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Epidemiologic Studies on Exercise, Self-perception, and Social Interactions by the Elderly - Characterization of Nonparticipating Individuals in the Care Prevention Project

Shinji SUITA[1], Tsuyoshi TANABE[2], Asami KUDO[1], Takayoshi MIYAGAWA[1], Minako HAYASHI[1], Masaru UCHIDA[1], Takeyasu KAKAMU[3], Natsu YAMAGUCHI[2], Mikiko KOBAYASHI-MIURA[2], Hiroki AMANO[2], Ryotaro SEKI[1] and Yasuyuki FUJITA[2]

[1]*Department of Physical therapy, Matsue Co-Medical College, Matsue, Japan,*

[2]*Department of Public Health, Shimane University Faculty of Medicine, Izumo, Japan,*

[3]*Department of Hygiene and Preventive Medicine, Fukushima Medical University School of Medicine, Fukushima, Japan*

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The purpose of this study was to identify the characteristics of elderly people requiring preventative healthcare and factors associated with their participation in preventative healthcare program. We classified 339 individuals（149 participating in preventative care projects and 190 eligible non-participating）into three groups, 1）participants 2）active lifestyle nonparticipants（AL-NP）3）minimally active lifestyle nonparticipants（ML-NP）by health status and lifestyle activities and compared their characteristics. The ML-NP group exhibited lower levels of all test parameters, suggesting they were at increased risk for requiring care. The factors associated with the ML-NP group were, for females, histories of falls and not engaged in agricultural work, and for males, low self-perceived health, no habitual alcohol use, and not engaged in agricultural work. These results indicate the importance of pro-actively intervening in providing care for the program's nonparticipants, and taking into account factors specific to their circumstances.

Key words : specified elderly, preventive healthcare program, quality of life

Correspondence: Tsuyoshi Tanabe, MD, Ph. D,
Department of Public Health, Shimane University Faculty of Medicine
Enya-cho 89-1, Izumo, 693-8501, Japan
Tel:+81-853-20-2162
Fax:+81-853-20-2160
E-mail:ttanabe@med.shimane-u.ac.jp

INTRODUCTION

In Japan, the number of people requiring care is increasing as the population ages. The Long-term Care Insurance Law has been in force since 2000 as part of Japan's welfare system for its elderly citizens. The system was revised in 2006 by passage of the Long-term Care Insurance Law Revision of April 2006, which includes a new "preventative benefit". Thus, those not in serious condition and reclassified into the new "requiring support" categories will receive the new benefit. The revision will facilitate providing preventive long-term care services at community social and health centers as well as at meeting rooms in many small residential associations, thereby allowing more people to participate who might otherwise have been unable to travel to centralized facilities［1-3］.

In order to reduce the number of elderly citizens requiring for medical and psychological care, and/or assisted living, it is important to identify elderly persons who are at increased risk for requiring *de novo* care or higher levels of their existing care（high-risk elderly person）, and to train them appropriately before their physical or psychological condition deteriorates. Although "high-risk elderly persons" are identified among care prevention program participant according to "the basic check list" and a "the medical checkup", high-risk elderly persons are not fully identified because many elderly citizens do not participate in the care prevention program or submit to medical examinations［4］. Kimura et al. demonstrated that it is important to intervene to

nonparticipants who have healthy, environmental, and familial problems [5], and that the existing care prevention programs are not enough to cope with the problems [6]. Suzuki et al. showed that elderly people who do not have medical checkup are relatively older and tend to be high-risk of requiring care [7]. Hirai et al. appealed that the distance from houses of elderly persons to the places for the preventive healthcare programs influences the participation rate to the programs [8]. Yoshida et al. reported that nonparticipants tend to be with low physical activity and with the risk of future requiring care [9].

Therefore, the goals of the present study were to identify variables associated with risk of requiring long-term care and/or assisted living by analyzing the physical and social activities of these nonparticipants, and to identify high-risk elders and providing them with appropriate interventions to prevent them from becoming dependent on long-term care and/or assisted living.

METHODS

1. Investigation period and subjects

The present investigation focused on 681, out of 709 except 28 of nursing home residents, all older than 65, from 11 districts of A-town Matsue-city, Shimane-Prefecture, from April to August in 2009 (Fig.1). There were 411 respondents including 169 participants and 242 nonparticipants for the preventive care program (60.4% response rate). A-town, located in a rural community faces Lake Shinji and the Sea of Japan in the western part of Matsue-City in Shimane Prefecture. Its approximately 2,000 residents are aging at the rate (65 or older) of 33.3% (March 31, 2009). The ethics committee of Shimane University School of Medicine approved this study.

2. Survey content

For the 169 preventive care participants, the survey's elements included such basic attributes as gender, age, certification of long-term care requiring,

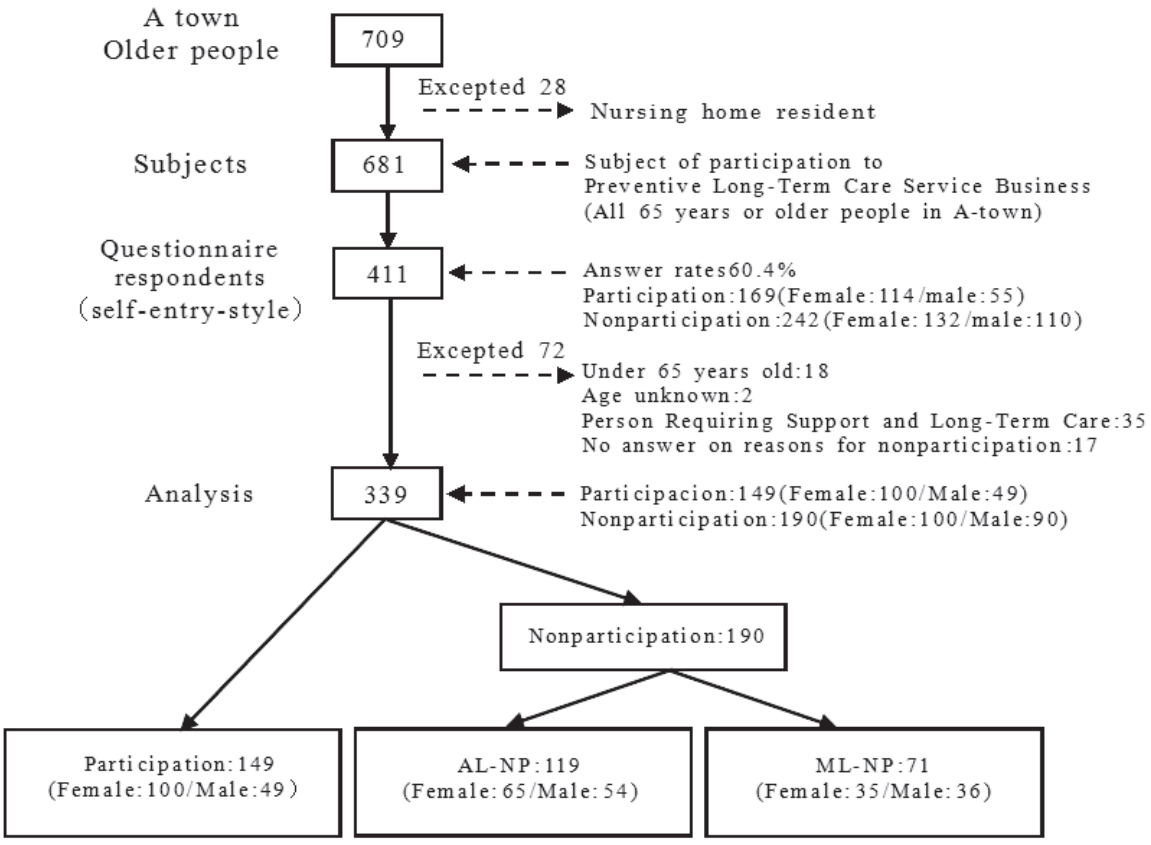

Fig. 1. Selection of subjects Analysis

as well as medical examinations, medical history (hypertension, hyperlipidemia, atherosclerosis, diabetes, heart disease, stroke, and orthopedic disease), self-perceived health, lifestyle (smoking, drinking, exercise, agricultural work), histories of falls, assisted ambulation, and E-SAS (Elderly Status Assessment Set)[10]. This study employed a self-entry-style questionnaire. The 242 nonparticipants were surveyed almost identically with the exception of the addition of the reason for nonparticipating. E-SAS was developed as part of the Japanese Physical Therapy Association's long-term preventive care activities, and evaluates participant's exercise levels related to acquiring an active local social life. E-SAS evaluates the influence of the preventive health care project's efforts to improve physical activity. The E-SAS also evaluates elders' participation in local social life as well as improving physical activity through exercise. That is, the E-SAS elucidates various factors necessary for an elderly person to live an active life.

E-SAS consists of the following six elements :(1) Life Space Assessment (LSA : Estimation of extent of movements in the personal life space), (2)Fall Efficacy Scale (FES : Estimation of self-sureness of not to fall for exercising ten ADL and IADL), (3)Lubben Social Network Scale-6 item version (LSNS6 : Estimation of personal social network as an index of emotional and social conditions), (4) Continuous walking distance (WALK : Estimation of continuous walking distance as an index of basic physical activity), (5)bathing (BATH : Estimation of bathing by oneself which is most difficult among daily performance), and (6) Time Up & Go test (TUG : Estimation of ability for keeping balance during walking). Items (1) to (5) are entered by respondents and (6) is measured. Each item's result is classified according to the respondent's status as follows: general elderly, specified elderly (those who will require care in the future), need support-1, and need support-2, according to the standard value of each care level (Table 1). We utilized (1) to (5) for the present study because (6) cannot be evaluated for the nonparticipants.

Table 1. E-SAS standard

	LSA	FES	BATH	WALK	LSNS6
General elderly level	120～	40～	10～	6～	30～
Specific elderly level	69～	33～	8～	4～	13～
Needed Sapport-1 level	51～	31～	7～	3～	12～
Needed Support-2 level	43～	28～	6～	2～	11～

3. Variable Categorization

The self-perceived health assessments entered by subjects as "good," "fair to good," and "fair" were classified as "healthy." The descriptions "fair to poor" and "poor" were classified as unhealthy. We classified "fair " as "healthy" based on the previous reports about preventive care showing that those with low self-perceived health tend to have low physical and social activity, which means those who still chose "fair" perceive their own health conditions as not so poor. Every smoker was classified as "smoker" regardless of the numbers of tobacco smoked. Those who drank more than two or three times per week were classified as "drinker". Subjects who exercised 30 minutes or more than twice each week were classified as "exercise habits". Any type of agricultural work regardless of time was classified as "agricultural work." Subjects' ability to walk was designated as "unassisted", "assistance required" (human and mechanical), and "unable to walk." The reasons for non-participation were as follows: "1. unaware of the project", "2. unable to leave residence", "3. declined to participate due to good health and physical condition", "4. lacked confidence to participate due to physical condition", "5. no accompanying partner", "6. unable to participate due to occupation (agricultural or non-agricultural) or duties at home", "7. under medical treatment, physical activity limited by physician", "8. refused offer to participate", "9. refused to exercise", "10. poor physical condition" and "11. other". Nonparticipants were classified into two groups: active lifestyle nonparticipants (AL-NP) and minimally active lifestyle nonparticipants (ML-NP). Those who chose "3. declined to participate due to good health and physical condition" or "6. unable to participate due to occupation (agricultural or non-agricultural) or duties at home" were classified as AL-NP. Those who chose other reason were classified as ML-NP.

4. Parameters selected for analysis

The criteria listed above were analyzed for sub-

jects over age 65, not certified as requiring care, and for those who stated reasons for their nonparticipation. We excluded 18 subjects under age 65, two whose ages were uncertain, and 17 who stated vague reasons for not participating. The remaining 339 (participants (n=149), AL-NP (n=119), and ML-NP (n=71)) were included in our analyses.

5. Analytical methods

We used the Cochran-Mantel-Haenszel method and Kruskal-Wallis test after correcting for gender to compare the three groups (1) participants 2) AL-NP 3) ML-NP). Next, to determine the influence of health-related factors, variables where a significant difference was noted, were assumed to be an induced variable, gender and the age are compelling turned on, other variables were analyzed in a multiple logistic regression by the stepwise procedure. "IBM SPSS Statistics 19.0 was used and a hazard ratio < 0.05 was assumed to be significant.

RESULTS

The three groups' (participation, AL-NP, and ML-NP) characteristics were compared according to gender. Although a significant difference was not detected when the participation and the AL-NP groups were compared, there were some significant differences such as subjective sense of health, drinking habits, history of falls, and agricultural work between the participation group and the ML-NP group (Table 2).

The average of the age of females and males in the ML-NP group was significantly higher than the others (P<0.001). The percentages who answered that their subjective healthy feeling level was low, were significantly lower in the ML-NP group in both sexes (female: P<0.05, male: P<0.01). Percentages of those who drank habitually were significantly lower for those in the ML-NP group for both sexes (female: P<0.05, male: P<0.01). Percentages for respondents with a history of falls were significantly high in the ML-NP group in both sexes (female: P<0.05, male: P<0.01). Although the difference was not statistically significant, the ratio was lowest for males in the AL-NP group.

Table 3 and Figure 2 shows the results of E-SAS. All of the five parameters' values were significantly lower in both sexes in the ML-NP. For females, the level of WALK and FES correspond to needed support-1 level (P<0.001, LSA values for specified elderly level (P<0.001), and LSNS6 (P<0.05) and BATH (P<0.001), fall into their general elderly levels. For males, LSNS6 values correspond to needed support-2 level (P <0.001),

Table 2. Characteristics of subject

	Female(n=200)			Male(n=139)		
	Participation (n=100)	AL-NP (n=65)	ML-NP (n=35)	Participation (n=49)	AL-NP (n=54)	ML-NP (n=36)
Age	75.0±5.7	75.0±7.0	79.5±6.7***	75.2±6.2	73.8±5.4	80.5±6.3***
presence or absence of health checkups	87.4	90.8	97.0	83.3	86.8	97.1
self-perceived health ;good	89.0	90.6	70.6*	91.8	88.5	66.7**
History of disorder	79.0	72.3	91.4	73.5	75.9	86.1
Smorker	1.0	0.0	0.0	24.5	7.4	20.0
Drinking habits	15.0	6.2	0.0*	71.4	69.8	40.0**
Histories of falls	9.0	9.5	27.3*	12.2	7.7	30.6**
Means for a walk						
Without assistance	97.0	100	97.1	100	100	94.1
Assistance is needed	3.0	0.0	3.0	0.0	0.0	2.9
Unable to walk	0.0	0.0	0.0	0.0	0.0	2.9
Agricultural work	91.0	81.3	62.9***	81.6	90.7	54.3***
Exercise habits	5.0	4.6	0.0	10.2	7.4	5.6

Cochran-Mantel-Haenszel test, mean±SD, rate: (%)
n.s.;not significant *;p<0.05 **;p<0.01,***;p<0.001

Table 3. Test result of E-SAS

	Female (n=200)				Male (n=139)			
	Participation (n=100)	AL-NP (n=64)	ML-NP (n=36)	*P*-value	Participation (n=49)	AL-NP (n=54)	ML-NP (n=36)	*P*-value
LSA	82.3±24.9 84.0 (6-120) General elderly level	89.9±26.7 100.0 (4-120) General elderly level	54.0±28.3 48.0 (8-120) Specific elderly level	***	89.4±20.4 90.0 (54-120) General elderly level	104.4±26.8 120 (0-120) General elderly level	65.0±30.7 74.0 (0-102) Specific elderly level	***
FES	38.0±3.4 40.0 (26-40) General elderly level	36.7±7.5 40.0 (0-40) General elderly level	30.4±8.2 32.0 (0-40) Needed Sapport-1 level	***	35.9±4.3 38.0 (23-40) General elderly level	34.0±9.5 38.0 (0-40) General elderly level	29.2±8.6 29.0 (0-40) Needed Sapport-1 level	***
LSNS6	16.8±4.3 17.0 (3-29) General elderly level	17.4±5.7 18.0 (4-30) General elderly level	14.0±6.0 14.0 (1-24) General elderly level	*	17.1±5.6 18.0 (3-27) General elderly level	18.6±6.8 18.0 (4-30) General elderly level	10.6±6.6 8.5 (0-22) Needed Support-2 level	***
BATH	10.0±0.2 10.0 (8-10) General elderly level	9.8±1.3 10.0 (0-10) General elderly level	8.9±3.0 10.0 (0-10) General elderly level	***	10.0±0.0 10.0 (10-10) General elderly level	9.4±2.3 10.0 (0-10) General elderly level	8.8±3.0 10.0 (0-10) General elderly level	**
WALK	4.9±1.4 5.0 (1-6) General elderly level	4.9±1.3 6.0 (2-6) General elderly level	2.9±1.7 2.0 (1-6) Needed Sapport-1 level	***	5.2±1.2 6.0 (2-6) General elderly level	5.4±1.0 6.0 (3-6) General elderly level	3.5±1.6 3.0 (1-6) Specific elderly level	***

Kruskal-Wallis test, mean±S.D., median(min-max), appropriate levels of the E-SAS
n.s.:not significant, P-value=*:p<0.05, **:p<0.01, ***:p<0.001

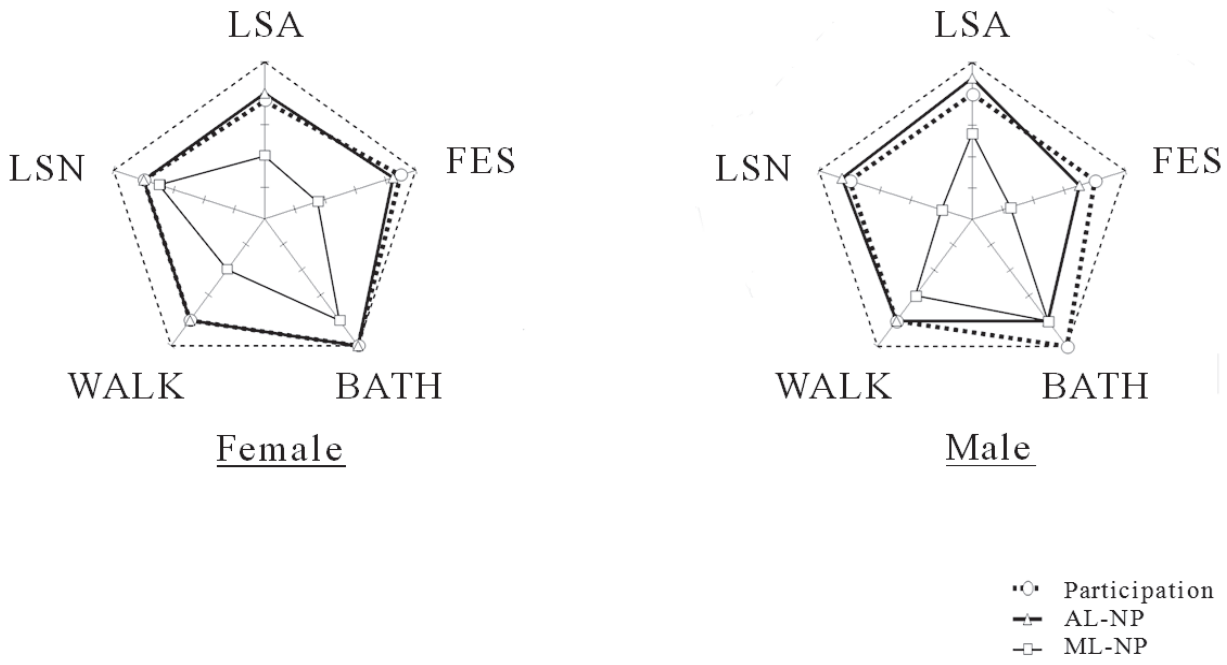

Fig. 2. Test results of E-SAS radar chart

FES to needed support-1 level (P <0.001), LSA and WALK to the specified elderly level (P <0.001), and BATH to the elderly general level (P <0.01). Furthermore, in the participation and AL-NP groups, all levels classified as general elderly level and LSA were higher in the AL-NP than in the participation group.

Multiple logistic regression analysis was performed by setting the independent variable as one of the 13 characteristics listed in the first column of Table 2 that the relation was shown by characteristics comparison, and the dependent variable as the ML-NP group (Table 4). The results revealed that the significantly relevant factors for females in this group were agricultural work (odds ratio (OR) = 2.822) and history of falls (OR = 0.334). The relevant factors in males were, in contrast, self-perceived health (OR = 0.260), habitual drinking (OR = 2.971), and farming (OR = 3.622). The highest odds ratio for both sexes was associated with agricultural work.

DISCUSSION

Although the current preventive Long-term care projects are designed to serve participants, support for nonparticipants has not been instituted, and only a few studies have characterized them. Interestingly, one of these studies revealed that a diminished ability to exercise characterized nonparticipants. Because the activity of daily living (ADL) and instrumental activity of daily living (IADL) are associated with exercise ability, we infer, therefore, that the nonparticipants' low physical capability implies that they are highly likely to require future care. These results prompted us to specify the characteristics of nonparticipants who will require future nursing care [11-13].

We identified the specified elderly (those who will require care in the future) using the project's participant checklist or lifestyle evaluation at physical examinations. However, the identification system has some limitations. The nonparticipants for the projects cannot be identified. Furthermore, it has been reported that the results of the identification system do not coincide with the judgment of experts in care prevention [14]. These results indicate the necessity to implement simple assessment techniques to replace those used by the current system. In the present study, we selected E-SAS as an evaluation tool because of the ability to screen both participants and nonparticipants and estimate their daily lifestyles and exercise levels [10]. E-SAS's features are such that it can be executed without expertise, and the subject can easily understand the results. Here, the director of each self-governing body was able to execute the investigation and provide each subject with their evaluations by letter.

Our present study clarified the characteristics of the nonparticipation group and factors related

Table 4. Multiple logistic regression analysis of minimally active nonparticipants

		partially coefficient of regression	OR	95% CI		p-value
				upper	lower	
female	age	-0.132	0.877	0.818	0.935	0
	agricultural work	1.038	2.822	1.11	7.173	0.029
	hisrory of fall	-1.095	0.334	0.117	0.956	0.041
male	age	-0.155	0.856	0.792	0.926	0
	self-percieved health	-1.349	0.26	0.079	0.857	0.027
	drinking habits	1.089	2.971	1.155	7.641	0.024
	agricultural work	1.287	3.622	1.324	9.909	0.012

OR : Odds Ratio , CI : Confidence Intervals

to their diminished activity. Notably, the ML-NP group's average age was significantly higher than other groups' for both sexes.

Our analysis of self-perceived health revealed that the level was significantly low in the ML-NP group, but there was no significant difference between the participation and AL-NP groups. There is little gender gap in self-perceived health, and those with a low self-perceived health level tend to have lower physical abilities, participate less frequently in social activities, and exhibit a higher incidence of requiring care [15-18].

We also show here that a higher proportion of both sexes who had histories of falls belonged to the ML-NP group. The average percentage of Japanese elderly with histories of falls is about 10 to 20% [19, 20], whereas, in the present study, the value was 2- to 3-fold greater. That this occurs in the ML-NP group might be attributed to the post-fall syndrome (physical functional decline resulting from falls), or to decreased leg muscle strength resulting from disuse atrophy syndrome induced by low self-perceived health, which coincides with a report showing that a history of falls tend to result in low activity.

Eighty-one percent of our subjects were engaged in agricultural work. The percentage of those not being engaged in agricultural work was significantly lower in the ML-NP group. Multiple logistic regression analysis revealed that agricultural work influenced activity, but routine exercise during leisure time was not practiced by either sex. These results indicate that future studies should be designed to assess the influence of exercise on elder citizen's activity related to agricultural work in a mountainous area. In the future studies, just as the definition of exercise habit, several indexes (frequency, time, intensity, and period) of agricultural work should be defined and their effects on physical, emotional, and social activities should be estimated.

The participation and AL-NP groups consumed alcoholic beverages at relatively high frequency (70%) in contrast to the ML-NP group (40%). People who tend to drink alcohol more frequently are known to have relatively more friends and an active daily life [21, 22]. Our results indicated that restriction of lifestyle caused by chronic diseases and perceiving lowered physical activity in ML-NP group leads to the low level of self-perceived health. We assume that ML-NP group with low level of self-perceived health keep healthy lifestyle for restoring the health, which leads to the relatively low frequency for drinking alcohol in the group.

The E-SAS showed significantly low levels in all items tested in ML-NP group in both sexes. Although the levels of LSA in the participation and AL-NP groups were classified as general elderly according to the E-SAS standard, those in the ML-NP group were rated as specified elderly in both sexes. Several studies showed that the determinants of the life space include amount of activity, lifestyle and the psychological factor [23-25]. This implies that characteristics of ML-NP (no Drinking habits, not doing Agricultural work, Syndrome after falls, and low Self-perceived health) lowered the activity, and leads to narrowing of Life Space and low level of LSA. Moreover, the association of LSA with IADL emphasizes the usefulness of LSA as assessment item of elderly [26, 27]. The levels of FES were also significantly low in the ML-NP group and were classified as needed support-1 for both sexes.

The levels of WALK were also significantly low in the ML-NP group and classified as needed support-1 for females and as identifying specified elderly in males. The level of WALK shows that long-distance mobility is necessary for an active life and has an influence on a range of activities and the frequency being able to participate in leisure activities away from home. FES evaluates one's conviction to be able to accomplish actions required for everyday life. Most of the respondents traveled by car or motorcycle instead of walking, leading to lack of exercise. Moreover, leg strength decreased with age, especially in women. We assumed that these two factors caused the decline in WALK to the needed support-1 level in females in the ML-NP group.

Although BATH levels were also significantly lower in the ML-NP group than the others were, the levels were classified as general elderly for both sexes. BATH estimates includes a series of complicated movements such as reaching the bathroom, changing clothes, washing oneself, and entering and exiting a bathtub. Regarding ADL, the decline

in physical ability influences bathing the earliest. Although BATH levels in the ML-NP group were classified as general elderly, the levels were significantly lower than other groups'. These results revealed that BATH is an important parameter for estimating ADL and for evaluating the ML-NP group.

LSNS6 values were also significantly low in the ML-NP group and classified as general elderly for females and as needed support-2 in males. There was a strong association between staying indoors with infrequent visits with friends, neighbors, and relatives [28]. Women generally tend to engage socially with high frequency [29]. We conclude that women in the ML-NP group maintained LSN6 at the general elderly level by keeping socially engaged. In contrast, because human relations can wane and the sense of estrangement becomes strong with resignation, men tend to feel of isolation more than women do [30]. This illustrates the high value of LSN6 to evaluate the activities of the elderly.

The present study has some limitations. Because we examined a relatively small number of variables, we may have missed others important for influencing daily living. For example, non-responders may have included persons with lower activity levels.

In conclusion, we were able to elucidate a factor influencing the activity and the lifestyle of the nonparticipation group using a simple and easy questionnaire. Among nonparticipants, those who exhibited a high level of self-perceived health and having roles in daily life maintained a high quality of life. Conversely, among nonparticipants, those with negative reasons for not participating and with no roles in daily life tended to be classified as those who will require care in the future. These results indicate the importance of pro-actively intervening in providing care for the program's nonparticipants to reduce the number of elderlies requiring care, and the proactively intervening requires both political (health education, and health promotion) and personal (self-motivating habit of exercise, and periodical health checkup) aspects.

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