

## Factors related to mental health and hearing in community-dwelling elderly

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### ABSTRACT

The purpose of this study was to clarify the factors related to mental health and hearing in community-dwelling elderly. Elderly participants in a project to prevent long-term care need were given a self-administered questionnaire and tested by pure-tone audiometry. One hundred fifty were taken as subjects. Forty-one of these subjects (27.3%) were found to have poor mental health. The results of multiple logistic regression analysis with mental health level as the dependent variable indicated that subjects 65–74 years old who did not think their own hearing was bad had better mental health than those who did think their hearing was bad (odds ratio 10.800). Among subjects 75 years and older, those who had not been certified as needing long-term care had better mental health than those who had been certified (odds ratio 3.937). When planning mental health support for community-dwelling elderly in the future, it will be necessary to consider differences in background due to age group. The present results suggest that appropriate support for awareness of hearing and acceptance of decreased hearing ability in people in early old age (65–74 years old) may help to prevent declining mental health in later old age.

Keywords: community-dwelling elderly, mental health, hearing

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### INTRODUCTION

Old age is a time of decline and loss, when a strong sense of isolation and psychological stress may occur. Positive interpersonal relationships are said associated with mental health in the elderly,<sup>1)</sup> and maintaining the hearing ability needed for communication, a means of building good interpersonal relationships, may be a necessary condition.

Epidemiological studies examining mental health levels in the elderly have been reported in the past.<sup>2-6)</sup> Supporting people so that they go out of the home is central to preventing them from becoming homebound, and the importance of approaches from the aspects of physical ability and sociality in this support has been suggested.<sup>7)</sup> Involvement emphasizing mental health is thought to be important in preventing declines in physical health and social activity.<sup>5)</sup>

Japan is estimated to have more than 15 million people aged 65 and older who have hearing

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loss,<sup>8)</sup> and while about half of elderly people are conjectured to have some hearing loss, most reports on this subject are limited to the relationship between mental health and the ability to hear pure tones and self-perceived hearing. There are also reports on how coping strategies and stress cognition<sup>9,10)</sup> accompanying hearing loss affect mental health, but the subjects in those studies were people receiving care at medical institutions. No reports focusing on community-dwelling elderly are seen.

Elucidation of the factors related to mental health and hearing in the elderly is also important from the perspective of preventing the need for long-term care, and may be helpful in supporting the mental health of elderly people in the community in coming years. The subjects of this study were community-dwelling elderly participating in a program to prevent the need for long-term care, and the aim of the study was to elucidate factors related to mental health and hearing.

## METHODS

### *Subjects*

The survey subjects were 192 elderly people participating in a program to prevent the need for long-term care in City A.

### *Questionnaire and Measurement*

The participants responded to a questionnaire and were tested with pure tone audiometry. The questionnaire forms were collected by researchers when the survey was finished. Pure tone audiometry was performed using a Rion audiometer (AA-58), and ability to hear 40 dB tones at 1000 Hz and 2000 Hz with both ears was tested. No sound-proof room was available, and so the tests were performed in a private room or one corner of the classroom where the long-term care need prevention program was held. The survey was conducted from mid-April until the end of June, 2011.

#### 1. Characteristics of elderly participants

Participants were asked their age, sex, whether they lived with family, whether they had a role to fulfill in daily life, whether they were certified to receive long-term care, and the frequency with which they went outside the home.

#### 2. Individual environment related to hearing

Participants were asked whether they have any ear disease, whether anyone close to them is hard of hearing, whether they have ever been told that they were hard of hearing, and whether they had ever used a hearing aid.

#### 3. Individual characteristics related to hearing

Participants were asked their self-perceived hearing, hearing handicap, and whether they like conversation.

For self-perceived hearing, the question “Do you feel you have a hearing loss?”<sup>11)</sup> has been translated into Japanese as “*Jibun de kikoe ga warui to omoimasu-ka?*” (Do you feel your hearing is poor?), and this translation was adopted.<sup>12)</sup>

For hearing handicap, the Hearing Handicap Inventory for the Elderly Short Version (HHIE-S),<sup>13,14)</sup>

#### 4. Pure-tone audiometry

A simple test of whether subjects could hear 40 dB tones at 1000 Hz and 2000 Hz was conducted. In this study, subjects who could hear 40 dB tones at 1000 Hz and 2000 Hz with both the left ear and right ear were recorded as “Can hear tones” and all others as “Cannot hear tones.”

## 5. Mental health

For mental health, the Japanese version GHQ12, the short form of the General Health Questionnaire (GHQ) was used. The GHQ was scored with 12 as the highest possible score, and a false recognition rate of 18.9% was adopted for the lowest demarcation point of 2–3,<sup>15)</sup> with  $\leq 2$  as good and  $\geq 3$  as poor.

### Data Analysis

People aged 65–74 years were classified as young-old, and those 75 years and older as old-old. A chi-square test was used to examine the relationship between mental health and the characteristics of elderly participants, individual environment related to hearing, and individual characteristics related to hearing. Fisher's exact test was performed for variables that had a cell with an expected frequency of  $< 5$ . To clarify factors related to mental health, a stepwise multiple logistic regression analysis was conducted based on the likelihood ratio with mental health as the dependent variable. The level of statistical significance was taken to be less than 5% and the statistical analysis was done using IBM SPSS Statistics Version 23.

### Ethical Considerations

The study purpose, study plan, and the confidentiality of personal information were explained to the subjects orally and in writing. The participants' consent to participate in the study was confirmed by signing consent forms. This study was approved by the Nagoya City University School of Nursing research ethics committee in February 2011.

## RESULTS

### Sample Characteristics

Among the participants in the program to prevent the need for long-term care in City A, consent for this survey was obtained from 157 men and women aged 65 to 94 years old. Among them, 7 people who did not respond to the GHQ12 measure of mental health were excluded and the study was conducted with the remaining 150 people as subjects (Table 1). The percentage of subjects with poor mental health was 22.9% in the young-old and 29.4% in the old-old, and significant differences were seen in *I can't always concentrate* ( $p = 0.008$ ), *I do not feel value in the things I do* ( $p = 0.012$ ), and *I do not enjoy daily life* ( $p = 0.014$ ).

**Table 1** Demographic backgrounds of respondents

Characteristics		N	%
Age	65–74	48	32.0
	75–	102	68.0
Sex	Male	14	9.3
	Female	136	90.7
Live together with family	Yes	97	64.7
	No	53	35.3
Have role in daily life	Yes	141	94.0
	No	9	6.0
Certification of need for long-term care <sup>a</sup>	Yes	18	12.2
	No	130	87.8

Frequency of going out	Almost every day	96	64.0
	No more than 3 times/week	54	36.0
Ear disease	Yes	46	30.7
	No	104	69.3
Hearing-impaired person around one <sup>a</sup>	Yes	55	37.2
	No	93	62.8
Been told one is hard of hearing	Yes	55	36.7
	No	95	63.3
Have worn a hearing aid	Yes	16	10.7
	No	134	89.3
Self-perceived hearing	Think	73	48.7
	Did not think	77	51.3
Hearing handicap	No handicap	106	70.7
	Mild handicap	33	22.0
	Significant handicap	11	7.3
Like conversation	Like	143	95.3
	Not like	7	4.7
Pure-tone thresholds <sup>b</sup>	Can hear some tones	90	60.4
	Cannot hear any tones	59	39.6

N=150

<sup>a</sup>N=148 because of missing values

<sup>b</sup>N=149 because of missing values

#### *Relationship between Mental Health and Each Variable*

The results of a chi-square test between mental health and each variable in the 65–74 year-old group showed significant differences in *Frequency of going out of the house* ( $p = 0.036$ ), *Have been told one is hard of hearing* ( $p = 0.032$ ), *Self-perceived hearing* ( $p = 0.009$ ), and *Hearing handicap* ( $p = 0.034$ ).

For those 75 and older, the only significant difference was seen in *Certification of need for long-term care* ( $p = 0.016$ ) (Table 2).

**Table 2** Relationship between mental health and all variables

		65–74		
		Good	No good	$P^b$
Total N (%)		37 (100.0)	11 (100.0)	
Sex	Male	3 (8.1)	0 (0.0)	.449
	Female	34 (91.9)	11 (100.0)	
Live together with family	Yes	32 (86.5)	9 (81.8)	.513
	No	5 (13.5)	2 (18.2)	

## Factors related to mental health and hearing

Have role in daily life	Yes	37 (100.0)	11 (100.0)	–
	No	0 (0.0)	0 (0.0)	
Certification of need for long-term care <sup>a</sup>	Yes	1 (2.7)	0 (0.0)	.771
	No	36 (97.3)	11 (100.0)	
Frequency of going out	Almost everyday	32 (86.5)	6 (54.5)	.036
	No more than 3 times/week	5 (13.5)	5 (45.5)	
Ear disease	Yes	9 (24.3)	5 (45.5)	.164
	No	28 (75.7)	6 (54.5)	
Have hearing-impaired person around one <sup>a</sup>	Yes	12 (32.4)	5 (50.0)	.253
	No	25 (67.6)	5 (50.0)	
Been told one is hard of hearing	Yes	10 (27.0)	7 (63.6)	.032
	No	27 (73.0)	4 (36.4)	
Have worn a hearing aid	Yes	1 (2.7)	2 (18.2)	.127
	No	36 (97.3)	9 (81.8)	
Self-perceived hearing	Think	10 (27.0)	8 (72.7)	.009
	Did not think	27 (73.0)	3 (27.3)	
Hearing handicap	No	30 (81.1)	5 (45.5)	.034
	Mild	6 (16.2)	6 (54.5)	
	significant	1 (2.7)	0 (0.0)	
Like conversation	Like	36 (97.3)	9 (81.8)	.127
	Not like	1 (2.7)	2 (18.2)	
Pure-tone thresholds <sup>a</sup>	Can hear some tones	30 (81.1)	8 (72.7)	.413
	Cannot hear any tones	7 (18.9)	3 (27.3)	

N=150

<sup>a</sup>n differs because of missing values for 1 person for *People around one who are hard of hearing* in the 65–74 year-old subjects, and for 2 persons for *Certification of need for long-term care* and for 1 person each for *People around one who are hard of hearing* and *Pure tone hearing ability* in the ≥75 year-old subjects

<sup>b</sup>Significant difference in cross-tabulation of mental health and each item in subjects aged 64–75 years and ≥75

**Table 2** Continued

		75–		<i>P</i> <sup>b</sup>
		Good	No good	
Total N (%)		72 (%)	30 (%)	
Sex	Male	9 (12.5)	2 (6.7)	.315
	Female	63 (87.5)	28 (93.3)	
Live together with family	Yes	42 (58.3)	14 (46.7)	.195
	No	30 (41.7)	16 (53.3)	
Have role in daily life	Yes	65 (90.3)	28 (93.3)	.474
	No	7 (9.7)	2 (6.7)	
Certification of need for long-term care <sup>a</sup>	Yes	8 (11.1)	9 (32.1)	.016
	No	64 (88.9)	19 (67.9)	
Frequency of going out	Almost everyday	45 (62.5)	13 (43.3)	.060
	No more than 3 times/week	27 (37.5)	17 (56.7)	
Ear disease	Yes	20 (27.8)	12 (40.0)	.164
	No	52 (72.2)	18 (60.0)	
Have hearing-impaired person around one <sup>a</sup>	Yes	25 (35.2)	13 (43.3)	.291
	No	46 (64.8)	17 (56.7)	
Been told one is hard of hearing	Yes	23 (31.9)	15 (50.0)	.068
	No	49 (68.1)	15 (50.0)	
Have worn a hearing aid	Yes	8 (11.1)	5 (16.7)	.320
	No	64 (88.9)	25 (83.3)	
Self-perceived hearing	Think	37 (51.4)	18 (60.0)	.283
	Did not think	35 (48.6)	12 (40.0)	
Hearing handicap	No	54 (75.0)	17 (56.7)	.058
	Mild	14 (19.4)	7 (23.3)	
	significant	4 (5.6)	6 (20.0)	
Like conversation	Like	69 (95.8)	29 (96.7)	.663
	Not like	3 (4.2)	1 (3.3)	
Pure-tone thresholds <sup>a</sup>	Can hear some tones	41 (56.9)	11 (37.9)	.065
	Cannot hear any tones	31 (43.1)	18 (62.1)	

*Factors Related to Mental Health and Hearing*

A stepwise multiple logistic regression analysis was conducted based on the likelihood ratio with mental health as the dependent variable. The result of a model chi-square test in those aged 65–74 years was  $p = 0.002$  and the discriminative predictive rate was 78.7%, showing no problems. *Self-perceived hearing* was identified as a related factor, for which the odds ratio was 10.800. The result of a model chi-square test in subjects aged 75 years and older was  $p = 0.014$ , and the discriminative predictive value was 73.5%, showing no problem. The identified related factor was *Certification of need for long-term care*, for which the odds ratio was 3.937 (Table 3).

**Table 3** Items selected in multiple logistic regression analysis odds ratio

	65–74 <sup>a</sup>		75–	
	<i>p</i>	Odds ratio (95%CI)	<i>p</i>	Odds ratio (95%CI)
Certification of need for long-term care			.013	
Yes				1.000
No				3.937 (1.328–11.675)
Self-perceived hearing	.006			
Thinks one has hearing loss		1.000		
Does not think one has hearing loss		10.800 (1.952–59.769)		

<sup>a</sup>In a correlation analysis, the correlation coefficient between *Hearing handicap* and *Have been told that one is hard of hearing* was  $r = 0.724$ , and that between *Hearing handicap* and *Self-perceived hearing* was  $r = 0.690$ . There was judged to be multicollinearity, and *Hearing handicap* was excluded from the covariates and a stepwise multiple logistic regression analysis was conducted by likelihood ratio.

## DISCUSSION

*Factors Related to Mental Health and Hearing in the Elderly*

The results of chi-square tests for mental health and each variable showed that in the young-old group, the frequency of going out, being told that one is hard of hearing, self-perceived hearing, and hearing handicap were related to mental health. Previous reports have also shown that people who seldom go out have a depressive tendency, feeling little ebullience, joy, or meaning in living.<sup>16)</sup> This was a cross-sectional study, and so no conclusions about causal relationships could be reached, but the same relationships as in previous studies were seen. The new hearing-related factors of *Being told that one is hard of hearing*, *Self-perceived hearing*, and *Hearing handicap* were shown to be related to the mental health of young elderly. The experience of being told by others about one's age-associated hearing loss, and feeling somewhat restricted in daily life because of one's own feeling of being hard of hearing, makes an individual keenly aware of his or her poor hearing. Such unpleasant experiences and awareness related to hearing may be associated with declining mental health.

The factor seen to have a significant relationship in multiple logistic regression analysis was *Self-perceived hearing*. Even if individual elderly people have environments or coping behaviors that supplement hearing, ultimately the perception that “my hearing is poor” seems to affect mental health. In the future, support measures to provide both ancillary support for surroundings so that people can recognize and accept their hearing loss and direct assistance for mental health may be necessary.

In the old-old group, only *Certification of need for long-term care* was related to mental health. *Certification of need for long-term care* was also selected in the multiple logistic regression analysis. The Ministry of Health, Labor and Welfare defines the state of needing long-term care as “a state in which constant care is expected to be needed continuously due to a physical or mental impairment over a period stipulated in a Ministry of Health, Labor and Welfare Ordinance for all or some of the basic actions in daily life, including bathing, using the toilet, and eating.” The rate of poor mental health was 22.9% in the young-old and somewhat higher, 29.4%, in the old-old. Significant differences were seen in the items of *I can't always concentrate*, *I do not feel value in the things I do*, and *I do not enjoy daily life*. In a state of needing care, people find it difficult to devote themselves to things they are interested in or working toward things, and a mental state may occur in which they cannot enjoy each day. Thus, after orchestrating assistance for mental health in community dwelling elderly, it will be necessary to consider differences in background in line with young-old and old-old age groups. It is also suggested that recognition of hearing and appropriate support for acceptance of and measures against hearing loss will lead to the prevention of worsening mental health in the old-old.

Limitations of this study and future issues are the likelihood of a bias toward subjects characterized by a low level of need for long-term care and a high frequency of going out. In the future it will be necessary to expand the survey field and obtain greater subject numbers in the selection method.

## CONCLUSION

The aim of this survey was to clarify factors related to mental health and hearing in 150 community-dwelling elderly. The results showed that factors related to mental health were *Frequency of going out of the house*, *Being told that one is hard of hearing*, *Self-perceived hearing*, and *Hearing handicap* in the young-old subjects. Of those factors, the determining factor was *Self-perceived hearing*. In old-old, only *Certification of need for long-term care* was related to mental health.

## CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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