ORIGINAL

Health behavior of elderly people engaged in agriculture in conjunction with information communication technology

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Abstract : The aim of this study is to clarify the health behavior of elderly people engaged in agriculture and information communication technology (ICT). The participants were 61 people engaged in agriculture in conjunction with ICT systems (group A), and 49 people not engaged in this (group B) from among the people aged 65 years or over in village C, both living located in a mountain areas. Data were collected from August 2009 to June 2011 in two stages : interviews to members of group A through home visits, and a group survey of groups A and B through questionnaires. The results of the study were as follows : 1) members of group A lived with feelings of attachment to the land to which they were accustomed and showed gratitude to their ancestors ; 2) in group A, the desire of participants to continue their life was sufficient motivation to look after their own health and maintain independence ; and 3) they provided a new challenge and a sense of achievement. The results suggest that the health behavior in group A was behavior adopted voluntarily in order to maintain an independent lifestyle supported by working, and it is likely to be linked to the preservation of health. J. Med. Invest. 59 : 192-205, February, 2012

Keywords **:** *mountainous region, elderly people, ICT, health behavior*

INTRODUCTION

The population of elderly people aged 65 years or over in Japan is 29.58 million, accounting for 23.1% of the country's overall population (as of October 1, 2010). In 2015, the baby boom generation, as it is known, will have reached the age of 65 years, and the population over 65 years is expected to exceed 30 million (1). The White Paper on Aging Society notes that social isolation of elderly people can lead to a decline in their quality in life, crimes committed by elderly people, and death in isolation, and it points to the importance of providing elderly people with a place in society and a chance to play a part in order to prevent such problems (1). Okamoto *et al.* described that social participation activities as a way to enable people to lead a rich life during their senior years, and they report that social participation activities have a major role to play in maintaining the health and self-fulfillment of elderly people (2).

"Successful aging" is an important issue in a longevity society (3-6), and Oda (7) defines successful aging as "growing older in good mental and physical health." The focus in this paper is on elderly people actively going about their work in a depopulated area. This embodies the idea of successful aging

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and it is considered as a model for initiatives designed to cope with longevity society (8-11). However, there appear to be no studies addressing the special characteristics of the health behavior of these elderly groups. This health behavior represents the knowledge and skills required for living in good health that elderly people in their depopulated community have fostered up to the present time. Also, we considered that to clarify this behavior reveals to be a response to the social issues accompanying the aging society. The aim of this study is to elucidate the health behavior of elderly people engaged in agriculture in conjunction with information communication technology (ICT).

MATERIALS AND METHODS

1. Survey methods

The survey was conducted in two stages : interviews conducted to the individual through home visits and a group survey conducted using a questionnaire.

a) Participants

The participants were elderly residents aged 65 years or over in village C, who living in a mountainous region. Participants were in either group A, comprising people who were engaged in agriculture in conjunction with ICT systems, or group B, comprising people not engaged in agriculture.

(i) Characteristics of the participants' community

Village C is a mountainous and depopulated region with a population of approximately 1,800 and approximately 50% of the population is 65 years of age and over. There is only a very small area of flat land in the river basin in the valley ; arable land is dotted about this flat area and on terraces on the steep mountainsides. There are a number of small settlements scattered throughout the area. Forty percent of the working population is involved in primary industries, such as forestry, rice cultivation in terraced paddy fields, and cultivation of shiitake mushrooms and other produce.

The only gatherings for elderly people are clubs for elderly people and educational activities for elderly people run by official bodies. There are also cultural associations, and a cultural festival is held every autumn (8).

(ii) Agriculturalists that have adopted ICT systems

In 1998, village C applied to take part in an ICT-related demonstration test organized by the then Ministry of International Trade and Industry (MITI). Personal computers (PCs) were introduced in October of that year, and an optical fiber network was installed in 2005, which meant that all residents of the village could access the Internet. In addition, private businesses in village C have been collaborating since October 2007 to create a model of measures for promoting sparsely-populated areas that use of information and communications technology (8, 10). Their tasks such as production orders, sales reports, and administrative communications in agriculture are performed completely online.

b) Survey period

Home-visit interviews were conducted from August 2009 to March 2010, and a questionnaire survey was conducted from August 2010 to June 2011.

c) Data collection method

First, members of group A were visited at home, and semi-structured interviews were held in order to understand how the members of this group felt about their work. Each participant was visited four or five times, each interview was about one hour per visit. Next, a questionnaire survey was carried out to compare elderly people within the same area. The self-administered questionnaire form was distributed in advance to members of group A, and completed forms were collected at a group meeting. With group B, the questionnaire forms were distributed at a group meeting, and the items were read out to the members, who were then asked to fill in the questionnaire on site. The completed forms were then collected.

2. Operational definition and survey items

The conceptual framework of the survey was that health behavior could be considered to indicate the behavior that supports an individual's healthy lifestyle, and that it comprises functional capacity, activities associated with daily living, and everyday habits. We regarded the activities of daily living (ADL) as a fundamental reflection of purpose in life and other areas of an individual's personal philosophy of life, with this philosophy established in the everyday habits of the individual. Also, we focused on feelings of fatigue as a subjective evaluation of ADL (12). Therefore, health behavior was defined as the behavior that supports an individual's healthy lifestyle in this study.

a) Survey items

During the home visits, the feelings about work were surveyed on the basis of an interview guide.

The questionnaire included 111 items in a multiple choice format, covering basic attributes, functional

capacity, ADL, accumulated fatigue, something one live for, lifestyle, and subjective feeling of well-being (SWB).

(i) Basic attribute items were : sex, age, life period years resident in the present location, family structure, utilization of services by long-term care insurance (LTCI) nursing care insurance, medical history, history of hospitalization, history of health checkups, perception of own health condition, and ICT use.

(ii) Functional capacity was assessed using the Tokyo Metropolitan Institute of Gerontology (TMIG) Index of Competence, which measures instrumental independence, intellectual activity, and social role (13).

(iii) ADL was assessed by asking participants about employment status, social activities, ADL, and awareness of everyday. Those questions were derived from the survey items regarding elderly people, as well as the current status and trends in the environment surrounding them (2008 White Paper on the Aging Society) (14).

(iv) Accumulated fatigue was assessed using the survey items relating to subjective symptoms in the Self-Diagnosis Checklist for Assessment of Worker's Accumulated Fatigue (MHLW's Checklist) which was showed by Ministry of Health, Labour and Welfare (MHLW) in 2006 (15).

(v) Something one live for was assessed using a scale consisting of items relating to current feeling of satisfaction, enjoyment of life, sense of presence, and ambition (16).

(vi) Lifestyle was assessed using Breslow's seven healthy living habits (17, 18). In this survey, the second item, "Do you regularly do fairly strenuous exercise" was replaced by "Do you go for walks or do exercise?" because the participants were elderly people.

(vii) SWB was assessed using Lawton's revised Philadelphia Geriatric Center Morale Scale (PGC Morale Scale) (13, 17).

3. Analysis methods

a) Home visit interview survey

The verbatim records from the interviews were corded and were analyzed by breaking the utterances down into the smallest simple sentences possible, encoding these sentences, and categorizing similar items. Categorization was repeatedly discussed among the researchers until agreement was reached.

b) Questionnaire survey

Answers on each scale were assigned numerical scores according to analytical criteria, and the scores were totaled. Comparisons were made between group A and group B, and also between those in group A that used a PC or mobile phone on a daily basis (group A-1) and those who did not (group A-2).

(i) TMIG Index were scored 1 for "Yes" and 0 for "No," and the total score (0-13) was calculated simply by adding the scores. Total scores were grouped into four levels : 0-5, 6-10, 11-12, and 13. A higher score was taken to indicate a higher level of functional capacity.

(ii) The scale of something one lives for was scored 3 for "Yes," 2 for "Neither yes nor no," and 1 for "No," and the total score was calculated simply by adding the scores. A higher score was taken to indicate a higher level of purpose in life.

(iii) Lifestyle was scored 1 for living habits considered desirable and 0 for those considered undesirable, and the total score (0-7) was calculated. A higher score was taken to indicate a better level of living habits. Total scores were grouped into three levels : 3 or less, 4 or 5, and 6 or 7.

(iv) Subjective symptoms of accumulated fatigue were scored according to MHLW's Checklist. For each item, "Almost never" scored 0, "Sometimes" scored 1, and "Often" scored 3. The total (out of a maximum of 39) and the mean were calculated. Based on the evaluation of subjective symptoms, fatigue was grouped into 4 levels : 0-4 (level I), 5-10 (level II), 11-20 (level III), and 21 or over (level IV).

(v) The PGC Morale Scale was scored 1 when an affirmative response was selected and 0 when another response was selected. The scores for each item were then totaled. The maximum score was 17, and a higher score was taken to indicate a greater subjective feeling of happiness.

(vi) The blank rate of the first questionnaire was calculated in order to assess capacity to read the survey items, judge them, and then fill in the answer.

Data analysis was carried out using Excel 2007 and SPSS ver. 11.5. Items to which there was no response were excluded from the analysis. Differences in the medians were tested using the Mann-Whitney test. To compare the two groups, Fisher's exact probability test was used to test for significant differences between two items, and otherwise the Mann-Whitney U Test was used. Reliability of

linear scales was tested using the Cronbach's α in each scale. The blank rate was calculated using Grubbs-Smirnov's rejection test. A probability level of 5% or less was taken to be significant.

4. Ethical considerations

a) Participants received a written explanation of the aim of the study and a statement that participation was of their own free will, that they were guaranteed the freedom to withdraw from the study at any time, that the privacy of respondents would be protected when data were totaled, that the data obtained would only be used for the purpose of the present study, and that the study would be made public in an academic context. Submission of the questionnaire form was taken as consent for study participation.

b) The study was approved by the Ethics Committee of Tokushima University Hospital (No. 762) on December 22, 2008.

RESULTS

1. Results of semi-structured interviews

Table 1 shows the result of the analysis. Participants' feelings with regard to engaging in agriculture in conjunction with ICT systems were classified into four major categories ; 1) I am grateful to be able to do a job in which I take on new challenges and compete with other people ; 2) I always look after my health so that I can continue working ; 3) I value the relationships with other people I have through work, and 4) I am worried I may not be able to keep on working indefinitely because of my age. In this study, categories are denoted by [ ] and subcategories by { }.

First category [I am grateful to be able to do a job in which I take on new challenges and compete with other people] was extracted from participants' responses : {I endeavor to put out better produce than other people, and I tend crops with an eye to the future}, {I make a point of taking the position of the buyer when I produce crops} and {I am glad when my crops have a better farm gate value than anyone else's}.

Second category [I always look after my health so that I can continue working], indicating the desire to keep working despite growing older, was extracted from {My job has become part of my life} and {I grow crops around my house and I look after my health so that I can continue working}.

Third category of feelings toward family and associates [I value the relationships with other people I have through work] was extracted from {I am grateful to my ancestors and my family that I can continue working}, as well as the feeling of gratitude toward associates, {My associates at work help me out}.

Fourth category [I am worried I may not be able to keep on working indefinitely because of my age] was extracted from that feelings of not being able to keep up with ICT systems {I feel left behind by the changes of the times} and of declining physical strength {I feel left behind by the changes of the times} were expressed. Some people felt that in their vicinity {There are people who have become unable to work because of their age}, as a result of which they had begun to feel {I am worried I may not be able to keep on working indefinitely}.

2. Results of questionnaire

a) Response rate

Questionnaire forms were distributed to 80 people in group A, and the response rate was 76.3% (61 people) ; forms were distributed to 49 people in group B, and the response rate was 100%. Valid responses were taken to be those in which the basic attributes were filled in and the respondent was aged 65 years or over and 100% of the responses was valid.

b) Participants' attributes

In group A, the mean age was 73.8± 5.9 years, with 7 male (11.5%) and 54 female (88.5%). In group B, the mean age was 78.5± 6.1 years, with 12 men (24.5%) and 37 women (75.5%). The mean age was significantly older in group B than in group A ($p< 0.01$).

The number of years living in the present location was 20 or more years for the majority of participants in both groups. The participants with another person living in the same household showed significantly higher number of group A (n=53, 86.9%) than in group B (n=33, 68.8%). There was significant difference in number of people with a job was 61 (100%) in group A and 26 (53.1%) in group B ($p< 0.01$). Looking at the type of occupation in group B agriculture was the most common, with 18 people (36.7%). Twenty-three people (46.9%) were non-workers, of which 11 responded that they would like to work if they had jobs. Eight people gave reasons for wanting to work, which were : for the sake of health (n=4), to give a purpose in life and participation in society (n=3), and other (n=1). There was

Table 1. Results of semi-structured interviews

Code	Subcategorises	Categorories
Activities looked forward to taking care of plants : e.g. producing seasonal products in advance for getting added-value.	I endeavor to put out better produce than other people, and I tend crops with an eye to the future.	1. I am grateful to be able to do a job in which I take on new challenges and compete with other people.
Learning continuously to create better products than others.		
Controlling products' quality.	I make a point of taking the position of the buyer when I produce crops.	
Having a sense of pride in one's work : e.g. having self-worth to conduct the total process autonomously.		
Seeing things from consumers' point of view.		
Being more pleased when products fetched a higher price than others.	I am glad when my crops have a better farm gate value than anyone else's.	
Living in ease.		
Being able to work at one's pace : e.g. no quota nor pressure from others.	My job has become part of my life.	2. I always look after my health so that I can continue working.
Going to the workplace even on a day-off as daily routine : e.g. part of a own place to stay comfortably.		
Having one's hardly to wait during the core business season.		
Easing being able to get in materials (leaves) that are growing naturally near by.	I grow crops around my house and I look after my health so that I can continue working.	
Handing leaves with ease due to their lightweight.		
Taking good care of one's health in order to continue working.		
Being able to work at one's pace : e.g. no quota nor pressure from others.	I am grateful to my ancestors and my family that I can continue working.	3. I value the relationships with other people I have through work.
Going to the workplace even on a day-off as daily routine : e.g. part of a own place to stay comfortably.		
Having one's hardly to wait during the core business season.		
Easing being able to get in materials (leaves) that are growing naturally near by.	My associates at work help me out.	
Handing leaves with ease due to their lightweight.		
Taking good care of one's health in order to continue working.		
Having trouble using of devices for communication : e.g. changing from use of facsimile to internet.	I feel left behind by the changes of the times.	4. I am worried I may not be able to keep on working indefinitely because of my age.
Feeling lonely when one's work less products due to aging : e.g. less communication with others.		
Having trouble with detailed work ; e.g. selection of material defects by aged eyes.	I feel left behind by the changes of the times.	
Slowed down work due to stiff shoulders.		
Feeling sorrow for knowing the people who become unable to work due to aging.	There are people who have become unable to work because of their age.	
Being uncomfortable with the envy of people who are unable to work anymore.		
No existence of a person to take over this work among younger family members : e.g. they have never experienced local life on mountain.	I am worried I may not be able to keep on working indefinitely.	
Thinking of retirement within a few years.		

no significant difference between the groups with respect to awareness of lifestyle, approximately 10% in both group A and group B responded that they were free from monetary constraints.

Regarding health condition over the preceding month, only a very few people in either group had been prone to illness and stayed in bed. The number of people with a history of illness was 36 (59.0%) in group A and 31 (66.0%) in group B. Conditions that were given as history of illness included hypertension, osteoarthritis, diabetes, stroke, heart disease, and osteoporosis. The number of people not certified as needing service by LTCI was 55 (91.7%) in group A and 35 (72.9%) in group B, with a significant difference between the two groups.

There were significant difference number of people using a PCs were 42 (70.0%) in group A and 8 (16.3%) in group B ($p<0.01$). The number of people using a mobile phone was 46 (76.7%) in group A and 30 (61.2%) in group B. Within group A, 35 people (58.3%) in group A-1 and 25 (41.7%) in group A-2 used a mobile phone. The mean age was 72.4±5.7 years in group A-1 and 75.6±5.8 years in group A-2, with a significant difference between the two groups ($p<0.01$) (Table 2).

Table 2. Participants' attributes

		total	engaging agriculture with ICT	
			Yes (A group)	No (B group)
		person (%)	person (%)	person (%)
Age, yrs (mean± SD) **		75.9 (6.4)	73.8 (5.9)	78.5 (6.1)
Sex		n=110	n=61	n=49
	Male	19 (17.3)	7 (11.5)	12 (24.5)
	Female	91 (82.7)	54 (88.5)	37 (75.5)
Life period years in the present location		n=109	n=61	n=48
	5-9 years	2 (1.8)	1 (1.6)	1 (2.1)
	10-19 years	5 (4.6)	1 (1.6)	4 (8.3)
	more than 20 years	102 (93.6)	59 (96.7)	43 (89.6)
Living with family *		n=109	n=61	n=48
	Yes	86 (78.9)	53 (86.9)	33 (68.8)
	No (alone)	23 (21.1)	8 (13.1)	15 (31.3)
Engaged in work **		n=110	n=61	n=49
	Yes	87 (79.1)	61 (100.0)	26 (53.1)
	No	23 (20.9)	0 (0.0)	23 (46.9)
medical history		n=108	n=61	n=47
	Yes	67 (62.0)	36 (59.0)	31 (66.0)
	No	41 (38.0)	25 (41.0)	16 (34.0)
Certification of LTCI *		n=108	n=60	n=48
	Yes	18 (16.7)	5 (8.3)	13 (27.1)
	No	90 (83.3)	55 (91.7)	35 (72.9)
History of health checkup		n=108	n=59	n=48
	Once a year	63 (58.3)	33 (55.9)	30 (61.2)
	Once every few years	29 (26.9)	16 (27.1)	13 (26.5)
	Never	16 (14.8)	10 (16.9)	6 (12.2)
Health condition in the last one month		n=107	n=60	n=47
	Very well	51 (47.7)	28 (46.7)	23 (48.9)
	Well	52 (48.6)	30 (50.0)	22 (46.8)
	not well	4 (3.7)	2 (3.3)	2 (4.3)
	Sick	0 (0.0)	0 (0.0)	0 (0.0)
PCs use or nonuse **		n=109	n=60	n=49
	Yes	50 (45.9)	42 (70.0)	8 (16.3)
	No	59 (54.1)	18 (30.0)	41 (83.7)
Mobile phone use or nonuse		n=109	n=60	n=49
	Yes	76 (69.7)	46 (76.7)	30 (61.2)
	No	33 (30.3)	14 (23.3)	19 (38.8)

LTCI : long-term care insurance
** : $p<0.01$, * : $p<0.05$
No responses are exclusive.

c) Functional capacity

There was very little difference between groups in the median of TMIG Index. Also, Cronbach's α coefficient was 0.799 in this scale.

d) Lifestyle

On Breslow's seven healthy living habits, the only item for which significant differences ($p < 0.01$) were found between the groups was number of hours of sleep per day, 45 people (76.3%) responded "7-8 hrs/day" in group A, and 14 (23.7%) responded either "6 or fewer hrs/day" or "9 or more hrs/day" in group B, these were 23 (46.9%) and 26 (53.1%), respectively (Table 3). Moreover, Cronbach's α coefficient was 0.590 in this scale.

e) ADL

The number of people who were members of gatherings for elderly people (senior citizen's clubs, etc.) and actively took part was 15 (25.4%) in group A and 38 (77.6%) in group B : members but not actively taking part was 14 (23.7%) in group A and 5 (10.2%) in group B ; and non-members was 30 (50.8%) in group A and 6 (12.2%) in group B. The numbers in group A were significantly smaller. The number of people who responded that they liked mixing with other people was 11 (18.3%) in group A and 18 (36.7%) in group B. The number of people who were in the habit of walking when they went out was 11 (18.3%) in group A and 17 (35.4%) in group B. The proportion of people walking was significantly higher in group B (Table 4).

f) Subjective symptoms by MHLW's Checklist

The median value was 7.0 in group A and 5.0 in

Table 3. Breslow's seven healthy living habits

Items		total	engaging agriculture with ICT	
			Yes (A group)	No (B group)
		person (%)	person (%)	person (%)
Range by the counts		n=100	n=58	n=43
	More than 6 points	31 (31.0)	21 (36.8)	10 (23.3)
	4 to 5 points	61 (61.0)	32 (56.1)	29 (67.4)
	Less than 3 points	8 (8.0)	4 (7.0)	4 (9.3)
Do you have an appropriate sleeping hours? *		n=108	n=59	n=49
	Yes (Sleep time : 7-8 hours)	68 (63.0)	45 (76.3)	23 (46.9)
	No (Sleep teme : 6 hours or less, mor than 9 hours)	40 (37.0)	14 (23.7)	26 (53.1)
Do you have a habit of smoking?		n=107	n=59	n=48
	Yes	18 (16.8)	8 (13.6)	10 (20.8)
	No	89 (83.2)	51 (86.4)	38 (79.2)
Do you often drink alcohol too much?		n=110	n=61	n=49
	Yes	14 (12.7)	78 (11.5)	7 (14.3)
	No	96 (87.3)	54 (88.5)	42 (85.7)
Do you keep your standard body weight?		n=105	n=61	n=44
	Yes	47 (44.8)	30 (49.2)	17 (38.6)
	No	58 (55.2)	31 (50.8)	27 (61.4)
Do you go for walks or do exercises?		n=109	n=60	n=49
	Yes	51 (46.8)	24 (40.0)	27 (55.1)
	No	58 (53.2)	36 (60.0)	22 (44.9)
Do you have breakfast everyday?		n=109	n=60	n=49
	Yes	106 (97.2)	58 (96.7)	48 (98.0)
	No	3 (2.8)	2 (3.3)	1 (2.0)
Do you have any snack?		n=108	n=59	n=49
	Yes	29 (26.9)	16 (27.1)	13 (26.5)
	No	79 (73.1)	43 (72.9)	36 (73.5)

* : $p < 0.05$ No responses are exclusive.

Table 4. Activities of daily living

		total	engaging agriculture with ICT	
			Yes (A group)	No (B group)
		person (%)	person (%)	person (%)
Do you participate in an association among elderly? **		n=108	n=59	n=49
	No	36 (33.3)	30 (50.8)	6 (12.2)
	Yes (passively)	19 (17.6)	14 (23.7)	5 (10.2)
	Yes (actively)	53 (49.1)	15 (25.4)	38 (77.6)
Do you participate in an association besides the elderly's?		n=103	n=57	n=46
	No	27 (26.2)	18 (31.6)	9 (19.6)
	Yes	76 (73.8)	39 (68.4)	37 (80.4)
Do you like to apper in public *		n=109	n=60	n=49
	No	12 (11.0)	10 (16.7)	2 (14.1)
	don't mind	68 (62.4)	39 (65.0)	29 (59.2)
	Yes	29 (26.6)	11 (18.3)	18 (36.7)
Do you like to chat with someone?		n=106	n=59	n=47
	No	6 (5.7)	4 (6.8)	2 (4.3)
	don't mind	59 (55.7)	34 (57.6)	25 (53.2)
	Yes	41 (38.7)	21 (35.6)	20 (42.6)
Do you have close relatives or friends?		n=107	n=59	n=48
	No	3 (2.8)	2 (3.4)	1 (2.1)
	a few greetings	22 (20.6)	15 (25.4)	7 (14.6)
	Yes	82 (76.6)	42 (71.2)	40 (83.3)
Do you usually take care of relatives or friends?		n=107	n=59	n=49
	Not often	37 (34.3)	20 (33.9)	17 (34.7)
	Sometimes	47 (43.5)	30 (50.8)	17 (34.7)
	Often	24 (22.2)	9 (15.3)	15 (30.6)
Do you usually walk during outing? *		n=108	n=60	n=49
	Not often	32 (29.6)	22 (36.7)	10 (20.8)
	Sometimes	48 (44.4)	27 (45.0)	21(43.8)
	Always	28 (25.9)	11 (18.3)	17 (35.4)
Are you able to walk for 15 minutes distance without anyone's help?		n=107	n=58	n=49
	No	2 (1.9)	1 (1.7)	1 (2.0)
	Yes, with a stick or a handcart	13 (12.1)	8 (13.8)	5 (10.2)
	Yes	92 (86.0)	49 (84.5)	43 (87.8)
Do you have a driving licence of car?		n=108	n=60	n=48
	No	38 (35.2)	19 (31.7)	19 (39.6)
	Yes	70 (64.8)	41 (68.3)	29 (60.4)

** : $p < 0.01$, * : $p < 0.05$ No responses are exclusive.

group B. In group A, 9 people (15.0%) were in level III and 4 (6.7%) in level IV : in group B, 12 (27.3%) were in level III and none in level IV. These differences were significant. Also, the number of people responding "I often feel anxious" was 4 (6.6%) in group A and 1 (2.0%) in group B, with significantly more in group A (Table 5). Additionally, Cronbach's α coefficient was 0.753 in this scale.

g) Something one lives for and SWB

The median value of points on the something

Table 5. Subjective symptoms by MHLW's Checklist

		total	engaging agriculture with ICT	
			Yes (A group)	No (B group)
		person (%)	person (%)	person (%)
Scale of one to four subjective symptoms of fatigue *		n=104	n=60	n=44
	I	37 (35.6)	18 (30.0)	19 (43.2)
	II	42 (40.4)	29 (48.3)	13 (29.5)
	III	9 (15.0)	9 (15.0)	12 (27.3)
	IV	4 (3.8)	4 (6.7)	0 (0.0)
I : 0~4 points, II : 5~10 points, III : 11~ 20 points, IV : more than 21 points				
Do you feel anxiety? *		n=110	n=61	n=49
	Almost none	39 (35.5)	17 (27.9)	22 (44.9)
	Sometimes	66 (60.0)	40 (65.6)	26 (53.1)
	Often	5 (4.5)	4 (6.6)	1 (2.0)
Do you feel illhealth?		n=109	n=61	n=48
	Almost none	40 (36.7)	18 (29.5)	22 (45.8)
	Sometimes	64 (58.7)	40 (65.6)	24 (50.0)
	Often	5 (4.6)	3 (4.9)	2 (4.2)
Do you feel making mistakes?		n=109	n=61	n=48
	Almost none	43 (39.4)	21 (34.4)	22 (45.8)
	Sometimes	63 (57.8)	38 (62.3)	25 (52.1)
	Often	3 (2.8)	2 (3.3)	1 (2.1)
Do you feel exahusted?		n=110	n=61	n=49
	Almost none	56 (50.9)	26 (42.6)	30 (61.2)
	Sometimes	49 (44.5)	33 (54.1)	16 (32.7)
	Often	5 (4.5)	2 (3.3)	3 (6.1)

MHLW's Checklist ; Self-Diagnosis Checklist for Assessment of Worker's Accumulated Fatigue( ) No responses are exclusive.
* : $p < 0.05$

one lives for scale of was 76.0 for group A and 80.5 for group B, with a significant difference between the two groups. The number of people responding "Yes" to the question "Do you feel happy now?" was 42 (72.4%) in group A and 44 (91.7%) in group B, with a significant difference between the groups. The items with a significant difference in both groups were as follows : "Do you often enjoy sleeping in a soft futon" was 32 (54.2%) in group A and 39 (81.3%) in group B ; "Are you trusted and depended on by other people?" was 19 (32.2%) in group A and 28 (58.3%) in group B ; "Do you sometimes join together with other people to work toward the same goal?" was 33 (55.9%) in group A and 38 (77.6%) in group B ; "Are there often times when you can feel you are highly valued?" was 9 (15.8%) in group A and 18 (37.5%) in group B ; "Are you accepted by people around you?" was 29 (47.5%) in group A and 33 (68.8%) in group B ; "Do you have big hopes for your own life?" was 13 (22.4%) in group A and 21 (46.7%) in group B ; and "Are you often able to find hobbies and things you like to do?" was 33 (55.0%) in group A.

The median scores of the PGC Morale Scale, which measured SWB, were 10.0 in group A and 11.0 in group B, with no significant difference between the groups for any of the items.

When the results were compared by group according to use (group A-1) or non-use (group A-2) of PCs/mobile phones, the median scores on the scale of something one lives for were 76.0 in group A-1 and 66.5 in group A-2, with a significant difference between the two.

In the PGC Morale Scale, the number of people responding "Yes" to the question "Do you sometimes feel you are glad to be alive?" was 31 (88.6%) in group A-1 and 16 (66.7%) in group A-2, with a significant difference between the two (Table 6). In

Table 6. Something one lives for and SWB

		range	total	Use of PCs and Mobile phone	
				daily use (A-1 grup)	not daily use (A-2 grup)
Age (mean ± SD)			73.8 (5.9)	72.4 (5.7)	75.6 (5.8)
			Median (25%, 75%)	Median (25%, 75%)	Median (25%, 75%)
ADL		4~16	11 (10,13)	11 (10,13)	10 (8.8,12.3)
Functional Capacity byTMIG Index		0~13	13 (11.5,13)	13 (12,13)	11 (11,13)
	Instrumental Activity of Daily living	0~5	5 (5,5)	5 (5,5)	5 (5,5)
	Intellectual activities	0~4	4 (3,4)	4 (4,4)	4 (3,4)
	Societal rolls	0~4	4 (3,4)	4 (3,4)	3 (3,4)
Value of living scale		31~93	76 (64.5,80.5)	76 (67.5,82.5)	66.5 (53.8,77.8)
	Satisfied	5~15	13 (11,14)	14 (12.8,14)	11.5 (9.8,14)
	Pleasure	6~18	14 (12,15)	14 (12,15)	14 (21,28)
	Existance value	11~33	26 (22,28.8)	26 (23.5,29.5)	23 (21,28)
	A challenging spirit with purpose	9~27	22 (19.5,25)	23 (21,25.3)	21 (18,24)
Breslow's seven healthy habits		0~7	5 (4,6)	5 (4.5,6)	5 (4,6)
Work Conditions and Ergonomics		0~39	7 (4,10)	7 (5,10)	5 (3,13)
PGC Morale Scale		0~17	11 (8,13)	11 (8.3,12.8)	9.5 (5.8,13.3)
	Attitude toward own aging	0~5	2 (1,3)	2 (1,3)	2 (0,3)
	Lonely dissatisfaction	0~6	5 (4,5.8)	5 (4,5)	5 (2.8,6)
	Agitation	0~6	4 (3,5)	4 (3,5)	3 (2,5)
Something one lives for scale					
Do you find every day peaceful and enjoyable? *			n=60	n=35	n=24
		Yes	39 (65.0)	28 (77.8)	11 (45.8)
		don't know	19 (31.7)	7 (19.4)	12 (5.0.)
		No	2 (3.3)	1 (2.8)	1 (4.2)
Do you feel happy now? *			n=60	n=35	n=23
		Yes	42 (72.4)	29 (82.9)	13 (56.6)
		don't know	12 (20.7)	5 (14.3)	7 (30.4)
		No	4 (6.9)	1 (2.9)	3 (13.0)
Do you sometimes find enjoyment in yourself that you didn't know before? *			n=59	n=36	n=23
		Yes	12 (20.3)	10 (27.8)	2 (8.7)
		don't know	28 (47.5)	18 (50.0)	10 (43.5)
		No	19 (47.8)	8 (22.2)	11 (47.8)
Do you sometimes feel you have been rewarded for the results of the efforts you made? *			n=59	n=35	n=24
		Yes	40 (67.8)	28 (80.0)	12 (50.0)
		don't know	16 (27.1)	6 (17.1)	10 (41.7)
		No	3 (5.1)	1 (2.9)	2 (8.3)
Do feel like you want to do things?			n=60	n=36	n=24
		Yes	53 (88.3)	35 (97.2)	18 (75.0)
		don't know	5 (8.3)	1 (2.8)	4 (16.7)
		No	2 (3.3)	0 (0.0)	2 (8.3)
Do you have goals which you want to achieve? *			n=60	n=36	n=24
		Yes	31 (51.7)	22 (61.1)	9 (37.5)
		don't know	24 (40.0)	13 (36.1)	11 (45.8)
		No	5 (8.3)	1(2.8)	4 (16.7)
Are you often able to find hobbies and things you like to do?			n=60	n=35	n=25
		Yes	33 (55.0)	23 (65.7)	10 (40.0)
		don't know	18 (30.0)	8 (22.9)	10 (40.0)
		No	9 (15.0)	4 (11.4)	5 (20.0)
PGC Morale Scale					
Do you sometimes feel you are glad to be alive? *			n=59	n=35	n=24
		Yes	47 (79.7)	31 (88.6)	16 (66.7)
		No	12 (20.3)	4 (11.4)	8 (33.3)

SWB : subjectve well-being
TMIG index : Tokyo metropolitan Institute of Gerontology Index of Competence
ADL : Ability of daily living
* : $p < 0.05$

No responses are exclusive.

addition, Cronbach's α coefficients were 0.860 in something one lives for scale and 0.844 in PGC morale scale.

h) Blank rate of questionnaire items

The proportion of all responses that were left blank the first time the questionnaire was carried out was 4.7±7.1% in group A and 12.1±14.0% in group B, with a significant difference ($p<0.01$) between the two (Table 7).

Table 7. Blank rate of questionnaire items

engaging agriculture with ICT			
Yes (A group) mean (± SD)	No (B group) mean (± SD)	significance differnce	Grubbs-Smirnov
n=62	n=81	p=0.000	18.14
4.7 (7.1)	12.1 (14.0)		

Grubbs-Smirnov's rejection test.

DISCUSSION

1. Feelings of elderly people engaged in agriculture in conjunction with ICT systems

Nomura (19) defines something one lives for in elderly people as "the meanings, objectives, and values that an elderly person discovers for living, and the actual feelings about living felt through the development of reflective and affirmative emotions." Also, Inagaki (20) states that the role of elderly people is to preserve the way of life of the area in which they were born and raised, to keep pride in the history of the area, and to preserve its traditions. This appears to be exactly the feelings of group A. The feelings of group A with regard to work were same as extracted from the home visit interviews.

From first category [I am grateful to be able to do a job in which I take on new challenges and compete with other people], there appears to be a connection between purpose in life and placing importance on crops for shipping or getting a positive evaluation for one's produce in the context of being engaged in agriculture with pioneering use of ICT systems. Also, in second category [I value the relationships with other people I have through work], the respondents felt they were able to ship out produce because of the things their ancestors had cultivated, because the people in their circles had provided seedlings, or because others had taught them the necessary skills. This probably means that, by continuing to work, they were honoring their ancestors and intensifying their gratitude to the people in their circle.

Moreover, fourth category [I am worried I may not be able to keep on working indefinitely because of my age] was extracted. This was probably because the elderly participants in group A had so far been able to continue working with relatively little physical strain as they were engaged in growing produce near their homes and only shipping small quantities ; this category expressed the worry that, as they grew physically weaker, they would not be able to work well, and the feeling that they wanted to continue at the same job indefinitely. This feeling is connected to care taken with everyday health management in order to be able to continue working for a long time, as shown by third category [I always look after my health so that I can continue working].

2. Health behavior of elderly people engaged in agriculture in conjunction with ICT systems

Lifestyle including one's own health management is reported to be extremely important for continuing to live in a mountainous region over the long term (21). Furthermore, elderly people are reported to have the knowledge and awareness necessary for improving their own health (22). In addition, it has been stated that health for elderly people is something that they themselves are proactive in developing and continuing to acquire within the activities of their daily lives (23). Thus, strongly health-conscious people are reported to have a desirable awareness of health and at the same time to be inclined to practice health behavior (24), and this was found in the participants of this study. In particular, more members of group A were getting the right amount of sleep than group B, so that group A seemed to be taking care to live a well-regulated lifestyle in order to be able to continue working. However, Matsuo *et al.* (25) report that people living in mountainous regions base their daily lives around cars and take little exercise such as walking. In this study, many people also used a car whenever they went outside, so the situation was clearly the same.

In addition, while 40% of participants had some illness or other, most of them responded that their health condition was not bad, enough to necessitate staying in bed. In group A, 91.1% of participants were not certified as needing LTCL. It was suggested that they led independent lifestyles. Koyano *et al.* (26) reported a mean TMIG Index of Competence of 10.8±3.0 ; in comparison, the participants

of the present study had higher scores, indicating that both groups had high functional capacity. All members of group A had jobs, and 80% of group B was involved in gatherings of elderly people, which was consistent with the prior report that frequent participation in voluntary activities significantly checks decline in functional capacity (27). Moreover, the blank rate in group A was significantly lower than in group B, suggesting that this group maintains the ability to read and comprehend the questionnaire forms because the members draw up shipping documentation when shipping produce and use faxes and PCs on a daily basis to check sales. However, there was no difference between groups in the items of TMIG Index to pay bills or to fill in pension-related and other documents. It is therefore likely that, in group B, there is a decrease in ability to fill in the questionnaire form within a limited time, as opposed to a decrease in intellectual function.

Next, local contribution activities and a sense of connection with the community of elderly people living in agricultural communities or in mountainous regions are reported to increase in proportion to the number of years lived in the area (28). The majority of participants in the present study had lived in the region for 20 years or longer. It therefore seems that people live their everyday lives with great importance placed on their links with other people living in the same area. In addition, hobbies and purpose in life during old age are reported to give self-fulfillment and at the same time to activate the body and mind (26). A trend has also been reported for those elderly people in an area who carry out social activities to grow older more successfully (11). According to this notion, the participants in the present study who are growing older successfully are those keeping active in body and mind. Having a job in particular is a form of social participation at the highest level (29). In group A, aspects of work such as the quality of produce or the amount shipped are managed by ICT, and members of the group need to communicate with the ICT managers about evaluations of their work or market trends. In meeting these demands, the members of group A appear to be building up a pattern of employment in which they pursue even higher evaluation.

The group of people within group A who used a PC or mobile phone every day (group A-1) scored significantly higher on the purpose in life scale, and many people responded that they "find every day peaceful and enjoyable," they "feel happy now," they "feel that every day is fulfilling," they "discover a new self," and they "feel rewarded for the results of the efforts [they] made." It is likely that these people feel great pleasure and a strong sense of achievement at being able to work in agriculture in conjunction with ICT, and, in particular, they are proud of their work, and this is linked to their feeling of purpose in life. Also, while more people in group A than group B responded that they were conscious of fatigue from work, it appears that they had sufficient sleep and took care of their health out of a desire to continue working.

3. Limitations of the study

There are limits to the extent to which the results of the present study can be generalized because the participants in both groups were people who were able to respond to the interviews and the questionnaire survey, and were not randomly selected groups. Nonetheless, in the absence of any studies to date that focus on the health behavior of elderly people like those in group A who are actively working, the present study is likely to be of use in the future in formulating proposals for policies to support elderly people. Also, the scales used in prior studies tend to be more appropriate for elderly people in need of support, and they include items that are difficult for people living in the rather inconvenient living environment of a mountainous region to respond to. For this reason, in the present study, we had to create our own questions to evaluate respondents' employment status and social relations. However, given that the number of elderly people working independently and in good health is forecast to increase, it will be necessary to develop an appropriate survey.

CONCLUSION

The present study aimed to clarify the health behavior of elderly people engaged in agriculture in conjunction with ICT systems. Interviews with elderly people were carried out through home visits in order to further the understanding of areas such as their feelings about their livelihood, and a questionnaire survey was carried out to gain an understanding of the special features of their livelihoods. The study elucidated the following points ;

1. People in group A lived by the produce of the land where they lived, with an attachment to the area in which they had become used to living and feelings of gratitude toward their ancestors.

2. In group A, the desire of participants to continue their everyday life at their place of residence was the motivation to look after their own health and maintain independence.
3. The implication of the results was that being engaged in agriculture and ICT systems gave the pleasure of a new challenge and a sense of achievement, which could be connected to preventing a decline in intellectual level.

The results suggest that health behavior in group A was adopted voluntarily in order to maintain the independent lifestyle obtained through working, also such activities contributes to the preservation of their health.

CONFLICTS OF INTEREST STATEMENT

None of the authors have any conflicts of interest to declare.

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