.5	1.0	0.020
		toilet	1.8	5.0	5.8	2.8	5.0	6.8	0.0	0.0	1.0	0.034
		bathtub/shower	1.0	3.0	5.0	2.5	4.5	6.0	0.0	1.0	1.8	0.010
		walking	0.0	1.0	4.8	2.5	4.5	6.0	1.0	1.5	3.8	0.005
		wheelchair	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.655
		stairs	1.0	1.0	1.0	1.0	1.0	5.0	0.0	0.0	1.8	0.041
	cognitive function	understanding	2.3	5.0	6.0	3.3	5.0	6.0	0.0	0.0	0.0	0.180
		expressing	2.5	5.0	6.0	4.0	5.0	6.8	0.0	0.0	0.8	0.102
		social exchange	4.3	5.5	7.0	4.3	6.0	7.0	0.0	0.0	0.0	0.317
		problem solution	1.0	3.0	5.8	1.3	3.0	5.8	0.0	0.0	0.0	0.317
		memory	1.3	2.5	4.5	2.3	3.0	5.8	0.0	0.0	1.0	0.038

We specifically coded four voluntary participant behaviours including 'talking (to the handler)', 'talking (to the therapy dog)', 'watching (the therapy dog)' and 'touching (the therapy dog)'. One patient was videotaped once weekly for 4 weeks, and a total of four surveys were conducted.

Physical function measures

The Functional Independence Measure (FIM) and Stroke Impairment Assessment Set (SIAS) were used to evaluate body function changes in both the AAT and waiting groups. A total of 2 surveys were conducted for on patient at the beginning of the survey and 4 weeks later. These data were evaluated by the treating physiotherapists.

Nursing Outcomes

NOC evaluations were completed four times per week for 4 weeks to examine changes in the various indices. NOC measures were determined for two items: 'psychomotor energy' and 'participation in leisure activities'c. Psychomotor energy was evaluated by nine items. Participation in leisure activities was evaluated by 10 items.

Statistical analysis

Mood changes

VAS values were measured before AAT, after AAT, and the difference in measured VAS values were determined before and after AAT from week 1 through 4. The median of the percentile was calculated using non-parametric methods. Differences in the measured VAS values were compared using the Friedman test.

Table 4. Changes in the NANDA-NOC index at 1-4 weeks -NOC: psychomotor energy, participation in leisure activities-

				1st week		2nd week		3rd week		4th week	pa	pb
			score	n	%	n	%	n	%	n	%		
psychomotor energy	601: showing a love fit for the situation	intervention group	0	0	0.0	0	0.0	0	0.0	0	0.0	0.001	0.025
			1	2	33.3	1	16.7	0	0.0	0	0.0		
			2	1	16.7	1	16.7	0	0.0	0	0.0		
			3	3	50.0	3	50.0	2	33.3	0	0.0		
			4	0	0.0	1	16.7	2	33.3	2	33.3		
			5	0	0.0	0	0.0	2	33.3	4	66.7		
		waiting group	0	1	12.5	1	12.5	1	12.5	1	12.5		
			1	6	75.0	5	62.5	3	37.5	2	25.0		
			2	1	12.5	2	25.0	3	37.5	4	50.0		
			3	0	0.0	0	0.0	1	12.5	1	12.5	0.010	
			4	0	0.0	0	0.0	0	0.0	0	0.0		
			5	0	0.0	0	0.0	0	0.0	0	0.0		
	602: indicating concentration	intervention group	0	0	0.0	0	0.0	0	0.0	0	0.0	0.004	0.014
			1	2	33.3	1	16.7	0	0.0	0	0.0		
			2	1	16.7	1	16.7	0	0.0	0	0.0		
			3	3	50.0	1	16.7	4	66.7	1	16.7		
			4	0	0.0	3	50.0	2	33.3	4	66.7		
			5	0	0.0	1	16.7	0	0.0	1	16.7		
		waiting group	0	0	0.0	0	0.0	0	0.0	0	0.0	0.005	
			1	6	75.0	5	62.5	3	37.5	2	25.0		
			2	2	25.0	2	25.0	3	37.5	4	50.0		
			3	0	0.0	1	12.5	2	25.0	2	25.0		
			4	0	0.0	0	0.0	0	0.0	0	0.0		
			5	0	0.0	0	0.0	0	0.0	0	0.0		
	603: indicating appropriate adjustment and hygiene	intervention group	0	5	83.3	5	83.3	5	83.3	5	83.3	-	0.157
			1	0	0.0	0	0.0	0	0.0	0	0.0		
			2	0	0.0	0	0.0	0	0.0	0	0.0		
			3	0	0.0	0	0.0	0	0.0	0	0.0		
			4	1	16.7	1	16.7	1	16.7	1	16.7		
			5	0	0.0	0	0.0	0	0.0	0	0.0		
		waiting group	0	6	75.0	6	75.0	6	75.0	6	75.0	0.112	
			1	0	0.0	0	0.0	0	0.0	0	0.0		
			2	1	12.5	1	12.5	1	12.5	0	0.0		
			3	1	12.5	1	12.5	1	12.5	1	12.5		
			4	0	0.0	0	0.0	0	0.0	1	12.5		
			5	0	0.0	0	0.0	0	0.0	0	0.0		
	604: indicating normal appetite	intervention group	0	3	50.0	3	50.0	3	50.0	3	50.0	0.194	0.157
			1	1	16.7	1	16.7	0	0.0	0	0.0		
			2	0	0.0	0	0.0	0	0.0	0	0.0		
			3	0	0.0	0	0.0	1	16.7	1	16.7		
			4	2	33.3	2	33.3	2	33.3	1	16.7		
			5	0	0.0	0	0.0	0	0.0	1	16.7		
		waiting group	0	4	50.0	4	50.0	4	50.0	4	50.0	0.129	
			1	2	25.0	1	12.5	1	12.5	1	12.5		
			2	0	0.0	1	12.5	0	0.0	0	0.0		
			3	1	12.5	1	12.5	1	12.5	1	12.5		
			4	0	0.0	0	0.0	1	12.5	0	0.0		
			5	1	12.5	1	12.5	1	12.5	2	25.0		
	613 protecting the indicated drug	intervention group	0	5	83.3	5	83.3	5	83.3	5	83.3	-	1.000
			1	0	0.0	0	0.0	0	0.0	0	0.0		
			2	0	0.0	0	0.0	0	0.0	0	0.0		
			3	0	0.0	0	0.0	0	0.0	0	0.0		
			4	1	16.7	1	16.7	1	16.7	1	16.7		
			5	0	0.0	0	0.0	0	0.0	0	0.0		
		waiting group	0	7	87.5	7	87.5	7	87.5	7	87.5		
			1	1	12.5	1	12.5	1	12.5	1	12.5		
			2	0	0.0	0	0.0	0	0.0	0	0.0	-	

		waiting group	3	0	0.0	0	0.0	0	0.0	0	0.0	-	
			4	0	0.0	0	0.0	0	0.0	0	0.0		
			5	0	0.0	0	0.0	0	0.0	0	0.0		
	614 : Protect instructed therapy	intervention group	0	5	83.3	5	83.3	5	83.3	5	83.3	-	0.724
			1	0	0.0	0	0.0	0	0.0	0	0.0		
			2	0	0.0	0	0.0	0	0.0	0	0.0		
			3	0	0.0	0	0.0	0	0.0	0	0.0		
			4	1	16.7	1	16.7	1	16.7	1	16.7		
			5	0	0.0	0	0.0	0	0.0	0	0.0		
		waiting group	0	6	75.0	6	75.0	6	75.0	6	75.0	0.392	
			1	2	25.0	2	25.0	1	12.5	1	12.5		
			2	0	0.0	0	0.0	1	12.5	1	12.5		
			3	0	0.0	0	0.0	0	0.0	0	0.0		
			4	0	0.0	0	0.0	0	0.0	0	0.0		
			5	0	0.0	0	0.0	0	0.0	0	0.0		
	606: Pay attention to surroundings	intervention group	0	0	0.0	0	0.0	0	0.0	0	0.0	0.002	0.005
			1	2	33.3	1	16.7	0	0.0	0	0.0		
			2	1	16.7	1	16.7	0	0.0	0	0.0		
			3	3	50.0	3	50.0	2	33.3	0	0.0		
			4	0	0.0	1	16.7	4	66.7	4	66.7		
			5	0	0.0	0	0.0	0	0.0	2	33.3		
		waiting group	0	0	0.0	0	0.0	0	0.0	0	0.0	0.003	
			1	7	87.5	6	75.0	3	37.5	2	25.0		
			2	1	12.5	2	25.0	4	50.0	5	62.5		
			3	0	0.0	0	0.0	1	12.5	1	12.5		
			4	0	0.0	0	0.0	0	0.0	0	0.0		
			5	0	0.0	0	0.0	0	0.0	0	0.0		
	608: Show appropriate energy level	intervention group	0	2	33.3	2	33.3	2	33.3	2	33.3	0.022	0.282
			1	2	33.3	1	16.7	0	0.0	0	0.0		
			2	0	0.0	0	0.0	0	0.0	0	0.0		
			3	2	33.3	2	33.3	2	33.3	1	16.7		
			4	0	0.0	1	16.7	2	33.3	2	33.3		
			5	0	0.0	0	0.0	0	0.0	1	16.7		
		waiting group	0	0	0.0	0	0.0	0	0.0	0	0.0	0.016	
			1	6	75.0	6	75.0	4	50.0	4	50.0		
			2	0	0.0	0	0.0	2	25.0	2	25.0		
			3	2	25.0	2	25.0	1	12.5	0	0.0		
			4	0	0.0	0	0.0	1	12.5	1	12.5		
			5	0	0.0	0	0.0	0	0.0	1	12.5		
	609: Ability to achieve daily routine	intervention group	0	6	100.0	6	100.0	6	100.0	6	100.0	-	0.491
			1	0	0.0	0	0.0	0	0.0	0	0.0		
			2	0	0.0	0	0.0	0	0.0	0	0.0		
			3	0	0.0	0	0.0	0	0.0	0	0.0		
			4	0	0.0	0	0.0	0	0.0	0	0.0		
			5	0	0.0	0	0.0	0	0.0	0	0.0		
		waiting group	0	2	25.0	2	25.0	2	25.0	2	25.0	0.121	
			1	4	50.0	4	50.0	4	50.0	3	37.5		
			2	0	0.0	0	0.0	0	0.0	1	12.5		
			3	2	25.0	2	25.0	0	0.0	0	0.0		
			4	0	0.0	0	0.0	2	25.0	1	12.5		
			5	0	0.0	0	0.0	0	0.0	1	12.5		
participation in leisure activities	160401: Participate in activities other than regular work	intervention group	0	0	0.0	0	0.0	0	0.0	0	0.0	0.047	0.200
			1	1	25.0	0	0.0	0	0.0	0	0.0		
			2	2	50.0	3	75.0	1	25.0	0	0.0		
			3	0	0.0	0	0.0	2	50.0	3	75.0		
			4	1	25.0	1	25.0	1	25.0	1	25.0		
			5	0	0.0	0	0.0	0	0.0	0	0.0		
		waiting group	0	0	0.0	0	0.0	0	0.0	0	0.0	0.392	
			1	0	0.0	0	0.0	0	0.0	0	0.0		
			2	1	25.0	1	25.0	0	0.0	0	0.0		
			3	3	75.0	3	75.0	4	100.0	4	100.0		

		4	0	0.0	0	0.0	0	0.0	0	0.0	
		5	0	0.0	0	0.0	0	0.0	0	0.0	
160410: physical exercise participates in advanced leisure activities	intervention group	0	4	100.0	3	75.0	3	75.0	0	0.0	-
		1	0	0.0	1	25.0	1	25.0	0	0.0	
		2	0	0.0	0	0.0	0	0.0	0	0.0	
		3	0	0.0	0	0.0	0	0.0	0	0.0	
		4	0	0.0	0	0.0	0	0.0	0	0.0	
		5	0	0.0	0	0.0	0	0.0	0	0.0	1.000
	waiting group	0	0	0.0	0	0.0	0	0.0	0	0.0	
		1	4	100.0	4	100.0	4	100.0	4	100.0	
		2	0		0	0.0	0	0.0	0	0.0	-
		3	0	0.0	0	0.0	0	0.0	0	0.0	
		4	0	0.0	0	0.0	0	0.0	0	0.0	
		5	0	0.0	0	0.0	0	0.0	0	0.0	
160411: participate in leisure activities with low physical activity	intervention group	0	4	100.0	3	75.0	3	75.0	4	100.0	0.392
		1	0	0.0	0	0.0	0	0.0	0	0.0	
		2	0	0.0	1	25.0	0	0.0	0	0.0	
		3	0	0.0	0	0.0	0	0.0	0	0.0	
		4	0	0.0	0	0.0	1	25.0	0	0.0	
		5	0	0.0	0	0.0	0	0.0	0	0.0	0.886
	waiting group	0	0	0.0	0	0.0	0	0.0	0	0.0	
		1	0	0.0	0	0.0	0	0.0	0	0.0	
		2	3	75.0	3	75.0	1	25.0	1	25.0	0.112
		3	1	25.0	1	25.0	3	75.0	3	75.0	
		4	0	0.0	0	0.0	0	0.0	0	0.0	
		5	0	0.0	0	0.0	0	0.0	0	0.0	
160412: Interest of Select a certain leisure activity	intervention group	0	0	0.0	0	0.0	0	0.0	0	0.0	0.019
		1	3	75.0	0	0.0	0	0.0	0	0.0	
		2	0	0.0	2	50.0	2	50.0	0	0.0	
		3	0	0.0	1	25.0	1	25.0	3	75.0	
		4	1	25.0	1	25.0	1	25.0	0	0.0	
		5	0	0.0	0	0.0	0	0.0	1	25.0	0.200
	waiting group	0	0	0.0	0	0.0	0	0.0	0	0.0	
		1	0	0.0	0	0.0	0	0.0	0	0.0	
		2	3	75.0	3	75.0	0	0.0	0	0.0	0.029
		3	1	25.0	1	25.0	4	100.0	4	100.0	
		4	0	0.0	0	0.0	0	0.0	0	0.0	
		5	0	0.0	0	0.0	0	0.0	0	0.0	
160402: express satisfaction in leisure activities	intervention group	0	0	0.0	0	0.0	0	0.0	0	0.0	0.013
		1	1	25.0	1	25.0	0	0.0	0	0.0	
		2	2	50.0	2	50.0	2	50.0	0	0.0	
		3	0	0.0	0	0.0	1	25.0	2	50.0	
		4	1	25.0	1	25.0	1	25.0	1	25.0	
		5	0	0.0	0	0.0	0	0.0	1	25.0	0.343
	waiting group	0	0	0.0	0	0.0	0	0.0	0	0.0	
		1	0	0.0	0	0.0	0	0.0	0	0.0	
		2	3	75.0	0	0.0	0	0.0	0	0.0	0.019
		3	1	25.0	4	100.0	3	75.0	3	75.0	
		4	0	0.0	0	0.0	1	25.0	1	25.0	
		5	0	0.0	0	0.0	0	0.0	0	0.0	
160403: use appropriate skills of social interaction	intervention group	0	0	0.0	0	0.0	0	0.0	0	0.0	0.043
		1	1	25.0	1	25.0	1	25.0	0	0.0	
		2	2	50.0	2	50.0	2	50.0	0	0.0	
		3	0	0.0	0	0.0	0	0.0	2	50.0	
		4	1	25.0	1	25.0	1	25.0	1	25.0	
		5	0	0.0	0	0.0	0	0.0	1	25.0	0.114
	waiting group	0	0	0.0	0	0.0	0	0.0	0	0.0	
		1	4	100.0	4	100.0	4	100.0	4	100.0	
		2	0	0.0	0	0.0	0	0.0	0	0.0	-
		3	0	0.0	0	0.0	0	0.0	0	0.0	
		4	0	0.0	0	0.0	0	0.0	0	0.0	

		5	0	0.0	0	0.0	0	0.0	0	0.0	
160404: relax by leisure activities	intervention group	0	0	0.0	0	0.0	0	0.0	0	0.0	0.022	0.343
		1	1	25.0	0	0.0	0	0.0	0	0.0	
		2	2	50.0	3	75.0	1	25.0	0	0.0	
		3	0	0.0	0	0.0	1	25.0	3	75.0	
		4	1	25.0	1	25.0	2	50.0	0	0.0	
		5	0	0.0	0	0.0	0	0.0	1	25.0	
	waiting group	0	0	0.0	0	0.0	0	0.0	0	0.0	0.024	
		1	0	0.0	0	0.0	0	0.0	0	0.0	
		2	3	75.0	1	25.0	0	0.0	0	0.0	
		3	1	25.0	3	75.0	3	75.0	3	75.0	
		4	0	0.0	0	0.0	1	25.0	1	25.0	
		5	0	0.0	0	0.0	0	0.0	0	0.0	
160413: enjoy leisure activities	intervention group	0	0	0.0	0	0.0	0	0.0	0	0.0	0.022	0.343
		1	1	25.0	0	0.0	0	0.0	0	0.0	
		2	2	50.0	3	75.0	1	25.0	0	0.0	
		3	0	0.0	0	0.0	1	25.0	2	50.0	
		4	1	25.0	1	25.0	2	50.0	1	25.0	
		5	0	0.0	0	0.0	0	0.0	1	25.0	
	waiting group	0	0	0.0	0	0.0	0	0.0	0	0.0	0.024	
		1	0	0.0	0	0.0	0	0.0	0	0.0	
		2	3	75.0	1	25.0	0	0.0	0	0.0	
		3	1	25.0	3	75.0	3	75.0	3	75.0	
		4	0	0.0	0	0.0	1	25.0	1	25.0	
		5	0	0.0	0	0.0	0	0.0	0	0.0	
160405: to demonstrate creativity through leisure activities	intervention group	0	0	0.0	0	0.0	0	0.0	0	0.0	0.022	0.114
		1	1	25.0	0	0.0	0	0.0	0	0.0	
		2	2	50.0	3	75.0	2	50.0	0	0.0	
		3	1	25.0	1	25.0	3	75.0	4	100.0	
		4	0	0.0	0	0.0	0	0.0	0	0.0	
		5	0	0.0	0	0.0	0	0.0	1	25.0	
	waiting group	0	0	0.0	0	0.0	0	0.0	0	0.0	0.112	
		1	0	0.0	0	0.0	0	0.0	0	0.0	
		2	3	75.0	3	75.0	1	25.0	1	25.0	
		3	1	25.0	1	25.0	3	75.0	3	75.0	
		4	0	0.0	0	0.0	0	0.0	0	0.0	
		5	0	0.0	0	0.0	0	0.0	0	0.0	
160407: consider various leisure activities	intervention group	0	0	0.0	0	0.0	0	0.0	0	0.0	0.067	0.686
		1	1	25.0	0	0.0	0	0.0	0	0.0	
		2	2	50.0	3	75.0	2	50.0	0	0.0	
		3	0	0.0	0	0.0	1	25.0	3	75.0	
		4	1	25.0	1	25.0	1	25.0	1	25.0	
		5	0	0.0	0	0.0	0	0.0	0	0.0	
	waiting group	0	0	0.0	0	0.0	0	0.0	0	0.0	0.029	
		1	0	0.0	0	0.0	0	0.0	0	0.0	
		2	3	75.0	3	75.0	0	0.0	0	0.0	
		3	1	25.0	1	25.0	4	100.0	4	100.0	
		4	0	0.0	0	0.0	0	0.0	0	0.0	
		5	0	0.0	0	0.0	0	0.0	0	0.0	

a: Significance probability of changes in scores of 1-4 weeks in intervention group and waiting group (Friedman test)

b: Significance probability of changes in scores on week 1 and week 4 of intervention group and waiting group (Wilcoxon test)

Behaviour during AAT

The median of the percentile was calculated using non-parametric methods. Differences in the number of appearances for each of the 4 actions, from week 1 to 4, were compared by Friedman test. Items with significant differences were further subjected to non-parametric testing and compared by Wilcoxon test. In addition, the median for the self-care and non-self-care groups of FIM was calculated using a non-parametric test. The differences in the number of times the four actions appeared were compared using the Friedman test. The obtained video was subjected to behaviour analysis and statistical processing using a behaviour coding system (DKH beco version 3.2). The Kappa coefficient was used to determine validity. Analysts were trained by DKH Co., Ltd., on behaviour analysis procedures and software operation to ensure reliability. There were two analysers and one supervisor.

Physical Function Measures

The median was calculated by performing a non-parametric test on the change in FIM scores between the AAT group and the waiting group

pre-AAT, post-AAT and before and after execution of AAT for motor function and cognitive function items. Trends before and after AAT were compared by Friedman test. The median was calculated by non-parametric test for changes in 'pain' and 'language function' on the SIAS pre-AAT and post-AAT. Changes between pre- and post-AAT were compared by Wilcoxon test.

Nursing Outcomes

Non-parametric tests were conducted separately for the AAT and waiting groups, and changes in the five points of the NOC index items between weeks 1 and 4 were compared by Friedman test. All statistical operations were completed using IBM SPSS Statistics Version 24.

Ethics

All participants provided consent for participation following oral and written explanations about the objectives, methods, freedom to participate (or not), risks/benefits and privacy concerns. All information was encrypted so that individuals and hospitals were not identified and stored securely.

We considered the possibility of both physical and psychological fatigue for the therapy dog, and all possible precautions were taken to insure maximum animal welfare. This research was conducted with the ethical review of the hospital and approval of the Research Ethics Review Committee of the International Medical and Welfare University.

RESULTS

Patient Overview

A total of 30 participants, including 15 in the AAT group and 15 in the waiting group were planned, but several people dropped out. As a result of attrition, there were 23 surveys. Ultimately, 11 patients were included in the intervention group [five women and six men, average age 78.6 (SD:15.09), and 12 patients in the waiting group [seven women and five men, average age 79.0 (SD:10.78).

In the ATT group, four patients were diagnosed with cerebral haemorrhage (36.4%) and seven with cerebral infarction (63.6%). In the waiting group, four patients (33.3%) were diagnosed with cerebral haemorrhage and eight (66.7%) with cerebral infarction. The groups were statistically homogeneous regarding age, gender and disease.

Mood changes

Change in VAS between week 1 and 4 was measured to investigate mood changes. There were no statistically significant differences in any measure between week 1 and 4 (Table 1).

Behaviour during AAT

We measured the duration (in seconds) of the four behaviours during AAT between weeks 1 and 4. The only significant difference ($P < 0.05$) was with 'talking (to the therapy dog)' ($P < 0.05$) and there was a significant difference between week 2 and 4 during multiple comparison ($P < 0.05$) (Table 2).

Among patients who demonstrated independence on FIMs, we measured the behaviour durations (in seconds) during AAT at weeks 1 to 4. The median of 'talking (to the handler)' 97.9-132.0, 'talking (to the therapy dog)' 0.52-4.4, 'watching' 57.9-88.1, and 'touching' 2.39-16.22 in 4 weeks. There were no significant differences noted in the four actions.

Among patients who were not independent on FIMs, the median duration for 'talking (to the handler)' 5.7-23.5, 'talking (to the therapy dog)' 0.0, 'watching' 84.5- 152.3, and 'touching' 0.0- 19.1 in 4 weeks. There were no significant differences in the durations of the four actions.

Physical function

The median values of items of exercise function and cognitive function by FIM were calculated before and after the AAT of the intervention group. There was a significant difference between the AAT before and after the item of 'bed/chair/wheelchair' of motor function ($p < 0.05$). There was a significant difference in 'memory' in cognitive function ($p < 0.05$).

The median values of items of exercise function and cognitive function by FIM were calculated at the start and end of survey of the waiting group. There was a significant difference in the difference in scores before and after the AAT for 'bed/chair/wheelchair' ($p < 0.05$), 'toilet' ($p < 0.05$), 'bathtub/shower' ($p < 0.01$), 'walk' ($p < 0.01$), and 'stairway' ($p < 0.05$). (Table 3)

Median values of SIAS items in the AAT group were 'pain' 2.0, 'language function' 2.0 before AAT and 'pain' 2.0, 'language function' 2.0 after AAT. In the waiting group, scores were 'pain' 3.0, 'language function' 3.0 before the AAT, and 'pain' 2.5, 'language function' 3.0 after the AAT. There was no statistically significant difference between pre- and post-test measures for any item.

Nursing Outcomes

The indicators of the selected NOC were 'psychomotor energy' (AAT group 6, and waiting group 8), 'participation in leisure activities' (AAT group 4, and waiting group 4) and 'severity of loneliness' (AAT group 1).

"Psychomotor energy") There was a significant difference in three items, '601: showing a love appropriate for the situation', '602: indicating concentration' and '606: paying attention to surroundings', between week 1 and 4 for both groups.

"Participation in leisure activities") There were significant between-group differences between week 1 and 4 for six evaluation items: '160401: participate in non-regular work activities', '160412: choose interesting leisure activities', '160402: express satisfaction with leisure activities', '160404: relax by leisure activities', '160413: enjoy leisure activities' and '160407: to consider various leisure activities as indices of 'participation in leisure activities'. There were significant differences in two items: '160403: use appropriate skills for social interaction' and '160405: demonstrate creativity through leisure activities' in the waiting group.

There were no statistically significant between-group differences between weeks 1 and 4 for all evaluation items (Table 4).

DISCUSSION

This study investigated the effects of AAT using a dog and a nurse as a handler, and the nursing care effects for patients following stroke. Although AAT has been conducted in medical institutions and elder care facilities, we evaluated AAT as a component of nursing care.

The effect of AAT on patients with stroke

We evaluated the effect of AAT on physical function, mood, behaviour and nursing outcome classifications in patients following stroke. Physical changes were evaluated by motor function and cognitive function by FIM and SIAS. There was a significant change in the motor function indicator for 'bed/chair/wheelchair' and in the 'memory' indicator for cognitive function in the AAT group. However, these items also changed significantly in the waiting group. In addition, there were significant differences in four items including 'exercise function', 'toilet' 'bathtub/shower', 'walk' and 'stairway' in the waiting group. Improvements in FIM scores are presumed to occur secondary to rehabilitation procedures commonly performed for the purpose of restoring function, yet FIM scores changed significantly in the waiting group. It is possible that 4 weeks of AAT was insufficient for recovery of physical functions because the items 'pain' and 'language function' (by SIAS) did not differ significantly in either group. However, In the present study, the position and degree of paralysis were different among the patients. Thus, the impact of paralysis on physical function could act as the common denominator.

There was no statistically significant change in mood for either group; therefore, it is unclear whether AAT affected mood in patients following stroke. Additionally, we could not clarify the effect of AAT on physical function changes. On the basis of previous research[25] it is possible that our results were different because the number of subjects and the number instances of AAT exposure were small.

We predicted that the action time spent talking to the therapy dogs during AAT would gradually increase, because patients would gradually become attached to the animal used for AAT[26]. Therefore, the four actions involving the patient voluntary 'talking (to the handler)', 'talking (to the therapy dog)', 'watching' and 'touching' were analysed. We anticipated that the time spent engaging in these actions would increase over

time. However, we did not identify such a trend. There was no significant difference in the time spent engaging in the 4 actions, even when patients were divided into those who were independent, or not independent, carrying out ADLs (as indicated by FIM score).There was a significant difference in time spent 'talking (to the therapy dog)', between week 2 and 4, but we were unable to clarify the effect of AAT on patients with histories of stroke. In this study, patients only interacted with the dogs or nurse handlers. Also, we did not consider conversational content as a variable of interest. To examine the emotional effects of AAT, it would be necessary to more deeply investigate the content of patient discourse, as in previous research[27].

Nursing Outcomes

AAT may have contributed to achieving nursing outcomes as nursing care, because there was a significant difference between the AAT group and the waiting group in the 'emotion', 'concentration' and 'interest' items of 'mental kinetic energy' as NOC indices. Depression is a common sequela of stroke that often occurs starting in the acute phase, and into the second-year post-onset, regardless of age. Approximately, 30% of individuals who suffer a stroke will have depression by three months post-onset[28]. Depression can be accompanied by pain and suffering and may also impair QOL and affect the family unit. For patients who have sustained a stroke, AAT may be an effective nursing care method for preventing depression after stroke.

We noted significant improvement on the six NOC indices including 'participation in leisure activities', but there was also a significant improvement in the waiting group. It is highly probable that AAT was not effective as a nursing care intervention for this outcome. This study allowed for direct comparison of the AAT and waiting group, thereby providing a better way of quantifying the effects of AAT. As a result, we believe that AAT can improve variables related to mental activity such as affection, concentration, and attention, although the effect of AAT was unclear for physical and functional variables.

Limitations

This study was limited by our relative small study cohort and short investigation period. We cannot draw conclusions about how AAT may affect physical functions in stroke patients, and further investigations are needed. Information gleaned from future studies will assist our efforts to restore physical and mental functionality in patients who have sustained strokes via effective application of AAT in Japan. We also seek to establish a system for formally implementing AAT as a form of nursing care.

CONCLUSION

We investigated the effects of AAT in a cohort of patients following stroke, and nursing care variables, using a dog handled by a nurse. Our results did not clearly indicate whether 4 weeks of AAT affected physical functional or mood variables following stroke. Observed behavioural changes in patients who participated in AAT included increased 'talking (to the therapy dog)', but these changes were not clearly attributable to AAT alone. As a nursing care modality, AAT may be an effective means of achieving nursing outcomes regarding 'emotion' 'concentration' and 'interest' as per the NOC. Future studies are needed to further verify the effects of AAT, including those with longer observation periods and with greater numbers of subjects.

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