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The Sapporo Health Sports Foundation (referred to as the "Foundation" below) has been providing muscle strength training to elderly people and examining and studying its results, for eight years since beginning in 2000. The city of Sapporo requested the Foundation to provide strength training for frail elderly when preventive care services[1] were implemented, because of a revision of the Long-term Care Insurance Law in April 2006.

In addition to strengthening muscles, the Foundation's training program aims to improve the daily lives and raise the enthusiasm of the elderly people participating in the training (referred to as the "participants" below). Staff qualified as health exercise managers and health exercise instructors conduct the training. The managers and staff assist each of the participants in connecting the results of the training with their daily lives and in imagining what they will be able to do with improved muscle power in their daily lives. They also help the participants to complete the three months of training by repeatedly encouraging and supporting them. The Foundation also provides opportunities for the participants to continue exercising after the three-month program.

In this issue, we will describe this program based on information provided by Mr. Keiji Satake, who is a health exercise manager and the chief responsible for health promotion in the Foundation's Establishments Section, which runs the project. Mr. Satake has been examining, studying and running the strength training program for the elderly since 2000.

Muscle strength training for frail elderly by the Sapporo Health Sports Foundation

Outline of the Sapporo Health Sports Foundation

The Foundation was established in April 1984 with the aim of promoting sports and the health of people in Hokkaido[2]. To meet this aim, the Foundation conducts projects to support the diffusion of sports and promotion of health improvement in Sapporo, and manages and operates municipal facilities for sports and health promotion. The Foundation currently operates 29 health and sports establishments in Sapporo, plans and conducts events, sponsors lectures, develops and dispatches exercise instructors, promotes the use of school facilities, provides health programs and consultations, and examines and studies related matters.[3]

Figure 1 Sapporo West Health Promotion Center

Source: Sapporo Health Promotion Center website, "Establishments", (visited May 14, 2008), <www.sapporo-hpc.com/index.html>

Muscle strength training for frail elderly conducted by the Sapporo Health Sports Foundation

1. Outline

The goal of the Foundation's program is to improve the functioning of the musculoskeletal system of frail elderly using exercise equipment. The target participants are those at high risk of becoming disabled and in need of long-term care, although they are not yet in need of long-term care or assistance. The partici-

[1] In the Long-term Care Insurance Law, preventive care services are provided to those elderly who have a weak physical condition such that they are at risk of becoming in need of long-term care, in order to prevent their condition from further deterioration. Muscle strength training is one of these preventive care services. The target participants of muscle strength training are those not currently qualifying for long term care, but with a weak physical condition, and at high risk of becoming disabled and in need of long-term care. The Long Term Care Insurance Law defines this group as "frail elderly" and we will use the term "frail elderly" to refer to them in this article.

[2] Sapporo Health Sports Foundation website, "Introduction to the foundation, and the articles of the foundation", (visited on April 4, 2008), <www.sspc.or.jp/zaidan/kifu.html>

[3] Sapporo Health Sports Foundation website, (visited on April 4, 2008), <www.sspc.or.jp/index.html>

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Table 1 Number of participants in the weight training program for frail elderly in fiscal 2007 (Sapporo West Health Promotion Center)

	No of Participants	No of Participants completed training
1st session	4	4
2nd session	12	10
3rd session	21	17
4th session	26	24
Total	63	55

Average age: 75.7 (± 4.82)
Number of men: 21, number of women: 42
Note: figures as of January 2008
Source: prepared by Sompo Japan Research Institute based on information provided.

pants receive training at a training venue. The Foundation has been assigned to perform several muscle strength training programs for elderly people and has been examining and studying its training programs since 2000. The programs have differed in various aspects, including the target subjects, depending upon the programs assigned and because of insurance system revisions. After the revision of the Long-term Care Insurance Law in April 2006, programs to prevent dependence on long-term care were introduced, and the Foundation was assigned to conduct the program that is the subject of this article. The foundation is currently conducting the program at three health promotion centers in Sapporo.

Muscle strength training program for frail elderly meets twice per week. One training session last three months, so four sessions are provided each year. Four classes are available for each session at each center, with a capacity of forty people (ten per class) per center. Before starting the training, physical therapists and other staff make physical assessments which include checking the participants' strength (such as muscle force and movement ability), the existence of any aches and pains, the mobility range, etc. Health exercise managers and health exercise instructors[4] who do the training (referred to as the "Exercise Instructors" below) and physical therapists discuss the training for each participant in accordance with the participant's physical conditions based on the assessment. Licensed exercise instructors provide instruction throughout the three months of each training session. Table 1 shows the numbers of participants during fiscal 2007 at Sapporo West Health Promotion Center - the center with the highest number of participants among the three health promotion centers in Sapporo.

2. History of muscle strength training for elderly people

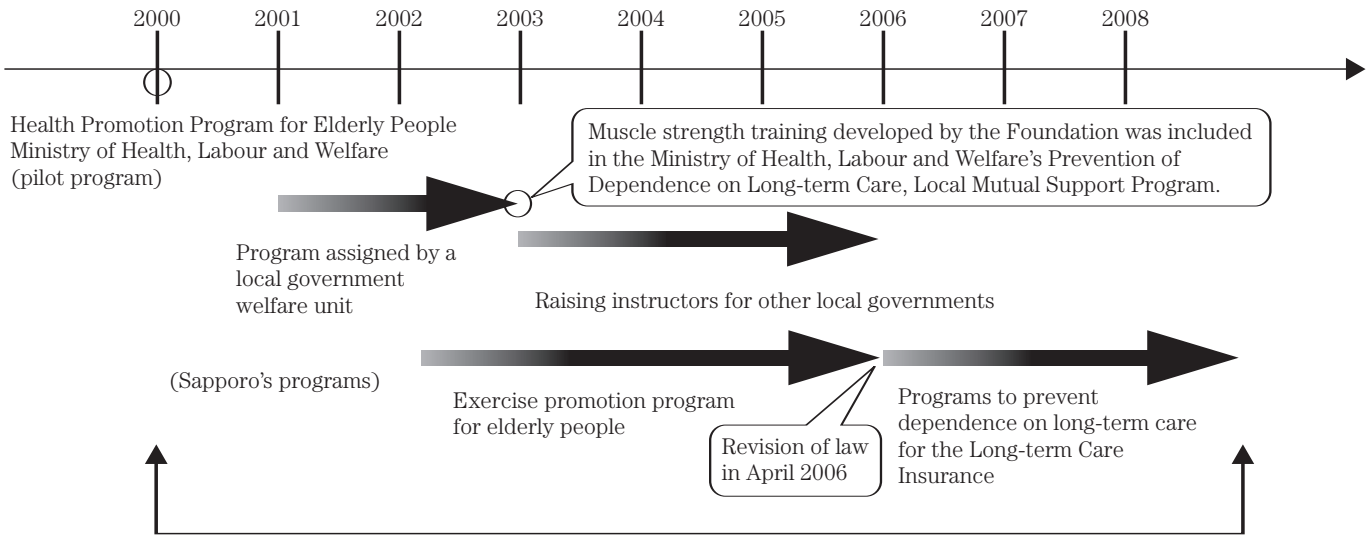
The Foundation started strength training for the elderly in 2000. Since then, the Foundation has continuously received assignments from the Ministry of Health, Labour and Welfare and from Sapporo city government. Figure 2 shows the history of muscle strength training programs for the elderly conducted by the Foundation.

In 2000, Mr. Satake started studying comprehensive exercise training for the elderly as proposed by Shuichi Obuchi (a former assistant professor of the Department of Rehabilitation, School of Allied Health Sciences, Kitasato University, and currently a member of the Tokyo Metropolitan Institute of Gerontology) to be used for the Ministry of Health, Labour and Welfare's "Health Promotion Program for Elderly People". A pilot program conducted with 25 elderly residents of Sapporo revealed that the training is highly effective in the recovery of physical functions. The Foundation was assigned by a local government welfare unit to conduct muscle strength training programs in 2001 and 2002. Owing to the Foundation's report on the results of the program over two years, muscle strength training was included in the "Prevention of Dependence on Long-term Care, Local Mutual Support Program" announced by the Ministry of Health, Labour and Welfare in fiscal 2003. Mr. Satake was requested to recruit exercise instructors and train them for use by other local governments. In 2002, Sapporo assigned an exercise promotion program for the elderly to the Foundation. The Foundation has been performing the current program since April 2006 when programs to prevent dependence on long-term care were introduced, after the revision of the Long-term Care Insurance Law.

A team studying muscle strength training for the elderly, which includes Mr. Satake, studied not only the effectiveness of the training concerning physical functions, but also the effectiveness from a number of diverse aspects during the eight years since 2000. Physical functions as well as mental functions

[4] The Japan Health Promotion and Fitness Foundation grants licenses to health exercise managers and health exercise instructors. Health exercise managers prepare exercise programs which ensure the safety and effectiveness of the exercises and make adjustments in exercise instruction plans, etc., through collaboration with health medical service staff. Health exercise instructors are one type of exercise instructor for health promotion. The license is granted to people with knowledge in basic medicine, knowledge of exercise and sports physiology, the knowledge and skills required for instruction of health promotion exercise, and who are able to provide instruction in accordance with exercise programs prepared for health promotion.
The Japan Health Promotion and Fitness Foundation website, "Exercise instructor information", (visited May 12, 2008), <http://www.health-net.or.jp/zaidan/undou/undou_index.html>

Figure 2 The Foundation's muscle strength training programs for elderly people



Source: prepared by Sompo Japan Research Institute based on Mr. Satake's presentation.

degenerate with aging. The study team checked the quality of life relating to health, including subjective feelings of health and the physical functions required in the daily lives of the participants, and found that the training improved the quality of life. They consider that training to prevent dependence on long-term care should aim for improvements in physical functions and in activities in daily life, and the study team showed the effectiveness of the training in these aspects[5]. In 2006, the study team examined the effect on the quantity of activity in daily life by measuring the quantity for three weeks before and after the training program using a lifecoder. The quantity of activity of previously relatively inactive participants increased after the progam, which proves that the participants became more confident in the performance of their activities[6]. As stated above, it was revealed that the Foundation's program of muscle strength training for the elderly is effective not only in improving physical functions, but also in improving mental functions and activities in daily life.

3. Contents and significance of program

Table 2 shows the outline of the muscle strength training program conducted by the Foundation for frail elderly. The program consists of ninety minutes of training twice a week for three months: a total of 24 classes including those for assessment. Physical therapists are involved in checking the physical strength of the participants and making physical assessments before the commencement of the program. The physical therapists and the exercise instructors meet to share information based on the views of the physical therapists concerning the physical conditions and points to note, etc., of each participant. The Foundation's exercise instructors lead the training. Each training class includes checking the blood pressure and heart rate, warming up (stretching) for thirty minutes, muscle strength training for fifty minutes, warming down (stretching) for ten minutes, followed by checking the blood pressure and heart rate again. During the training program, the exercise instructors gradually change the content of the program to suit the level of the participants.

According to Mr. Satake, the significance of the program is as follows. Muscle power is the power to act: it is difficult to continue to act with little strength. The first step to improve muscle power, which is the power to act, is the concentrated weight training program for three months. However, muscle strengthening is not the only aim of the program. The Foundation helps to connect the results of the training to the daily lives of the participants, and draws out the personal targets of each of the par-

[5] Effectiveness of muscle strength training for elderly people requiring nursing care by Keiji Satake, Naomi Kanazawa, Shinji Takemura, Kumiko Fujita, Tomomi Yamase, Hirotaka Nishijima (Hokkaido Public Health Magazine, vol. 18, 2, 2004)

[6] Fiscal 2006 Health Promotion Program for Elderly People, Study of the effect of muscle strength training with heavy loads for weak elderly people on physical and daily life functions and quantity of activity in daily life (Sapporo Health Sports Foundation, October 2007)

Table 2 Outline of frail elderly muscle strength training program

Session	Twice a week, three months (24 times including assessment)
Length of one class	90 minutes
No. of participants	8 - 10 per class
Staff	Musculoskeletal system function assessment: physical therapists Exercise instruction: health exercise managers, health exercise instructors
Flow of the three-month program	8 classes (first stage): conditioning stage To get used to training physically and mentally and raise enthusiasm for training. 8 classes (second stage): muscle strength stage To raise muscular strength. 8 classes: daily life improvement stage To improve the physical functions required in daily life.
Flow of each ninety-minute class	Measurement of blood pressure and heart rate ↓ 30 minutes: warming up (stretching) ↓ 50 minutes: equipment-assisted muscle strength training ↓ 10 minutes: warming down (stretching) ↓ Measurement of blood pressure and heart rate
Assessment	Basic information Past history, subjective symptoms, etc. Physical strength check Muscular strength: grip strength, knee extension force Body suppleness: bending forward while sitting on the floor with legs extended Dynamic balance: functional reach Static balance: standing motionless on one leg with eyes open Movement ability: maximum walking speed for 10m, timed up & go test Other physical assessments Assessment of aches and pains Posture, alignment (base pivot of the limbs) Joint motion range and muscular strength

Source: prepared by Sompo Japan Research Institute based on the Manual for improvements in musculoskeletal system functions for prevention of dependence on long-term care by Kiyonori Kawahatsu, Hirotaka Nishijima, Keiji Satake (Chuohoki Publishers Co., Ltd., 2006)

Figure 3 Stretching

Source: muscle strength training for frail elderly at the Sapporo West Health Promotion Center (photo taken by the editorial staff on January 16, 2008)

Figure 4 Equipment-assisted training

Source: muscle strength training for frail elderly at the Sapporo West Health Promotion Center (photo taken by the editorial staff on January 16, 2008)

ticipants and their enthusiasm. The muscle strength training is a means to assist the participants to change their activities. Assistance is provided by the staff using specialized skills, and they also help the participants to complete the three-month program.

Two exercise instructors were leading a training class we observed. During the stretching exercises, one instructor demonstrated the action in front of the participants; the other checked all of the participants and assisted them as required. Figure 3 shows one of stretching exercises. This is a movement to get up from a lying down position. Sufficient time was spent, and the instructor tried to provide as little assistance as possible to help each participant to do the exercise alone. This exercise was designed based on the act of getting up from a futon (Japanese bed which is a thin mattress placed directly on the floor), with the aim of enabling the participants get up from their futons at home. Thus training connected to daily life activities is emphasized. During training using equipment, the exercise instructors stood by the various machines to adjust the load to suit the physical strength of each participant. The exercise instructors checked the participants' training by talking to them such as "Can you manage this (weight)?" and "Is it too hard?"(Figure 4). The instructors give each of the participants equal attention and provide support, always bearing in mind not to provide too much assistance, during the program.

4. Exercise instructors' program innovations

(1) How to elicit and set participants' individual goals

The Foundation's exercise instructors assist participants individually to set their own targets for the three-month program and then to train to meet the targets.

It is generally thought that the goal of muscle strength training for the elderly is to improve the quality of life, but Mr. Satake says that in reality people do not often discuss how to achieve this goal. He believes the process to achieve this goal should be as follows. Participants who increase their muscular force through strength training can do more in their daily life (i.e. improve their ability to perform activities of daily living or ADLs). Expansion of the sphere of activities in daily life raises enthusiasm to take up hobbies and make challenges to try out new things (i.e. improve their quality of life). As an example, Mr. Satake described the case of a former participant who suffered a decline in physical functions after treatment for stroke. Before participating in the program, this person had difficulty even standing up on a futon. But after gradually improving muscle strength through the program, the person fell less frequently at home and became able to do some housework. The former participant was able to undertake further activities and began playing the koto (A Japanese musical instrument) once again, as an example of an improvement in quality of life. Thus, the program improves physical strength and at the same time gradually changes the participants' activities and feelings, and eventually improves participants' quality of lite in ways such as taking up hobbies. The former participant in this case did not have the aim of playing the koto again at the start of the program. But after improvements in the ability to perform ADLs due to the program, she felt enthusiastic to try something more.

Even if the program goal is the prevention of dependence on long-term care is set to be improvement in the quality of life, the participants have different targets, with some aiming to improve the quality of their lives while others aspire only to improve their ability to perform their ADLs. Each participants should set their own targets rather than have the exercise instructors set them, but they do not have clear targets at the beginning of the program. According to Mr. Satake, what the instructors should do as a first step is to assist the participants to visualize the potential changes in their daily lives after improving their physical strength generally through the program. For instance, during the stretching exercise where the participants get up from a lying down position the instructors help the participants to imagine that they are getting up from a futon. When talking with the participants during the course of the program, the instructors inquire about any change in their daily lives. By doing so, the participants begin to realize the effectiveness of the program in their daily lives and start wanting to be able to do more. Wanting to be able to do more brings out the individual requirements and interests of each of the participants. The instructors elicit such discussion and make the participants understand that they complete the three months of the program by setting their own individual goals as targets.

Motivation to do the training rapidly increases by helping each of the participants to become aware of their own requirements and interests, and to set their own targets. This persuades the participants to want to continue exercising even after completion of the program. Responding to the wishes of the participants to continue exercising after completion of the program, the Foundation started providing follow-up programs in 2001.

According to Mr. Satake, if the instructors have a knack for drawing out the requirements and interests of the participants, their motivation rises, which also provides satisfaction for the instructors themselves. To leam this skill, experience in practical instruction is important, so new instructors learn how to elicit the participants' interests and requirements by

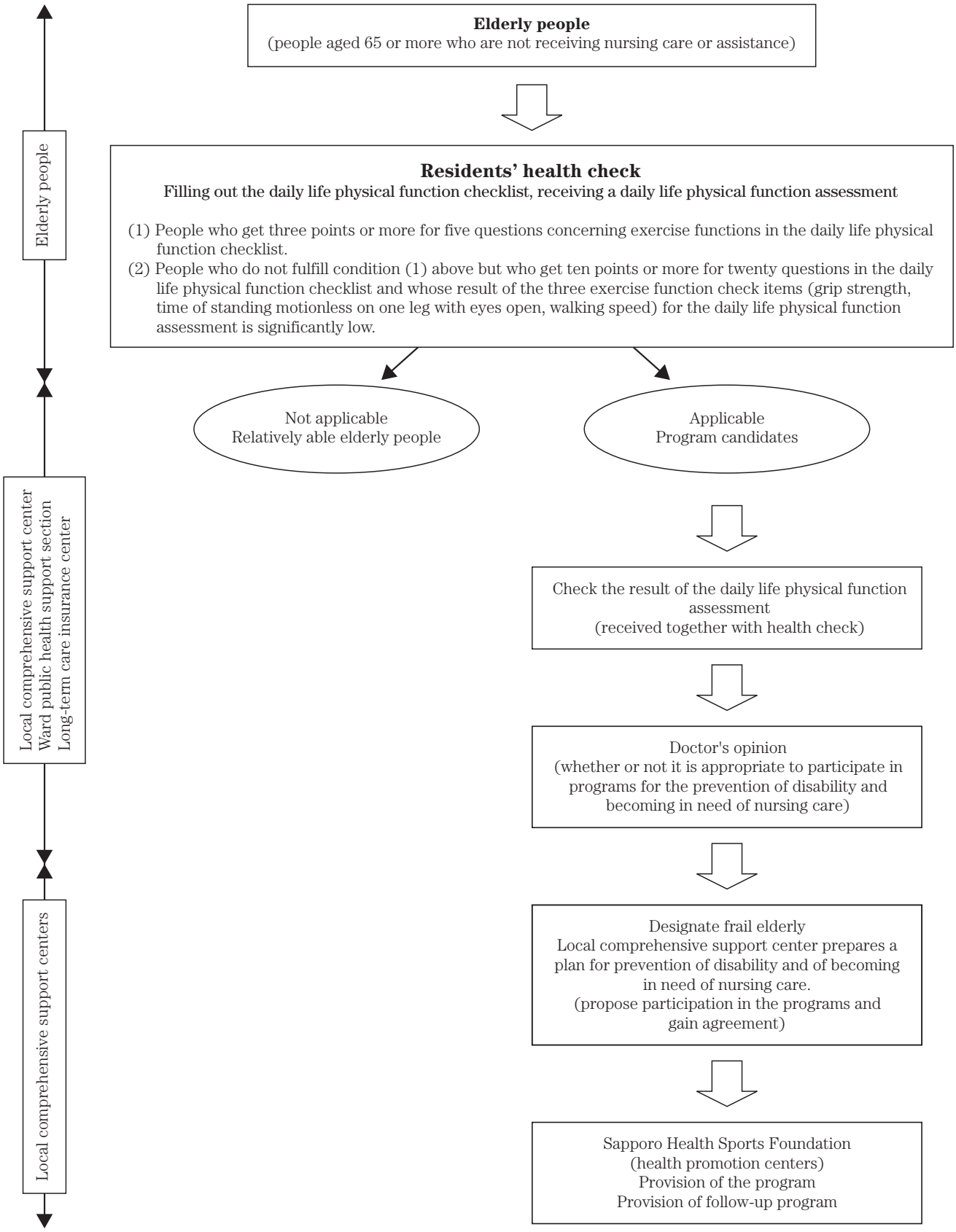
observing the work of experienced instructors.

(2) How to persuade the participants to complete the three-month program

Of the 63 participants in all four sessions of the program in fiscal 2007, 87% completed the program. Reasons for dropping out included work. Few participants quit because of dissatisfaction with the program. Mr. Satake says that the most effective means to prevent early departures from the program is to set the level of training to the level of the participant with the lowest physical strength.

The physical strength of the participants in a class differs, so it is difficult to set the level of training of each program. If the level is set too high, participants with low physical

Figure 5 Flow of participation in muscle strength training for frail elderly



Source: Prepared by Sompo Japan Research Institute based on Sapporo City Long-term Care Division's information.

Table 3 Daily life physical function checklist

1	Daily life activities	Do you go out alone using a bus or a train?	0. Yes	1. No
2		Do you shop for daily necessities?	0. Yes	1. No
3		Do you withdraw/deposit money in a bank account yourself?	0. Yes	1. No
4		Do you visit friends?	0. Yes	1. No
5		Do you give advice to family and friends?	0. Yes	1. No
6	Exercise functions	Do you climb stairs without using a handrail or touching the wall?	0. Yes	1. No
7		Do you stand up from a chair without support?	0. Yes	1. No
8		Do you walk for fifteen minutes or so continuously?	0. Yes	1. No
9		Have you fallen in the previous twelve months?	1. Yes	0. No
10		Do you worry a lot about falling?	1. Yes	0. No
11	Nutrition	Have you lost more than a couple of kilograms in the last six months?	1. Yes	0. No
12		Height: cm Weight: kg BMI Note: BMI of less than 18.5 is applicable. [BMI = weight (kg) ÷ height (m) ÷height (m)]		
13	Oral functions	Do you have more trouble eating hard food than six months ago?	1. Yes	0. No
14		Do you sometimes choke on tea or soup, etc?	1. Yes	0. No
15		Do you think your mouth gets dry?	1. Yes	0. No
16	Going out	Do you go out at least once a week?	0. Yes	1. No
17		Have you reduced the number of times you go out compared with last year?	1. Yes	0. No
18	Forgetting	Do people say you forget things, such as asking the same questions repeatedly?	1. Yes	0. No
19		Do you make phone calls by checking telephone numbers yourself?	0. Yes	1. No
20		Do you sometimes forget the date?	1. Yes	0. No
21	Mental state	You do not feel content with your daily life. (last two weeks)	1. Agree	0.Disagree
22		You no longer enjoy doing things you used to enjoy. (last two weeks)	1. Agree	0.Disagree
23		You feel it is rather bothersome to do things which you used to do effortlessly. (last two weeks)	1. Agree	0.Disagree
24		You feel you are good for nothing. (last two weeks)	1. Agree	0.Disagree
25		You feel tired without any reason. (last two weeks)	1. Agree	0.Disagree

Source: prepared by Sompo Japan Research Institute based on Sapporo Nursing Care Insurance website, "Daily life physical function check list", (visited May 9, 2008), <www.city.sapporo.jp/kaigo/chiikishien/gaiyo/ky-jigyo.html>

strength will quit after just a few classes in the belief that they "can't catch up" or they "can't do it". According to Mr. Satake, it is important to make all of the participants experience that they can do it right from the start and then have the instructors raise the level of stretching exercises, etc., performed by all of the participants together, while ensuring that the Participant with the lowest physical strength is able to keep up. The instructors support the participants in equal measure. To assist participants who are having trouble with the training, the instructors teach them practical ways to keep up. At the program we observed, during the stretching, which was performed by all of the participants together, the instructors had the men do different stretching exercises than the women, out of consideration that the women had more supple bodies. Mr. Satake believes that it is essential to support the participants in a way that encourages the participants to feel they can do the training, even if they do it in a different way or cannot do it very well.

5. Program follow up

The Foundation offers various programs that follow the three-month program, responding to the desire of elderly people to continue exercising. Sapporo West Health Promotion Center, that we visited, has been offering a course called "Niko-Niko Club" since 2004. Classes of eighty minutes run twice a week, mainly for training relating to daily life activities, without using equipment. About eighty percent of the people who completed the training program attend. Many elderly people start using a gym available in the center after completion of the program.

By offering the follow-up programs and making available a gym, the aim of the Foundation is for former participants to maintain their improved muscular strength, develop the habit of exercising and to set a healthy rhythm in daily life.

6. Future issues

(1) Selection of participants

Figure 5 shows the current process of selection of participants for the muscle strengthen training program.

When people aged 65 or more who are not receiving long-term care or assistance have their annual health check (which is offered by the local government insurance office in Japan) they fill in a daily life physical function checklist and receive a daily life physical function assessment. Elderly people who fulfill either of the following conditions with regard to the checklist become candidates: (1) those who get three or more points by adding up the numbers written

in front of their answers (yes or no) to questions 6 - 10 concerning exercise functions (shown in Table 3) in the daily life physical function checklist, or (2) elderly people who do not fulfill condition (1) above but who get ten or more points by adding up the numbers written in front of their answers to questions 1 - 20 in the daily life physical function checklist, and whose result of the three exercise function check items (grip strength, time of standing motionless on one leg with eyes open, walking speed) for the daily life physical function assessment is significantly low. The local comprehensive support center and other organizations determine whether or not it is appropriate to allow the frail elderly candidates to participate in programs designed to prevent progressing disability and dependence on long-term care. The candidates who are judged to be eligible to participate in the programs are recognized as being frail elderly. Those chosen are invited to participate in the muscle strength training. Those frail elderly who accept the invitation are introduced to a health promotion center and become participants in the training program. Mr. Satake says that despite the fact that a specific process is in place to find those eligible, the number who become candidates by means of the residents' health check and go on to participate in the training program is extremely small. Some local public health nurses and the local comprehensive support center staff started visiting the homes of elderly people and canvassing all residents to find more eligible candidates. Mr. Satake believes that it is also important to gain support from related organizations and groups in order to improve participation in the training program. The Foundation's muscle strength training program for frail elderly is supported by eight years of experience and a specialized staff. Foundation staff explains the Foundation's programs at meetings with other organizations to exchange information, etc., and the local comprehensive support center staff and other people observe the Foundation's programs to understand their contents. Mr. Satake says that more efforts are required in the future to gain support from government and local community staff responsible for prevention of disability and long term care dependence, in order to promote growth in this, and other similar, programs.

(2) Enhancement of programs for elderly people

The Foundation offers follow-up programs for people who completed the three-month program responding to their wishes to continue exercising, as stated above. Mr. Satake believes that opportunities for those elderly who completed the muscle strength training program to continue to exercise should be made available by enhancing follow-up programs and developing new programs using public facilities, such as gymnasiums and swimming pools.

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