

Effects of the Continuity of Daily Life Record Chart and of Voluntary Training in Elderly People with Mild Care

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ABSTRACT

21 elderly people receiving light nursing care were asked to fill in daily life record charts and to do voluntary training for three months. They were then divided into two groups, in order to assess the effects of the above activities: the “completion” group, who were able to continue the program during the 3-month period, and the “resignation” group, who resigned from the program without finishing the 3-month period. Comparing the two groups of participants, we found that the resignation group showed a significantly lower figures in the duration of home-visit rehabilitation, daily life record chart, voluntary training, HDS-R, and frequency of going out ($p<0.05$). As for the changes after the intervention, the completion group showed an increase in ROM, MMT, and FIM ($p<0.05$). The resignation group showed a significant increase only in FIM, but no significant difference in ROM or MMT. As for the achievement of daily life record chart and of voluntary training, the daily life record chart proved to be easier for the participants to work on. It was revealed that those who have been using the in-home rehabilitation service for a long time are more likely to establish the daily life record chart log and voluntary training. These findings suggest that the continuation of daily life record charts and of voluntary training are effective in improving physical functions and in acquiring exercise habits.

Keywords: light care receivers, nursing care prevention, voluntary training, life record chart, physical therapy evaluation

INTRODUCTION

In 2021, Japan ranked first in the world with an average life expectancy of 84.5 years for men and women, and an aging rate of 28.9%, ushering in “the Age of 100 Years as a Normal Lifespan” [4]. The increase in the elderly population is expected to peak in 2042, after which it will begin to decline, but the aging rate is expected to increase until 2042 due to the simultaneous decline in the total population [4]. In recent years, in terms of trends in the elderly population, attention

has been focused on “healthy life expectancy,” or the period of time during which the elderly are free from restrictions in their daily lives. The differences between the increase in healthy life expectancy and the increase in average life expectancy in the last 10 years (0.4 years for men and 0.61 years for women) shows that healthy life expectancy is becoming longer [12]. It is important to try to increase healthy life expectancy in the future. The certification system of long-term care insurance, which is a social security system, is the best way to grasp healthy life expectancy in stages. As of January 2021, of the 6.79 million people certified as requiring long-term care, 4.47 million were in need of light care (Level 1 and 2 requiring Support) and 2.32 million were in need of heavy care (Level 3 to 5 requiring Care) with limited mobility [14]. Heavy care receivers accounted for 63.8% of the total nursing care benefit costs in 2021 [13]. From the aspect of social security, it is important to have a system that does not allow care receivers to become severely ill. According to Airi Amemiya et al [1], 19.5% of the total number of 4149 participants in the Japan Gerontological Evaluation Study showed improvement of one or more levels of care receiving. Conversely, it suggests that 80% of the elderly who once entered a nursing care state may have difficulty in improving their care level and may become severely ill. In recent years, as the trend of preventive medicine for the elderly has been increasing, we believe that ingenuity is needed, especially in reviewing lifestyle habits and acquiring exercise habits.

Although a questionnaire report on the retention of voluntary training by Takahashi et al [21]. using an implementation record sheet and staff encouragement for two years and a report using group exercises for light care receivers in order to acquire exercise habits have been published, individualized and semi-supervised field experiments have not been known. Establishing an exercise habit in a state where the patient is able to control his or her own body and mind as much as possible will prevent the severity of care receiving. This study examined changes in the physical functions of elderly subjects, who are still light care receivers, by keeping a daily life record for three months and continuing habitual voluntary training, using physical therapy evaluation methods: range of motions testing (ROM), manual muscle strength testing (MMT) and functional independence measure (FIM).

SUBJECTS AND RESEARCH METHODS

Participants

The participants in the analysis were 21 elderly people (18 women and 3 men) receiving light care, certified by nursing care insurance as Requiring Support Level 1 to Requiring Nursing Level 2, and who were using home-visit rehabilitation at elderly care facilities or at home. For the record, this study was conducted after explaining the purpose and main objective of the study to all the subjects and obtaining their consent to participate in the study. The application for review of the research plan for human subjects of Osaka Seikei University was approved (Approval No. Dai 2020-26).

Methods

Classification of Participants:

The participants were classified into two groups, with those who recorded higher than the group median, in the total number of days when they executed daily record chart log and voluntary training, as the completion group, while those recording the group median or lower as the resignation group. The basic attributes of each group (age, sex ratio: showing female ratio,

height, weight, BMI, level of care needed, living with family or not) were to be indicated (Table 1). The levels of care needed were indicated with scores of 1 to 4, with the score 1 as Requiring Support Level 1; the score 2 as Requiring Support Level 2, the score 3 as Requiring Nursing Level 1, and the score 4 as Requiring Nursing Level 2 as 4. Also, the scores of 0 to 3 were given to different modes of living, with the score 0 to those in facilities, the score 1 to those living alone, the score 2 to those living with the spouse, and the score 3 to those living with their family. Thereby, the mean values and standard deviations were to be calculated.

Table 1. Subject's basic attributes, performance group and completion group

	whole (n=21)	performance group (n=13)	end group (n=8)
age	82.5 ± 7.6	82.5 ± 7.8	81.6 ± 7.4
Female ratio (%)	86.4	84.6	87.5
height(cm)	150.9 ± 6.7	150.7 ± 7.2	150.5 ± 6.2
body weight(kg)	56.1 ± 11.3	56.4 ± 12.6	56 ± 8.4
BMI(score)	24.2 ± 4.5	24.1 ± 4.7	24.8 ± 4.0
Nursing care required (level)	2.6 ± 1.0	2.8 ± 1.0	2.3 ± 0.8
Lifestyle(point)	2.7 ± 0.7	1.2 ± 0.7	0.8 ± 0.8

Life Record Chart and Voluntary Training:

As for the daily life record chart, the participants themselves were to fill out a form every day with their blood pressure, body temperature, content of their meals, whether they executed voluntary training or not, and whether they went out or not. After every 14 days, a new form was handed out, as the completed form was collected. The number of days of achievement out of a maximum of 84 days was calculated (Figure 1). For voluntary training, we suggested a menu of safe exercises that can be done while sitting, in order to minimize the risk of injuries or falls. For voluntary training, five items of lower limb and inner muscle strength training related to walking were adopted, namely:

- (1) Knee Raise, 2 sets of 20 repetitions;
- (2) Leg Extension, 2 sets of 10 repetitions for 5 seconds;
- (3) Toe and Heel Lift, 2 sets of 20 repetitions each;
- (4) Buttock Lift, 2 sets of 10 repetitions;
- (5) Standing Leg Lift, 2 sets of 10 repetitions.

The training was to be practiced every day for three months. After the training of the day, the participants were to enter the activities into the life record chart. Only if the sheet was filled in by the participants themselves, was the voluntary training deemed valid. In addition, the relationship between the achievement levels of daily life record chart log as well as of voluntary training and the length of the rehabilitation visit was verified.

Life Record Table									
date: February 15th, 2021 ~ February 28th, 2021 No. 5									
Name :									
• Please write the number in the morning. • Please write the meal/self-training with ○ • △ • × • Write down how many hours you slept last night.									
	7/15 (Mon)	7/16 (Tue)	7/17 (Wed)	7/18 (Thu)	7/19 (Fri)	7/20 (Sat)	7/21 (Sun)	example	
① Blood Pressure	158/93	135/75	132/79	144/80	119/67	138/86	124/76	138/75	
② Body Temperature	35.6°	35.3°	35.7°	35.4°	35.8°	35.3°	35.8°	36.7°	
④ Break Fast	8:30 ○	8:00 ○	8:00 ○	8:30 ○	8:30 ○	8:30 ○	9:00 ○	○	
⑤ Lunch	12:00 ○	12:20 ○	×	12:00 ○	12:00 ○	12:00 ○	12:00 ○	×	
⑥ Dinner	19:00 ○	19:20 ○	19:20 ○	19:00 ○	19:00 ○	19:00 ○	19:30 ○	△	
⑦ Did you go out for a walk?	×	×	○	×	×	×	×	○	
⑧ Last night's sleep	0:30 ~ 7:30	1:00 ~ 7:30	0:30 ~ 8:30	0:30 ~ 8:00	0:30 ~ 8:30	1:00 ~ 8:30	0:30 ~ 7:30	22:00 ~ 7:00	
⑨ Voluntary-training	△	○	○	○	○	○	△	△	
⑩ Body Pain	my shin hurts							shoulder/waist	
	7/22 (Mon)	7/23 (Tue)	7/24 (Wed)	7/25 (Thu)	7/26 (Fri)	7/27 (Sat)	7/28 (Sun)		
① Blood Pressure	149/85	141/81	136/79	157/89	131/70	120/80	125/73		
② Body Temperature	35.8°	36.2°	35.4°	35.6°	36.1°	35.3°	35.3°		
④ Break Fast	9:30 ○	9:00 ○	8:30 ○	8:30 ○	8:15 ○	8:00 ○	9:00 ○		
⑤ Lunch	12:30 ○	12:00 ○	15:00 ○	12:30 ○	12:00 ○	12:00 ○	12:00 ○		
⑥ Dinner	18:30 ○	19:00 ○	19:00 ○	19:00 ○	19:30 ○	19:00 ○	19:30 ○		
⑦ Did you go out for a walk?	○	○	△	×	×	○	×		
⑧ Last night's sleep	0:30 ~ 7:30	1:00 ~ 7:30	0:30 ~ 7:30	1:00 ~ 7:30	12:30 ~ 7:55	2:00 ~ 8:15	1:00 ~ 7:00		
⑨ Voluntary-training	×	×	×	○	△	△	○		
⑩ Body Pain									

Figure 1. Life Record Table Actually Used

Physiotherapy Assessment:

As the physical therapy testing method to measure changes in the physical functions of the participants, we used the following methods of Range of Motion: ROM, Manual Muscle Testing: MMT, and Functional Independence Measure: FIM (Figure 2). The details of the measurement items are described below.

- ROM: The angles that the participants could move their joints in their 10 lower extremity movements involved in gait, namely: bilateral hip flexion, extension, abduction, adduction, external rotation, internal rotation; knee flexion and extension; and ankle dorsiflexion and plantar flexion, were measured and then totaled.
- MMT: The tester measures the muscle strength of the subjects, and gives the score of 1 to 5, on the 8 lower limb regions that show involvement in gait: muscles working in bilateral hip flexion, extension, 2 types of abduction, adduction, knee joint extension, ankle dorsiflexion and plantar flexion.
- FIM: The degree of independence of the subjects in daily living is scored as "Performance ADL", and the total score out of 126 was calculated.

The results of the above three evaluations were recorded, before and after the three months' intervention, and compared and examined, taking into consideration the achievement degrees of the life record chart and of the voluntary training.



a. Joint Range of Motion (ROM)



b. Manual Muscle Test (MMT)

Functional Independence Measure (FIM)					
Self Care	Excretion Control	Transfer	Move	Communication	Cognitive Ability
1, Meal 2, Grooming 3, Bathing 4, Changing upperbody 5, Changing Lowerbody 6, Toilet	7, Urination Management 8, Bowel Management	9, Bed / Chair / WheelChair 10, Toilet 11, Bathtub / Shower	12, Walking / wheel Chair 13, Stairs	14, Understanding 15, Expression	16, Social Interaction 17, Problem Solving 18, Memory
18 Small All 1 to 7 points				score:	/126

c. functional Independence Measure (FIM)

Figure 2. Physical Therapy Evaluation Change after 3 Months

Analysis Method

For statistical analysis, the participants' basic attributes (their age, height, weight, BMI, level of care required, and whether they are living with family or not) were compared between the two groups, namely the completion and the resignation groups. The pre- and post- intervention analyses concerning the daily life record chart and voluntary training were conducted on the two groups, using a paired t-test. Pearson's correlation coefficient was used for the number of days of continuous rehabilitation visits, of days of life record log completion, and of days of voluntary training. Statistical analysis was conducted using Excel Statistical HAD and IBM SPSS 24.0. Incidentally, the significance level was set at less than 5%.

RESULTS

Comparison of the Two Groups concerning the Measured Items

Statistical analysis was conducted, not only on the duration of the participants' rehabilitation visits and on the numbers of their days of daily life record chart log and of voluntary training, but also using resources to evaluate the quality of life of the elderly, namely the HDS-R, the Basic Health Check for Those over 65 Years Old, and the Geriatric Activity Capacity Index. How often the participants go outdoors, how many meals a day they have, and how long they sleep were also statistically analyzed. The results were compared between the two groups (Table 2). The resignation group showed significantly lower values in the duration of home-visit rehabilitation, in daily life record chart log, in voluntary training, in HDS-R, and in the frequency of outing ($p < 0.05$).

Table 2. Two-group comparison of inspection items

	whole (n=21)	performance group (n=13)	end group (n=8)
Visit rehabilitation period(week)	194.9 ± 134.4	231.3 ± 146.9	131.3 ± 96.7 *a
Life life table (day)	61.0 ± 26.2	80.3 ± 5.8	14.6 ± 16.7 *a
Voluntary training (day)	75.0 ± 20.0	66.4 ± 12.8	12.8 ± 12.8 *a
HDS-R (score)	27.8 ± 3.6	28.9 ± 2.1	26.5 ± 4.8 *a
Basic checklist(score)	10.5 ± 4.8	8.9 ± 4.8	11.5 ± 4.0
Geriatric healthtest (points)	7.5 ± 3.9	8.4 ± 3.9	6.5 ± 3.5
Frequency of going out (times)	59.8 ± 27.4	49.8 ± 23.8	12.3 ± 11.2 *a
Number of meals(time/day)	3 ± 0.2	3 ± 0	2.9 ± 0.3
Number of sleep hours (hours)	7.7 ± 1.1	7.9 ± 0.4	7.3 ± 0.5

Average value±standard deviation, HDS-R:Hasegawa dementia scale, *:Unpaired T-test, *:p<0.05

Achievement Levels of Daily Life Record Chart and Voluntary Training

In this research program, a daily life record chart was used as a simple and objective tool to evaluate the amount of physical activity. The purpose to use the daily life record chart was to make the participant's life visible by filling in the form and record their lifestyle on a daily basis. The continuation of voluntary training was intended for the participants to make exercise a habit, in order to increase the amount of their physical activity. The achievement level was divided with every 10 days as a unit and accumulated. The number of participants who quit the daily life record log in 1 to 10 days from the start was 5 (23.8%) of all the participants; 1 (4.7%) in 11 to 20 days; 1 (4.7%) in 21 to 30 days; 0 (0%) in 31 to 40 days; 0 (0%) in 41 to 50 days; 1 (4.7%) in 51 to 60 days; 1 (4.7%) in 61 to 70 days; 4 (19.0%) in 71 to 80 days, and 8 (38.1%) in 81 to 84 days. The average number of days reached was 55.3 days. As for the level of achievement of voluntary training, 5 (23.8%) of the participants resigned in 1 to 10 days; 1 (4.7%) in 11 to 20 days; 0 (0%) in 21 to 30 days; 2 (9.5%) in 31 to 40 days; 1 (4.7%) in 41 to 50 days; 4 (19.0%) in 51 to 60 days; 1 (4.7%) in 61 to 70 days; 5 (23.8%) in 71 to 80 days, and 2 (9.5%) in 81 to 84 days. The average number of days reached was 46.0 days (Figure 3).

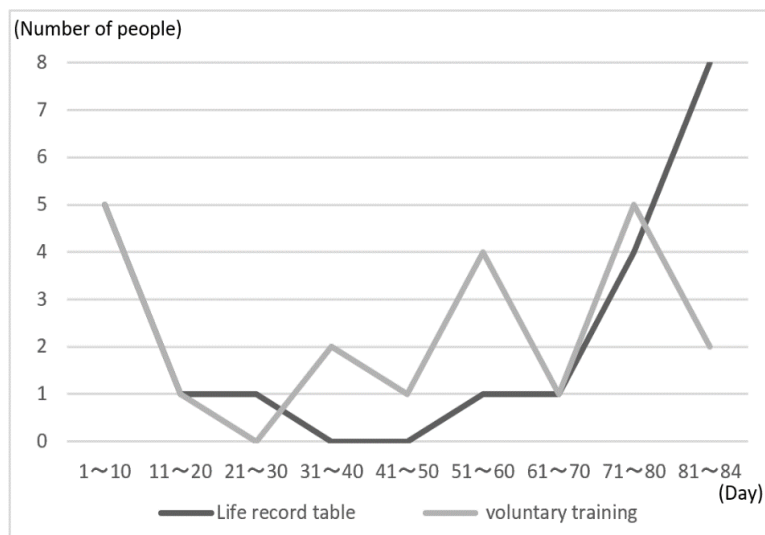


Figure 3. Achievement level of life record table / Achievement level of voluntary training

The Relation that the Duration of Visit Rehabilitation Has with the Number of Days of Life Record Chart Log and with Voluntary Training

A significant positive correlation was found between the duration of home-visit rehabilitation and the number of days of life record chart achievement (Figure 4-1). A positive correlation was also found between the duration of home-visit rehabilitation and the number of days of voluntary training (Figure 4-2). The number of the participants here was 16, excluding whoever did not complete the rehabilitation due to cardiac disease, or was not sure how long they had been using home-visit rehabilitation.

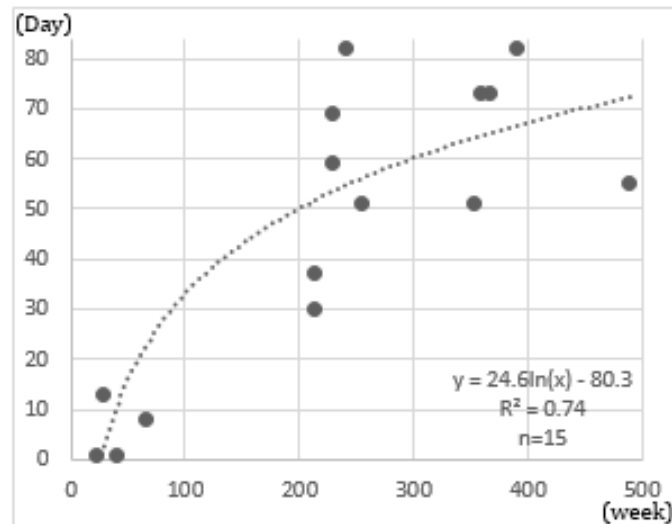


Figure 4-1 Correlation between home-visit rehabilitation and daily life record

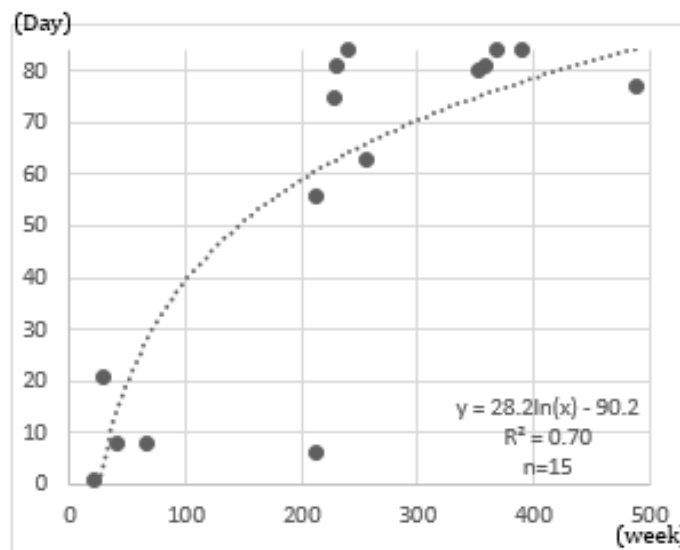


Figure 4-2 Correlation between home-visit rehabilitation and voluntary training days

Effects of Voluntary Training after Three Months

This study aimed to improve the lifestyle of 21 participants using a daily life record chart. After three months of voluntary training, the effectiveness of the training was examined, using three physiotherapy assessments (ROM, MMT, and FIM). The participants were divided into two: the completion group (13 participants), who recorded higher than the median values in the achievement levels of daily life record chart and of voluntary training, and the resignation group (8 participants), whose achievement levels of daily life record chart and of voluntary training were the median values or less. Their records of the physiotherapy assessments were examined twice, at the beginning of the intervention and at the end using a paired t-test. Consequently, significant improvement was observed in ROM of the completion group, with 10 participants recording improvements and with the mean $+30.0^\circ$ (Figure 5-1); MMT of the completion group, with 4 participants improved and with the mean $+1.5$ points (Figure 5-3); FIM of the completion group, with 7 participants improved and with the mean $+2.5$ points (Figure 5-5); FIM of the resignation group, with 5 participants improved and with the mean $+2.6$ points (Figure 5-6) ($p < 0.05$). In ROM of and MMT of the resignation group, 2 participants showed decreases in their results, with no significant improvements observed (Figure 5-2) (Figure 5-4).

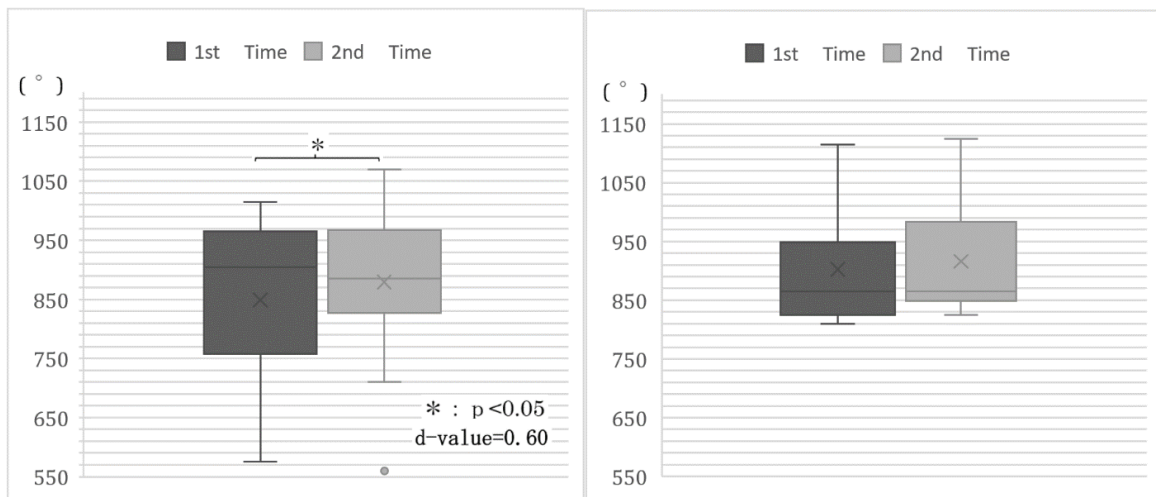


Figure 5-1. performance group (ROM)

Figure 5-2. end group (ROM)

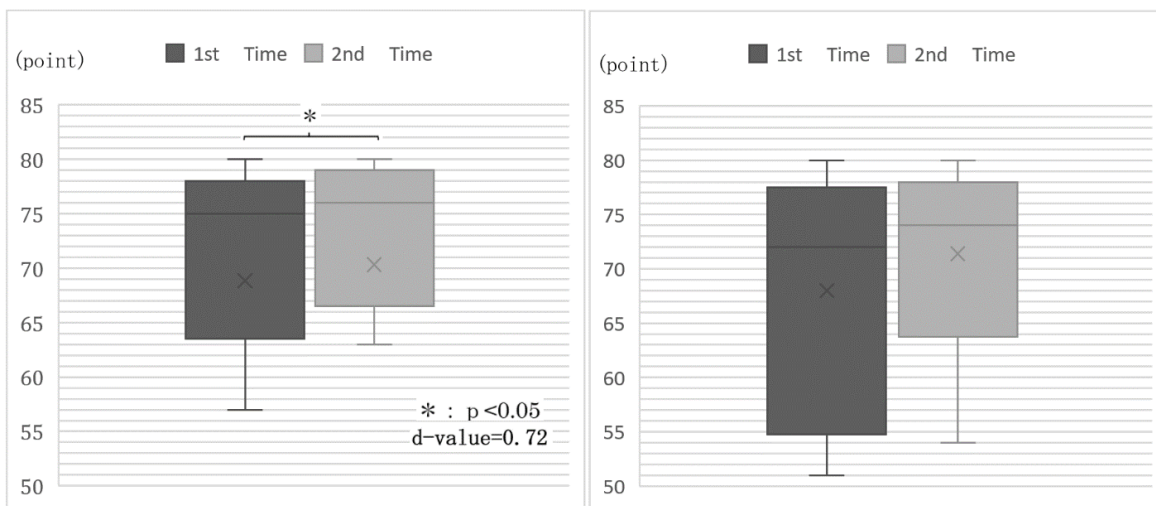


Figure 5-3. performance group (MMT)

Figure 5-4. end group (MMT)

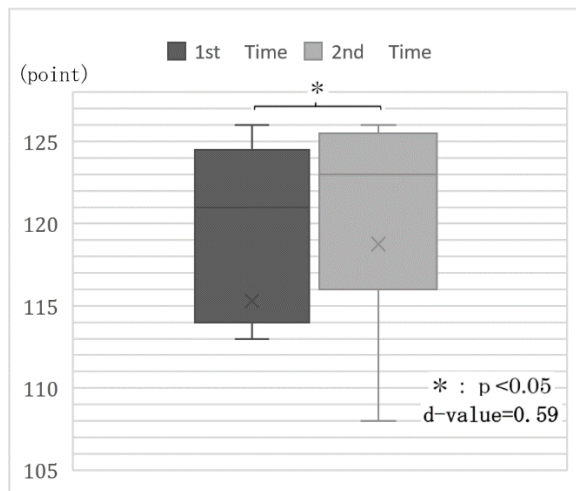


Figure 5-5. performance group (FIM)

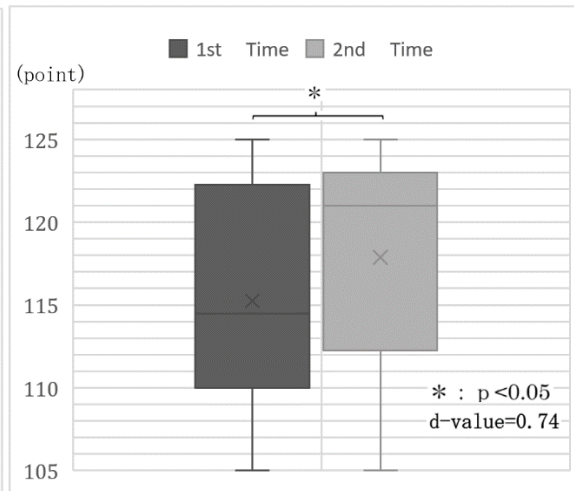


Figure 5-6. end group (FIM)

DISCUSSION

The purpose of this study was to clarify the acquisition of exercise habituation and changes in improvements in muscle strength, range of motion of joints and so on, by creating a regular life rhythm through the continuation of a daily life record chart and voluntary training for three months, with elderly persons receiving light nursing care as the participants, at the certified levels from Requiring Support Level 1 to Requiring Nursing Level 2. The light care receiving stage is a time when functional recovery can still be expected, and is the turning point between being able to lead an independent life or becoming a severe care receiving condition such as being bedridden [6]. Concerning the achievement levels of daily life record chart log and of voluntary training, in both practices, five participants (23.8%) resigned between the day 1 and 10. The number of those who completed the whole period (81 to 84 days) were 2 (9.5%) in voluntary training and 8 (38.1%) in daily life record chart log. It was suggested that the daily life record chart is more often continued daily than voluntary training and is an easier task to tackle. In both tasks, the number of the participants who quit between the day 1 and 10 and those who continued for 60 days or more tended to be high, indicating that there was a tendency for fewer participants to quit during the training if they continued for at least the first 10 days. In addition, those who were consistently engaged in the daily life record tended to engage in more voluntary training as well. Takahashi et al [21]. recorded in their "Life Goals and Exercise Habits in Care Prevention," 33.3% of their participants continued voluntary training for 6 months, while 31.3% continued for 12 months, suggesting that those who were able to continue for a certain period of time could achieve long-term continuation. Another study by Takahashi et al [21]. noted that the implementation record sheet played a role as an ancillary effect; in this study also, the simultaneous implementation of the daily life record chart may have had an ancillary effect on the continuation of the voluntary training. In addition, a positive correlation was found between the duration of use of home-visit rehabilitation and the achievement levels of daily life record chart log and of voluntary training (Figure 4-1 and 4-2). Yokoyama et al [22]. stated that in order to facilitate exercise habituation, having an autonomous attitude and experiencing a sense of achievement and satisfaction are indispensable. It became clear that those who deepened understanding of rehabilitation and enhanced autonomy through home-visit rehabilitation are more likely to acquire an exercise habit. The results of the 3-month

training program divided the participants into two: the completion group, which achieved an average of 80 days of continuation, and the resignation group, with an average of 14.6 days of continuation. The completion group showed significant improvement in ROM, MMT, and FIM respectively. The resignation group showed significant improvement in FIM, but not in ROM or MMT. Fujimoto et al [5]. stated that a 3-month exercise program for community-dwelling elderly people led to an increase in the transverse areas of the psoas major and of thigh muscles, proven by CT scan, and that physical fitness tests showed improvements in their muscle strength, muscle power, aerobic capacity and other parameters. In our study, it was found that those who were able to continue the program for three months showed improvements in muscle strength and in joint range of motion, and that daily continuation of the program was found to have a certain effect even on elderly people with light nursing care. The only improvement observed in the resignation group was in their FIM, which can be interpreted as the sign of raised awareness in leading an independent life and of boosted ADL performance, through participating in this research, even though it has been said that people who receive nursing care daily tend to become dependent on receiving care from others, with even movements that they have the ability to perform [9]. Thus, it was suggested that even over a period of three months, setting a clear goal or purpose of continuing exercise can change the mindset of the elderly and can lead to their daily practice. Limitations of this study include that the number of subjects was limited because it was assumed that the subjects should fall into a limited number of mild care levels, should be using in-home rehabilitation, and should be able to safely perform independent training. In order for this study to prove beneficial, we think that we need more participants, based on a comprehensive assessment of the elderly people in the community. We also believe that it is appropriate for physical therapists, who are experts in exercise instruction and in lifestyle guidance, to be involved in activities for light care receivers to prevent nursing care. We believe that the spillover effects of such activities over a long term will lead to the development of care prevention for light care receivers. Asai et al [2]. stated that regular exercise triggers the emergence of signs that the elderly themselves become motivated to live eagerly, seeking a sense of purpose in life as well as enjoyment. Through exercise, one can keep a healthy condition both physically and mentally, making more interactions with friends and family possible, and realizing a fulfilled life, with enjoyment and a purpose of life. As the Age of 100 Years as a Normal Life Span is dawning, we by this study hope to realize healthy and vibrant lifestyles for the elderly, assisting them proclaim their goal of independence, as well as establish and continue exercise habit.

CONCLUSIONS

This study was conducted to examine what changes in the physical functions and the lives of the elderly would occur after three months of recording on a daily life record chart and continuing voluntary training in 21 mild care elderly patients, using physical therapy assessments ROM, MMT, and FIM. As a result, the following findings were obtained.

1. Comparison of the subjects showed that the resignation group recorded a significantly lower achievements in the duration of home-visit rehabilitation, daily life record chart, voluntary training, HDS-R and frequency of outings ($p < 0.05$).
2. As for the levels of achievement of daily life record chart and voluntary training, daily life record chart was easier to work on than that of voluntary training. It was found that those who have been using home-visit rehabilitation for a long time are more likely to establish the daily life record chart log and voluntary training ($p < 0.05$).

3. The completion group showed an increase in ROM, MMT, and FIM in pre-and post-intervention comparisons ($p < 0.05$). The resignation group showed a significant improvement only in FIM in pre-and post-intervention comparisons ($p < 0.05$).

These findings suggest that writing a daily life record chart and continuing voluntary training are effective in improving physical functions and acquiring exercise habits.

Conflict of Interest

There are no conflicts in this study.

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