

ARTICLES



## Efficacy of a program to address older adults' challenges of daily living after disasters

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### ABSTRACT

After the Great East Japan Earthquake in March 2011, providing support for older adults who continued to live in the affected areas has been a critical issue. We examined the effects of programs to address how challenges of daily living impact individuals' health-related quality of life (HRQOL). This was a 14 session, quasi-experiment trial that included 89 older adults aged 65 years or older who continued to live in the earthquake-affected areas. Participants were assigned to one of two programs: 48 older adults participated in the program "activities and participation", aimed at addressing the challenges of daily living such as loss of habits, meaning to live, social and domestic roles, and leisure; and 44 older adults participated in the program "body functions and structures", aimed at improving their physical functions. Differences between groups were assessed using chi-square tests, t-tests, Mann-Whitney U tests, and Wilcoxon signed-rank tests. The "activities and participation" program was effective in advancing participants' HRQOL ( $p < .01$ , effect size = 0.51). Further, it may lead to improved physical functions. This study indicates that, in a post-disaster response, it is effective to focus on challenges of daily living while considering the QOL of affected older adults. The program was useful in helping older adults affected by disasters to rebuild their lives as part of a disaster response.

Disasters change the lives of people living in the disaster area, including decreasing their quality of life (QOL; Ceyhan & Ceyhan, 2007; Cui & Han, 2019). Older age is negatively associated with QOL (Khachadourian et al., 2015), and older adults are considered the most vulnerable population group (Rushford & Freeman, 2016). It is essential to implement measures to reduce the impact on QOL and support disaster-affected older adults.

The Great East Japan Earthquake, which was an eEee 9.1-magnitude earthquake that occurred in March 2011 in Japan, was ddisaster that the older adults' QOL had decreased significantly (Shimazaki et al., 2015). There were 25,949 dead and missing persons (Reconstruction Agency, 2019). Deaths due to indirect effects of the disaster were 2,688; of these, 2,396 (89.1%) were aged 66 years or older, highlighting that older adults were greatly affected by the disaster (Cabinet Office, 2013). Older adults also experienced psychological (e.g., increased post-traumatic stress disorder symptoms, depression, anxiety, impatience, and anger) and physical (e.g., sleep disorders, elevated blood pressure, stroke, chronic illnesses, and lifestyle-related diseases) problems. In response to these problems, resources such as public transportation, gathering places, and public housing were implemented

(Reconstruction Agency, 2014), and services such as gymnastics and group activities were provided (Shiino & Hasegawa, 2016). Physical and psychological functions are associated with QOL (Greiner et al., 2016; Othman et al., 2016), and exercise and stress coping programs are effective for health-related QOL (HRQOL; Greiner et al., 2016; Othman et al., 2016). These programs focus on "body functions and structures" – a component of the World Health Organization's International Classification of Functioning, Disability, and Health (ICF), a framework for describing and organizing information on functioning and disability.

Disaster-affected people experience challenges with daily living such as loss of habits, life's purpose, social and domestic roles, and leisure activities owing to environmental changes brought about by disasters (Khankeh et al., 2013; Shiino & Hasegawa, 2016). These challenges are associated with HRQOL (Shimazaki et al., 2019) and can be addressed by focusing on the "activities and participation" component of the ICF. However, although some studies have tested the effectiveness of programs that address the challenges of daily living (Akiyama et al., 2018), few have explored their relationship with HRQOL among disaster-affected older adults.

Occupational therapists have reduced the negative effects of "activities and participation" issues on health (Townsend & Polatajko, 2007) and helped improve individuals' HRQOL (Clark et al., 2015). Encouraging participation through occupational therapy supports people's sense of identity, restores adaptation habits, and contributes to the establishment of mental connections amidst disaster situations (Scaffa et al., 2011). Occupational therapists help disaster-affected people adapt to new living environments and manage the health-related consequences of disasters based on individual choices (Rushford & Thomas, 2016).

Therefore, preliminary experiments conducted by the current authors focused on "activities and participation" among disaster-affected older adults. These experiments were constructed using occupational therapy theory and addressed adults' challenges of daily living. The findings indicated that participation in relevant programs may affect older adults' HRQOL (citation blinded for review). Our present aim was clarify the HRQOL effects of a program that addresses the challenges of daily living faced by disaster-affected older adults by adjusting the number of participants based on our preliminary results.

## **Materials and methods**

### ***Study design***

This study used a quasi-experimental design. Participants were assigned to either an experimental group or a control group; a unique program was administered to each group, and the effects were compared. Participants' group assignment was not randomized, as they were given descriptions of both programs and encouraged to participate in the program they preferred. This was done in compliance with the following notification issued to researchers: "consider the psychological burden of the people affected by a disaster when conducting research in the disaster area" (Ministry of Education & Ministry of Health, Labor and Welfare, 2012). To prevent withdrawal bias, we called for participation in all schedules at the time of recruitment and sent reminders of the next schedule and the content of the program to participants, among other procedures.

The sample size was calculated based on the results of our preliminary studies (citation blinded for review), using an effect size of 0.6, a power of 0.8, and a significance level of .05; the result indicated a minimum sample of 36 people was required per group. We decided to recruit at least 43 people for each group (86 people in total) to allow for a 20% withdrawal rate (based on previous and preliminary studies).

### ***Participant recruitment***

The inclusion criteria were as follows: 1) aged 65 or older and 2) left temporary housing or a relative's house to settle in permanent post-disaster housing in M City, Fukushima Prefecture. M City is a hilly and mountainous area that was significantly affected by the Great East Japan Earthquake, consequent tsunami, and radiation. Participants were recruited through advertisements in local newspapers and public-relations magazines; they were not paid or given a reward for their participation.

### ***Program content***

Both the experimental and control group programs were conducted approximately every Sunday, comprising 14 sessions. Both programs were designed and managed by the first author. The program was implemented from June to October 2016 and from June to November 2017. Because of the lifestyle of older adults in Japan can be different in winter (December to February) compared to other seasons. Each session lasted 120 minutes. Baseline data were collected during the first session, and outcome data were collected during the final session.

### ***Experimental group***

In the experimental group, the program to address the challenges of daily living that focused on "activities and participation" was administered. This program was based on a randomized clinical trial of a wellness program for healthy older adults (Yamada et al., 2010) and the Model of Human Occupation (MOHO; Kielhofner et al., 2008), which is a practical model for occupational therapy. The MOHO focuses on concepts relevant to daily life (i.e. values, interests, sense of capacity, role, habits, and environmental influences). The aim of this program was to provide older adults with opportunities to reflect on their challenges of daily living and collaboratively discuss and develop strategies that could help them better meet their needs.

The program comprised two parts. The first part, "learning", involved lectures and discussions. In each lecture, participants were introduced to a certain concept and shown how the concept was related to their everyday lives. In the discussions, they performed exercises to help them self-analyze and reflect on their daily activities, and they discussed aspects that were deemed necessary for a healthy life. Participants were assigned homework after each lecture and were asked to bring the completed work to the subsequent discussion. For example, the second lecture concerned "interests", and aimed to deepen participants' understanding of the definition of interests and its impact on health. After the lecture, as homework, participants reflected on their lives and answered an interest-related questionnaire that was based on the MOHO. In the next session, they engaged in a discussion based on their homework, regarding the topics that had interested them in the past and what they would like to do in the future.

The second part, "practice", involved a group activity that concerned planning and conducting health-related activities using the knowledge gained in previous sessions. For example, one group decided to create a place that would facilitate interactions between older adults. They subsequently held discussions and performed planning exercises. This activity was followed by their first meeting.

Table 1 shows the specific content of the program. The second–ninth sessions comprised the first part, and the 10th–13th sessions constituted the second part. The program was administered by six occupational therapists, two of whom had master's degrees and four had PhDs. To avoid the risk of information bias, the present authors endeavored to remain neutral and were only involved in facilitating group activities during the second part of the program.

### ***Control group***

In the control group, an exercise program focused on "body functions and structures" was administered. This program was based on the recommendations of the Ministry of Health, Labor and Welfare in Japan concerning the improvement of physical functions; its effects on HRQOL have been verified

**Table 1.** Specific content of the program.

Learning	1	Orientation, Measurement
	2	Local health (lecture), Interests (lecture)
	3	Interests (discussion), Roles (lecture)
	4	Roles (discussion), Habits (lecture)
	5	Habits (discussion), Performance capacity (lecture)
	6	Performance capacity (discussion), Personal causation (lecture)
	7	Personal causation (discussion), Values (lecture)
	8	Values (discussion), Environment (lecture)
	9	Environment (discussion), Reflect on life
Practice	10	Planning and executing activities necessary for one's own health (1)
	11	Planning and executing activities necessary for one's own health (2)
	12	Planning and executing activities necessary for one's own health (3)
	13	Planning and executing activities necessary for one's own health (4)
	14	Measurement, Completion ceremony

in previous studies (Greiner et al., 2016). The program included physical exercise and lectures regarding body structures. Generally, it is recommended to exercise 30 minutes at least two days a week to improve physical function (Ministry of Health, Labor and Welfare, 2017); therefore, participants were assigned home-based exercise as homework and at the next session were asked to report how many minutes they had exercised. The control group program was conducted by occupational therapists, physical therapists, and speech-hearing therapists who are all experts in their fields with over five years of clinical experience.

## Measures

### Individual information

A questionnaire was used to collect demographic data such as age, sex, and exercise habits; factors that were reported in previous studies as affecting health behavior, such as depression and self-efficacy; and social determinants of health, such as employment and social exclusion. The geriatric depression scale was used to measure depression and the General Self-Efficacy Scale was used to measure self-efficacy.

### HRQOL

HRQOL was evaluated using the Japanese version of the Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36; Fukuhara & Suzukamo, 2004). The SF-36 is a comprehensive tool for examining HRQOL, and the target audience is not limited. Across its 36 items, eight concepts are measured and the reliability coefficients of each scale has been validated (Fukuhara et al., 1998): physical function ( $\alpha = 0.84$ ), role physical (RP) ( $\alpha = 0.83$ ), bodily pain ( $\alpha = 0.87$ ), general health (GH) ( $\alpha = 0.86$ ), vitality (VT) ( $\alpha = 0.78$ ), social function (SF) ( $\alpha = 0.71$ ), role emotional (RE) ( $\alpha = 0.78$ ), and mental health ( $\alpha = 0.83$ ). In the present study, based on the results of preliminary experiments (citation blinded for review), only four items (related to appreciation of the value of roles and social participation: RP, SF, RE, and GH) that were expected to be highly effective were analyzed.

### The challenges of daily living

The challenges of daily living were evaluated using the Japanese version of the Occupational Self-Assessment, Version 2.1 (OSA). Based on the MOHO, the OSA measures self-perceived competency (the respondent's view of his/her ability to perform an occupation) and value (the importance of certain occupations for the respondent) for 29 items. The scores were derived from the ratings provided for competency and value. For both competency and value, participants rated their abilities to perform a range of daily activities, and their perceived importance, respectively, using a 4-point scale (ranging from 1 to 4). In this study, based on the preliminary experiments

(citation blinded for review), only 13 items were used in the analysis, which were expected to be highly effective. OSA has been validated and can sensitively measure self-perceived competency and value (Kielhofner et al., 2008). Its Japanese version is also reliable and valid (Ishii & Yamada, 2008).

### **Physical function**

Physical function was evaluated using the exercise-measurement items for older adults specified by the Ministry of Health, Labor and Welfare in Japan: grip strength, one-leg standing time, timed up and go test, and 5-m walking time test. For the timed up and go test and the 5-m walking time test, lower scores indicate better physical function.

### **Statistical analysis**

Chi-square tests, t-tests, Mann-Whitney U tests, and Wilcoxon signed-rank tests were used to examine the differences between the groups, controlling for sample distribution and variable characteristics. This study adopted a one-sided test. First, we analyzed whether participants differed in demographic characteristics. Then, among the participants who completed the study, we compared the between-group differences from the baseline date to the outcome date regarding the three outcome variables (HRQOL, OSA, and physical function). HRQOL was the primary variable to facilitate multiple testing. The secondary measures were OSA scores and physical function measurements, which were treated as exploratory measures.

Significance was adjusted to less than 1%, controlling for multiplicity, and OSA and physical function were treated as exploratory indicators. Missing values were processed with multiple imputation. Statistical analysis was performed using IBM SPSS Statistics Base and Missing Values v. 25 (SPSS; IBM, Tokyo, Japan).

### **Ethics**

This study was approved by the ethics committee of the authors' affiliated institution (protocol number 0047–2015), and it was registered with the UMIN Clinical Trials Registry (UMIN-CTR; UMIN000039121). All participants were informed of the objectives and procedure of the study, and that they could withdraw from the study at any time. Written informed consent was obtained from all participants.

## **Results**

### **Participants**

78 participants completed the study: 42 from the experimental group (13 men, 29 women; mean age =  $74.3 \pm 5.0$  years) and 36 from the control group (7 men, 29 women; mean age =  $77.1 \pm 6.1$  years; Figure 1). The comparison between the individual information of the experimental group and that of the control group showed no significant differences for any item (Table 2).

### **Between groups comparison of the baseline scores for challenges of daily living, physical function, and HRQOL**

Baseline data for the OSA score, physical function, and SF-36 score were compared between the groups. As for OSA, the score for the control group was significantly higher for item 9: "the things I need to be productive" ( $p = .02$ ). There were no significant differences between the groups regarding the scores for physical function or SF-36 (Tables 3 and 4).

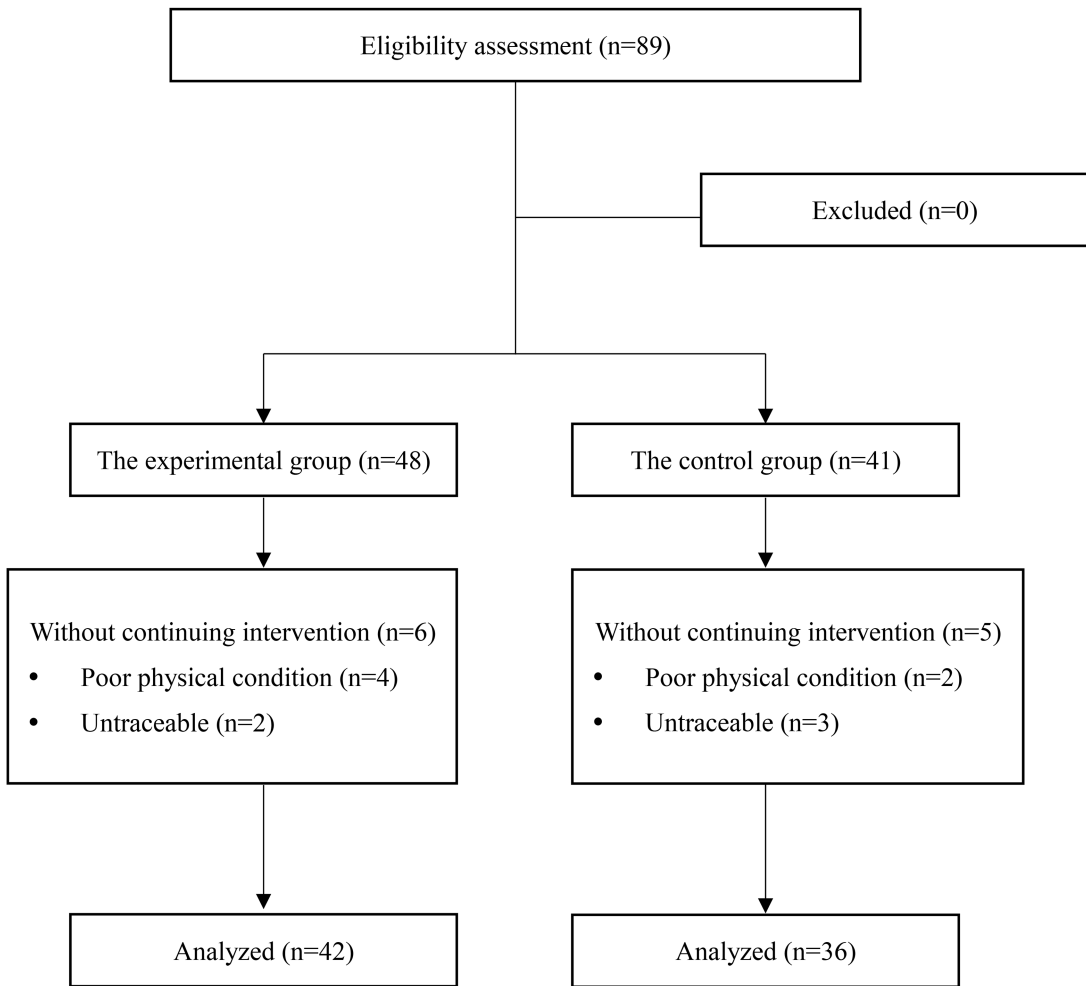


Figure 1. Participant group allocation and retention flowchart.

Table 2. Participants' Demographic Characteristics.

		Experimental group (n = 42)	Control group (n = 36)	p-value
Age		74.3 ± 5.0	77.1 ± 6.1	.06
Sex	Men	13	7	.30
	Women	29	29	
Exercise habits	Exercise regularly	27	28	.22
	None	15	8	
Employment status	Employed	10	8	1.00
	Unemployed	32	28	
Social exclusion	Participating	31	31	.26
	Not participating	11	5	
Depression	GDS score	6.00(5.00, 8.00)	6.00(5.00, 8.00)	.82
Self-efficacy	GSES score	6.00(4.00, 12.00)	8.00(5.50, 9.00)	.70

Age, sex, exercise habits, employment status, and social exclusion were analyzed using a chi-square test. GDS: General Depression Score; GSES: General Self Efficacy Score.

Depression and self-efficacy were analyzed using a Mann-Whitney U test.

**Table 3.** Comparison between groups of baseline scores for SF-36 and physical functions.

	Experimental group <i>M(SD)</i>		Control group <i>M(SD)</i>		p-value
RP	71.49	(23.88)	71.88	(28.08)	.95
GH	56.27	(15.12)	51.57	(15.59)	.21
SF	82.62	(16.74)	87.08	(17.82)	.28
RE	75.61	(25.58)	75.83	(24.50)	.94
Grip strength	24.77	(8.05)	22.69	(6.23)	.23
One-leg standing time	24.10	(19.16)	30.98	(24.02)	.19
Timed up and go test	7.12	(1.69)	6.73	(1.05)	.21
5-m walking time test	3.35	(0.79)	3.45	(0.88)	.61

T-test. *M(SD)*: mean (standard deviation). RP: Role Physical; GH: General Health; SF: Social Function; RE: Role Emotional.

**Table 4.** Comparison between groups regarding baseline scores for OSA.

OSA	Experimental group(%)				Control group(%)				p-value
	I have a lot of problems doing this	I have some difficulty doing this	I do this well	I do this extremely well	I have a lot of problems doing this	I have some difficulty doing this	I do this well	I do this extremely well	
1. Relaxing and enjoying myself	0.0	6.3	70.8	22.9	3.2	3.2	67.7	25.8	.85
2. Getting what I need to do done	4.2	22.9	64.6	8.3	3.2	19.4	51.6	25.8	.24
3. Having a satisfying routine	2.1	20.8	64.6	12.5	0.0	19.4	71.0	9.7	.93
4. Handling my responsibilities	2.1	14.6	62.5	20.8	0.0	6.5	71.0	22.6	.70
5. Being involved as a student, worker, volunteer, and/or family member	9.1	15.9	63.6	11.4	0.0	12.9	61.3	25.8	.06
6. A place to live and take care of myself	0.0	4.2	77.1	18.8	3.2	3.2	64.5	29.0	.73
7. A place where I can be productive (work, study, volunteer)	4.3	12.8	70.2	12.8	3.2	9.7	71.0	16.1	.67
8. The basic things I need to live and take care of myself	0.0	12.5	79.2	8.3	0.0	12.9	61.3	25.8	.29
9. The things I need to be productive	2.2	28.3	65.2	4.3	0.0	12.9	61.3	25.8	<b>.02</b>
10. People who support and encourage me	6.3	6.3	68.8	18.8	3.2	12.9	58.1	25.8	.99
11. People who do things with me	6.3	18.8	66.7	8.3	9.7	9.7	48.4	32.3	.29
12. Opportunities to do things I value and like	2.1	12.5	75.0	10.4	0.0	16.1	58.1	25.8	.20
13. Places where I can go and enjoy myself	4.2	18.8	72.9	4.2	0.0	16.1	54.8	29.0	.51

Wilcoxon signed-rank test. As the scale comprised four points, it is difficult to obtain accurate median results; thus, the values in the table represent the proportions respective respondents. OSA: Occupational Self-Assessment.

### **Between groups comparison regarding change scores for HRQOL and physical function**

Change scores for SF-36 and physical function were compared between the groups. For SF-36, the experimental group had a significantly higher change score for GH ( $p < .001$ ,  $d = 0.51$ , 95% CI: 0.06–0.96), and the effect size was moderate. For physical function, there was no significant difference in the change scores for either group (Table 5).

**Table 5.** Comparison of change scores for SF-36 and physical functions between groups.

	Experimental group						Control group						p-value	Effect size
	Baseline M(SD)	Reevaluation M(SD)	Change M(SD)		Baseline M(SD)	Reevaluation M(SD)	Change M(SD)							
RP	71.49 (23.88)	75.63 (23.67)	6.25 (21.81)		71.88 (28.08)	77.23 (21.73)	5.50 (18.95)		.64	0.12				
GH	56.27 (15.12)	55.33 (17.91)	6.96 (13.90)		51.57 (15.59)	58.43 (12.45)	0.44 (11.33)		.00	0.62				
SF	82.62 (16.74)	88.75 (15.96)	8.11 (17.51)		87.08 (17.82)	83.04 (21.03)	-2.00 (19.32)		.11	0.40				
RE	75.61 (25.58)	79.38 (24.89)	5.95 (25.45)		75.83 (24.50)	80.95 (21.26)	7.00 (19.64)		.54	0.16				
Grip strength	24.77 (8.05)	26.66 (7.24)	0.36 (2.67)		22.69 (6.23)	24.17 (6.06)	1.28 (2.81)		.42	0.10				
One-leg standing time	24.10 (19.16)	26.51 (21.93)	2.09 (19.73)		30.98 (24.02)	36.63 (22.94)	2.13 (12.59)		.13	0.19				
Timed up and go test	7.12 (1.69)	7.15 (17.96)	0.13 (1.21)		6.73 (1.05)	6.75 (1.50)	-0.05 (0.76)		.64	0.06				
5-m walking time test	3.35 (0.79)	2.87 (0.62)	-0.47 (0.56)		3.45 (0.88)	2.87 (0.69)	-0.59 (0.56)		.22	0.15				

T-test. M(SD): mean (standard deviation).

Reverse item; for the timed up and go test and the 5-m walking time test, lower scores indicate better physical function.

### **Between groups comparison regarding change scores for challenges of daily living**

The change scores for OSA were compared between the groups. This showed that the change score for the experimental group was significantly higher for two items: item 9, "the things I need to be productive" ( $p < .001$ ,  $r = 0.50$ , 95% CI: 0.06–1.02); and item 13, "places where I can go and enjoy myself" ( $p < .001$ ,  $r = 0.48$ , 95% CI: 0.00–0.96). The effect size ranged from moderate to large (Table 6).

## **Discussion**

The goal of disaster response in Japan is to ensure the affected people to healthy and autonomous lives. Thus, the interest in daily life in the community is promoted among rehabilitation professionals. In the present study, two program types – one addressing the challenges of daily living and one exercising – were administered to the older adults after the Great East Japan Earthquake. It was suggested that a program addressing the challenges of daily living may be more effective in improving HRQOL. Upon study completion, participants were encouraged to participate in similar activities sponsored by the local community.

### **Effects of the programs on HRQOL**

Comparing HRQOL between the experimental and control groups showed that the post-program score for the experimental group was significantly higher than that of the control group for two items: GH that represents "perception of health" and SF that represents "interaction with others". The effect size showed that the experimental program had a moderate effect on GH and that this program was useful to improve GH in older adults affected by the disaster. Social participation can help older adults feel mentally healthier (Hao et al., 2017). The experimental program included discussions and exchanges of opinions between participants that encouraged social participation. This seems to have led to an increase in the health of older adults affected by the disaster. Thus, programs that address the challenges of daily living may have a positive impact on HRQOL if they focus on perceptions of health and interactions with others among disaster-affected older adults.



Table 6. Comparison of change scores for OSA between groups.

OSA	Experimental group(%)										Control group(%)				Effect size							
	Baseline					Reevaluation					Baseline		Reevaluation									
	I have a lot of problems doing this	I do this extremely well	I do this extremely well	I have a lot of problems doing this	I have some difficulty doing this	I have a lot of problems doing this	I do this extremely well	I do this extremely well	I have a lot of problems doing this	I have some difficulty doing this	I do this extremely well	I do this extremely well	I have a lot of problems doing this	I have some difficulty doing this		Change	p-value					
1. Relaxing and enjoying myself	0.0	6.3	70.8	22.9	0.0	2.6	76.3	21.1	0.0	(0.00)	3.2	67.7	25.8	0.0	(0.00)	0.94	0.01					
2. Getting what I need to do done	4.2	22.9	64.6	8.3	0.0	18.4	57.9	23.7	0.0	(1.00)	3.2	19.4	51.6	25.8	0.0	(0.00)	0.04	0.26				
3. Having a satisfying routine	2.1	20.8	64.6	12.5	2.6	7.9	78.9	10.5	0.0	(0.00)	0.0	19.4	71.0	9.7	0.0	(0.25)	0.67	0.05				
4. Handling my responsibilities	2.1	14.6	62.5	20.8	2.6	7.9	65.8	23.7	0.0	(0.25)	0.0	6.5	71.0	22.6	3.7	7.4	63.0	25.9	0.0	(0.00)	0.50	0.08
5. Being involved as a student, worker, volunteer, and/or family member	9.1	15.9	63.6	11.4	2.8	19.4	69.4	8.3	0.0	(1.00)	0.0	12.9	61.3	25.8	4.0	16.0	72.0	8.0	0.0	(0.00)	0.04	0.26
6. A place to live and take care of myself	0.0	4.2	77.1	18.8	0.0	2.6	71.1	26.3	0.0	(0.00)	3.2	3.2	64.5	29.0	3.8	3.8	61.5	30.8	0.0	(1.00)	0.56	0.07
7. A place where I can be productive (work, study, volunteer)	4.3	12.8	70.2	12.8	0.0	19.4	75.0	5.6	0.0	(0.00)	3.2	9.7	71.0	16.1	8.3	8.3	83.3	0.0	0.0	(0.00)	0.38	0.11
8. The basic things I need to live and take care of myself	0.0	12.5	79.2	8.3	0.0	5.3	84.2	10.5	0.0	(0.00)	0.0	12.9	61.3	25.8	4.0	16.0	60.0	20.0	0.0	(1.00)	0.52	0.08
9. The things I need to be productive and encourage me	2.2	28.3	65.2	4.3	2.7	8.1	81.1	8.1	0.0	(0.00)	0.0	12.9	61.3	25.8	4.3	21.7	73.9	0.0	-1.0	(0.00)	0.00	0.50
10. People who support and encourage things I value and like	6.3	6.3	68.8	18.8	0.0	7.9	55.3	36.8	0.0	(1.00)	3.2	12.9	58.1	25.8	0.0	9.8	73.1	23.1	0.0	(0.25)	0.36	0.11
11. People who do things with me	6.3	18.8	66.7	8.3	0.0	7.9	71.1	21.1	0.0	(1.00)	9.7	9.7	48.4	32.3	0.0	7.7	73.1	19.2	0.0	(0.25)	0.20	0.16
12. Opportunities to do things I value and like	2.1	12.5	75.0	10.4	0.0	7.9	71.1	21.1	0.0	(1.00)	0.0	16.1	58.1	25.8	0.0	15.4	57.7	26.9	0.0	(0.25)	0.19	0.16
13. Places where I can go and enjoy myself	4.2	18.8	72.9	4.2	0.0	7.9	71.1	21.1	0.0	(1.00)	0.0	16.1	54.8	29.0	3.8	7.7	69.2	19.2	0.0	(0.00)	0.00	0.31

Wilcoxon signed-rank test. As the scale comprised four points, it is difficult to obtain accurate median results; thus, the values in the table represent the proportions of respective respondents. The values of change indicate: median (interquartile deviation). OSA: Occupational Self-Assessment

### ***Effects of the programs on challenges of daily living and physical functions***

The scores for two OSA items (items 9 and 13) improved significantly in the experimental group compared to the control group, and the effect sizes indicated a moderate effect. Both items were related to the environment, which indicates that engaging in a program that focuses on "activities and participation" can mitigate the challenges of daily living relating to the environment. The experimental program was designed to encourage participants to reflect on their daily lives and conduct a self-analysis – where they reflect on their past, present, and future occupations, roles, routines, and identities. Self-analysis helps people develop a clear understanding of the activities that are important to them and can help them optimize their lives and develop a productive and satisfying lifestyle (Clark et al., 2015). Notably, people can change their environment to match their activities (Kielhofner et al., 2008). In other words, self-analysis of one's daily activities and the identification of necessary activities can lead to the creation of appropriate living environments. Programs that address the challenges of daily living may help older adults who are affected by disasters to change their living environments to facilitate the performance of essential individual activities.

As for the change in physical function, there were no significant differences between the experimental and control groups. These results indicate that programs that address the challenges of daily living may have a positive effect on physical function. Behavioral changes and physical functions have previously been shown to be related (Gardner et al., 2017), and the changes in activities can influence changes in physical function (Cardinal & Kosma, 2004). The experimental program provided participants with experience in identifying and implementing essential health-related activities. The program did not include physical exercise; however, it encouraged participants to engage in activities that were not normally practiced. Although the current results cannot confirm whether participants subsequently changed their lifestyle patterns, the experience of identifying and implementing essential health-related activities may have determined positive changes in older adults' physical function.

### ***Limitations***

There were some limitations to the present study. A randomized controlled trial design was not used, and we could not consider confounding factors other than those related to demographic characteristics. In addition, withdrawal bias cannot be excluded as it was not possible to track persons who did not complete the program owing to their poor physical condition. Furthermore, certain items showed a significant difference in the baseline comparison; therefore, it may be necessary to perform comparative verification considering confounding factors such as the evacuation period and the disaster situation. Further, although direct contact between the authors and the participants was avoided, the risk of the Hawthorne effect cannot be completely disregarded. Finally, participants could choose the program they preferred; thus, self-selection bias could not be controlled. However, in the analysis, we used HRQOL change amount; thus, we posit that it is unlikely that only self-selection bias explains the effect on HRQOL.

### ***Conclusions***

The program to address the challenges of daily living effectively improved the HRQOL of older adults affected by the Great East Japan Earthquake. This program provided opportunities for affected older adults to reflect on their daily activities and conduct self-analysis, and it encouraged discussion and the exchange of opinions among participants. This approach may have a positive effect on participants' HRQOL, and it may lead to the optimization of living environments and physical function improvements. Our findings indicate that, in a post-disaster response, it is effective to focus on challenges of daily living while considering the QOL of affected older adults. Programs should also aim to promote

their responsiveness rather than their vulnerability.

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The authors declare they have no conflicts of interest and are responsible for the content and writing of the article.

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