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Effects of a program to prevent social isolation on loneliness, depression, and subjective well-being of older adults: A randomized trial among older migrants in Japan

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ABSTRACT

Social isolation among the elderly is a concern in developed countries. Using a randomized trial, this study examined the effect of a social isolation prevention program on loneliness, depression, and subjective well-being of the elderly in Japan. Among the elderly people who relocated to suburban Tokyo, 63 who responded to a pre-test were randomized and assessed 1 and 6 months after the program. Four sessions of a group-based program were designed to prevent social isolation by improving community knowledge and networking with other participants and community "gatekeepers." The Life Satisfaction Index A (LSI-A), Geriatric Depression Scale (GDS), Ando-Osada-Kodama (AOK) loneliness scale, social support, and other variables were used as outcomes of this study. A linear mixed model was used to compare 20 of the 21 people in the intervention group to 40 of the 42 in the control group, and showed that the intervention program had a significant positive effect on LSI-A, social support, and familiarity with services scores and a significant negative effect on AOK over the study period. The program had no significant effect on depression. The findings of this study suggest that programs aimed at preventing social isolation are effective when they utilize existing community resources, are tailor-made based on the specific needs of the individual, and target people who can share similar experiences.

1. Introduction

Elderly people who are socially isolated from their family members or community are a concern in western countries (Findlay, 2003; Grenade & Boldy, 2008; Sabir et al., 2009). Previous studies showed that 5–20% of aged people are at risk of social isolation (Findlay, 2003; Lubben et al., 2006), caused by decline in health (Grenade & Boldy, 2008) and life events such as the death of a spouse or relocation (Grenade & Boldy, 2008; Saito, Lee, & Kai, 2007; Saito, Sugisawa, Sugihara, Okabayashi, & Shibata, 2000). Although there is no consensus on the definition of social isolation, it is generally agreed to be a state with little contact with family members, friends, or neighbors who form supportive networks for the individual (Lubben et al., 2006). Social isolation is sometimes confounded with loneliness, which is a subjective feeling of distress caused by the discrepancy between the quantitative and qualitative interpersonal relationships a person has and desires to have (McWhirter, 1990; Pinquart & Sorensen, 2001).

Social isolation and loneliness are distinct but interrelated concepts (Grenade & Boldy, 2008). The lack of social support and involvement in community activities are also closely related to social isolation. Berkman, Glass, Brissette, and Seeman (2000) proposed a conceptual framework in which social networks generate social support and social engagement. This framework was supported by Blozik et al. (2009) using data from a cross-national survey. Thus, social isolation should not be considered a simple state of scarcity in social contact but quantitative and qualitative imperfections in social connectivity.

Many studies indicate relationships between social connectivity and mortality (Berkman & Syme, 1979; Iwasaki et al., 2002; Lund, Modvig, Due, & Holstein, 2000), disability (Avlund, Lund, Holstein, & Due, 2004; Unger, Johnson, & Marks, 1997), cognitive ability (Seeman, Lusignolo, Albert, & Berkman, 2001; Zunzunegui, Alvarado, Del Ser, & Otero, 2003), depression (Jang, Haley, Small, & Mortimer, 2002; Prince, Harwood, Thomas, & Mann, 1998), and subjective well-being (McAuley et al., 2000; Pinquart & Sorensen, 2000) in the elderly. Since these variables can be modified by relevant interventions (Stevens, Martina, & Westerhof, 2006), they are thought to represent promising avenues for health-promotion programs (Cattan, White, Bond, & Learmouth, 2005; McAuley et al., 2000).

Cattan et al. (2005) reviewed 30 intervention studies of social isolation and/or loneliness among older people. They concluded

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that group-oriented educational and/or social support programs targeting specific groups such as women or caregivers, promoting involvement from the older people, and utilizing existing community resources were effective in reducing social isolation. Findlay (2003) also suggested that gatekeeper programs that utilize gatekeepers to identify people at risk for social isolation and connect them to the community services are effective.

However, these reviews showed that the design of previous intervention studies was problematic, such as having no comparison group or no randomized design, and that more studies using randomized controlled designs are needed to provide stronger evidence. Moreover, all these studies were conducted in Western countries such as the United States, Australia, the United Kingdom, and other European countries. Therefore, the effectiveness of the programs on social isolation or loneliness in other countries is unclear.

A recent systematic review by Dickens, Richards, Greaves, and Campbell (2011) showed that 16 studies used randomized controlled trials and provided a group-based program targeting socially isolated people. Among them, four studies primarily aimed to prevent social isolation. A Finnish study group examined the effectiveness of a group-based psychosocial program for preventing social isolation and loneliness for elderly people who suffered from loneliness (Pitkala, Routasalo, Kautiainen, Sintonen, & Tilvis, 2011; Pitkala, Routasalo, Kautiainen, & Tilvis, 2009; Routasalo, Tilvis, Kautiainen, & Pitkala, 2009). They showed that programs that enhanced relationships between group members had a positive effect on mortality, subjective health (Pitkala et al., 2009), and cognitive health (Pitkala et al., 2011), but no significant effect on loneliness. Moreover, these studies did not aim to enhance networking with people other than group members such as "gatekeepers" or other community resources.

In Japan, people are generally thought to have abundant and close personal networks of kinship or community members, and this is believed to be one of the reasons that Japanese people have the highest longevity in the world (Marmot & Smith, 1989; Takao, 2009). However, the proportion of non-married people in Japan has increased rapidly (National Institute of Population and Social Security Research, 2010), while community ties have remained weak in the last few decades (Cabinet Office, 2011), which may cause a decrease in the quantity and quality of social relationships. Several studies have shown that 10.4–28.7% of elderly Japanese people are socially isolated (Saito, Shimizu, Yamaguchi, & Takei, 2009; Saito et al., 2010). Yabe, Nishimura, Asakawa, Ando, and Koyano (2002) showed that the majority of elderly people made friends at schools or workplaces, which suggests that it might be difficult for elderly Japanese people to make friends with others as they become older. In addition, a cross-national survey showed that the proportion of elderly people who have no close friends is higher in Japan than in the United States, France, and Germany (Cabinet Office, 2011). Thus, it is possible that the Japanese elderly are vulnerable to a loss of social relationships since the community resources to form new social networks in old age are limited.

Recently, prevention of social isolation has become an important issue in Japan (Cabinet Office, 2011). A variety of programs aimed at preventing social isolation has recently been developed by local governments, NPOs, and other local organizations. However, most of the programs were not developed based on the scientific evidence but on the practical experiences of the staff, and the effects of these programs are seldom evaluated. Moreover, a majority of the programs are limited in targeting only elderly people who live alone or who are frail. Our previous study (Saito et al., 2007) showed that elderly people who experienced a recent relocation had a higher risk of social isolation. Consequently, we should recognize that social isolation is not only a problem for people living alone. However, there are very few previous intervention studies to prevent social isolation or improve social integration for elderly people in Japan, and to the best of our knowledge, none of these study has employed randomized trials.

We developed an intervention program that aimed to prevent social isolation by improving community knowledge and networking with other participants and community "gatekeepers", and as a result, lead to well-being among older Japanese migrants. In evaluating the effect of the program, we used a randomized controlled design and followed up 6 months after the end of the intervention program.

2. Methods

2.1. Study site

City A is located in the suburbs of Tokyo, the capital of Japan. The city was selected as the study site because, according to the national census conducted in 2000, it has a high proportion of people aged 65 years and above who moved to the city in the last 5 years. This proportion in City A is 11.2%, which is more than twice the national average of 4.7% (Saito et al., 2007).

2.2. Procedure

The procedure for this study is shown in Fig. 1. Based on a previous study (Saito et al., 2007), we assumed that the elderly people who experienced relocation within 2 years tended to be socially isolated. A total of 999 senior citizens aged 65 years or over who had moved into City A within the last 2 years were selected from the Basic Resident Registration Cards. Among them, 290 older persons who had moved to residential facilities (i.e., a special care or home-care facility for the frail elderly) in City A were excluded from the recruiting list because the facilities provide specific services. In July 2006, a recruiting letter and a consent form were sent to the 709 senior residents.

The recruitment letter contained an outline of the intervention program and requirements for participation, such as cooperation for three evaluation questionnaires during the study period. It also explained that participants were randomly assigned to two groups and that people in the control group had to wait for 7 months before participating in the program. People in the control group were sent several newsletters or written information about group activities in City A during the intervention period. The participants were told that there was no compulsion to participate, that they could choose to discontinue at any point during the study procedure, and that their data would be kept confidential throughout.

A total of 76 senior residents returned the signed consent form for participation in the study within 3 weeks of the date of recruitment. We could not determine why the remaining 633 people did not send back the form, although our previous study (Saito, Lee, & Kai, 2006) showed that common reasons for non-participation included ill health, being too busy, and having no interest. Among the 76 respondents, 63 completed a self-administered mail questionnaire pre-test (T1) survey and were assigned sequential numbers in the order of their response. In the group allocation, the sequential numbers were randomly assigned to two groups with an allocation ratio of 1:2 for the intervention and control groups, respectively, according to simple randomization. As a result, 21 people were allocated to the intervention group and 42 to the control group; this allocation was carried out by the authors, who developed and implemented the program and analyzed the data. Thus, this trial was randomized but was not blinded. In addition, sample size was not determined by a sample size calculation based on the estimated mean difference between the two groups but by the feasibility of implementing the program

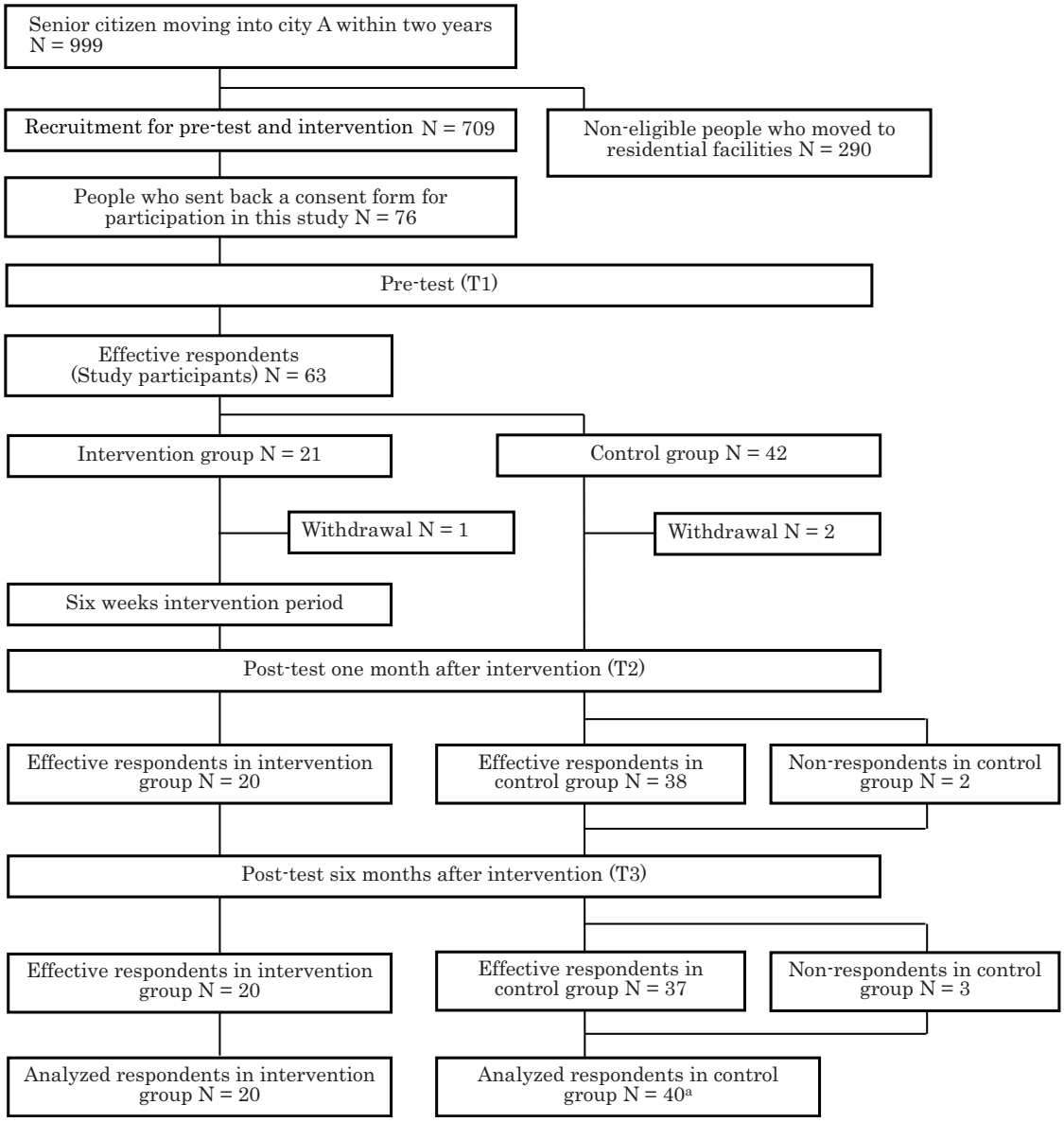

Fig. 1. Study procedure. *Note*: [a]Those analyzed in the control group responded to at least one post-test. Among 40 people in the control group, 35 responded to both post-test and five responded either T2 or T3.

effectively and by the number of senior citizens who applied for the program.

The intervention program was conducted during September and October 2006. Twenty of 21 intervention group members and 38 of 42 control group members responded to the first follow-up self-administered mail survey (T2), which was conducted 1 month after the intervention program ended. Six months after the intervention program ended, the second follow-up survey (T3) was conducted with the same method as T2 survey, and 20 people in the intervention group and 37 out of 42 people in the control group responded. We compared the results for those participants who completed at least one follow-up survey (T2 and/or T3). Among 21 people in the intervention group, 20 completed both follow-up surveys and one person dropped out before the first follow up survey was conducted. As for the control group, 35 of 42 people completed both follow-up surveys, five people completed either the T2 or the T3 survey, and two people withdrew from the program. The study protocol was approved by the IRB committee in the University of Tokyo, Japan.

2.3. Intervention

The purpose of the intervention was to improve the health and well-being of the elderly participants by preventing social isolation. Based on previous studies (Cattan et al., 2005; Findlay, 2003), we developed a group-based educational, cognitive, and social support program designed to prevent social isolation by improving community knowledge and networking with other participants and various community "gatekeepers," who could make connections between the study participants and community services.

In developing this intervention, we conducted a telephone survey for elderly migrants to get a grasp of their needs, demands, and preferences, and we reviewed previous programs for elderly migrants. We utilized existing community resources in City A (Saito et al., 2006). A department in City A provided us with information on activities and support systems for elderly people and communicated with other departments and community leaders in City A who might be helpful to elderly migrants. In

addition, a member of the community who was experienced in leading group activities for the elderly and four elderly migrants who participated in our previous pilot program participated in this intervention program as volunteer supporters. More detailed information on the program's development is provided in Saito et al. (2006).

The program contained four 2-h sessions. Sessions were conducted once every 2 weeks at a public facility in City A. The first session introduced the content of the intervention programs, provided an opportunity for participants to acquaint themselves with other older migrants and staff who were participating in the program, and to learn general information about City A.

The second session was used for a focus group discussion about the effects of participants' relocation experiences on their lives. This activity aimed at making the participants aware of their own needs and, by sharing personal relocation experiences, to promote the formation of networks among the participants. We asked three experienced colleagues to facilitate the discussion.

The third session was conducted to find out what information each participant was interested in and for meetings with gatekeepers who could support each participant based on their interests. We prepared seven small booths where participants could make face-to-face contact with each gatekeeper specializing in specific themes such as health and welfare issues, volunteering, and leisure activities for seniors in City A; history or historical places in City A; transportation and commercial facilities in City A; or the department in City A that provides information on activities and support for the frail elderly.

In the final session, we conducted a sightseeing tour of City A to show the participants public facilities and historical places. This was aimed at increasing opportunities for going out or utilizing public services.

2.4. Measurement

2.4.1. Indicators of subjective well-being, depression, and loneliness

We measured subjective well-being with the LSI-A (Neugarten, Havighurst, & Tobin, 1961), which is one of the most well-known and validated scales. It gages the long-term cognitive evaluation of a person's life as well as transient affective feelings (Lawrence & Liang, 1988). We used a 10-item Japanese version of the LSI-A scale (Kim, Sugisawa, Okabayashi, Fukaya, & Shibata, 1999) that has the same structure as Liang's (1984) (Saito et al., 2000). Scores ranged from 10 to 30, and internal consistency (alpha coefficient) was 0.72, 0.80, and 0.80 at pre-test, 1-month follow-up, and 6-month follow-up, respectively.

The GDS was developed to measure the affective dimension of depressive status in older populations (Yesavage et al., 1983). We used a Japanese version of the scale with 15 items, which has high construct validity and internal consistency (Niino, Imaizumi, & Kawakami, 1991). Its internal consistency (alpha coefficient) in this study was 0.78, 0.78, and 0.77, at pre-test, 1-month follow-up, and 6-month follow-up, respectively.

We measured loneliness using the AOK loneliness scale, which was developed as a revised version of the revised UCLA (University of California, Los Angeles) loneliness scale (Russell, Peplau, & Cutrona, 1980) and showed internal consistency and concurrent validity (Ando, Osada, & Kodama, 2000). The internal consistency (alpha coefficient) in this study was 0.87, 0.86, and 0.90, at pre-test, 1-month follow-up, and 6-month follow-up, respectively.

2.4.2. Indicators of social support, network, and activity

We measured social support with four items related to emotional support and four items related to instrumental support provided by the participants' informal networks, such as family members, children who live apart from the participant, relatives, friends, or neighbors. The responses were scored one for each item if they received support from any informal networks, and zero if they received no support. We summed all the social support items, as the results of a principal component analysis showed that all the social support items had a factor loading score higher than 0.4 on the primary factor.

Social network was assessed with one item that evaluated the frequency of face-to-face contact with friends or neighbors on a scale from 1 (no contact) to 6 (contact more than twice per week). This item was treated as a continuous variable.

In addition to the social support and network indicators, frequency of participation in group activities such as neighborhood organization, commercial organization, hobby group, or religious group was assessed with one item that ranged from 1 (not participating) to 6 (participating more than twice per week).

2.4.3. Familiarity with the formal services provided by City A

Utilization of services provided by the community was an important issue in previous studies on social connectivity (Kouzis & Eaton, 1998; Russell & Schofield, 1999). We used familiarity with formal services for the elderly as a proxy measure for service utilization. This was assessed by asking participants if they knew about the existence of two services for frail elderly citizens covered by Long-term Care Insurance System, and seven other services for elderly people provided by NGOs and local government. We summed the number of known items, resulting in a score that ranged from 0 to 8.

2.4.4. Other participant characteristics

Information about basic and instrumental activities of daily living, marital status, living arrangement, educational attainment, gender, and age was collected at the pre-test for participants in both the intervention and control groups.

2.5. Analysis

All the analyses were conducted using the principles of intention-to-treat analysis, which was defined as all participants who are randomly assigned to either intervention group or control group and responded to the evaluation questionnaires at least once (T2 and/or T3) after the intervention.

To examine the differences in the characteristics of the intervention and control groups at pre-test, we conducted *t*-tests for continuous variables, or Fisher's exact tests for dichotomous variables. A linear mixed-model analysis on each dependent variable was used to assess the effect of the intervention program on elderly migrants. The participants were modeled as a random effect since we assumed a within-subject correlation between measures. The intervention (group), time, the interaction between group and time, and intercept were modeled as fixed effects. A pre-test score of each dependent variable was entered into the model as a covariate. All the analyses were estimated using a restricted maximum likelihood method. Additionally, subgroup analyses by severity-of-loneliness level were conducted to determine whether the effect of the intervention program was different on people with different risk levels. Since the cutoff scores of the AOK loneliness scale and the UCLA loneliness scale were unknown, we regarded people who responded to all ten AOK items with "not lonely"—those who scored 10 points—as members of the low-risk group, while those who scored 11 points or more were considered members of the high-risk group. The subgroup analyses were conducted with a Wilcoxon signed-rank test comparing the pre-test (T1) and the post-test 1 month after the intervention (T2), T1 and the post-test 6 months after the intervention (T3), and T2 and T3 among four different groups (two different risk levels for each of the intervention and control groups). The subgroup analyses were

conducted only on the variables that showed statistical significance in the main analyses.

In this study, p values of less than 0.05 (two-tailed) were interpreted as statistically significant, and the analyses were conducted using the Japanese version of SPSS 18.0.

3. Results

3.1. Participant characteristics at pre-test

The characteristics of the intervention and control group participants are shown in Table 1. There were no statistical differences between the intervention and control groups in terms of participant characteristics at pre-test other than familiarity with services, which was significantly higher in the control group ($p = 0.041$). The average age of participants in the intervention group was 72.6, and eight of those participants were male (40.0%). Nine of the intervention group participants were married (45.0%) and seven lived alone (35.0%). Seven participants in the intervention group had higher education (35.0%). Regarding health status at pre-test, all participants in the intervention group were assessed, and 18 of them were found to be independent with instrumental activities of daily living. GDS score was divided into two groups with the clinical cutoff score point of 5/6. Five cases (25.0%) from the intervention group and 20 (50.0%) from the control group were categorized as having at least mild depressive status. Although the percentage of the control group was double that of the intervention group, no statistical difference was detected. As for the AOK loneliness scale, eight (42.1%) cases from the intervention group and 18 (45.0%) from the control group were shown as feeling at least mild loneliness.

3.2. Frequency of participation in the program

Thirteen of the twenty participants in the intervention group participated in the program for all four sessions. Seven people did not attend the program at least once. This was partly due to a tropical typhoon that hit Tokyo on the day of the second session.

3.3. Effects of the intervention program

The intervention program had a significant positive effect on subjective well-being measured by the LSI-A ($p = 0.039$), social support ($p = 0.013$), and familiarity with services scores ($p = 0.008$), and it had a significant negative effect on the AOK loneliness scale ($p = 0.011$) over the 6 months of the study period. Fig. 2 shows the effects of the intervention, the adjusted mean, and 95% confidence interval scores of these variables in the intervention and control groups. The AOK scores in the intervention group decreased about 0.9 point at T2 and 1.0 point at T3, whereas the scores of the control group increased about 0.6 point at T2 and 0.4 point at T3. As for the LSI-A, scores increased about 1.0 point at T2 and 1.9 points at T3 in the intervention group, while those of the control group decreased 0.7 point at T2 and increased 0.2 point at T3. The social support scores in the intervention group increased about 0.6 point at T3, whereas scores in the control group decreased 0.8 point at T3. The familiarity with services scores in the intervention group continued to increase after the intervention program. The scores increased about 1.6 points at T2 and 2.0 points at T3, whereas the scores in the control group increased only 0.3 point 6 months after the program.

Statistical differences were not observed for GDS, social network, and social activity scores (not shown in the paper). The adjusted mean score of the GDS in the intervention group decreased 1.1 points at T2 but decreased only 0.4 point at T3. As for the social network, scores in the intervention group increased about 0.3 point at T2 and 0.6 point at T3, although it did not reach a significant level.

The results of the additional subgroup analyses are shown in Table 2. In the high-risk group with AOK scores of 11 or above, the LSI-A score of the intervention group at T1 increased significantly at the post-test 6 months after the intervention (T3); similarly, the score at the post-test 1 month after the intervention (T2) increased at T3. As for the AOK loneliness scale, the score of the intervention group at T1 significantly decreased at T2. No significant effect was found in the high-risk control group. In the low-risk group with no loneliness, no significant effect other than increased familiarity with services was found in the intervention group. In contrast, the AOK score at T1 significantly increased at T2, and the social support score at T1 and T2 significantly decreased at T3 in the control group.

4. Discussion

This study showed that our intervention program, aimed at preventing social isolation, was effective for improving subjective

Table 1
Comparison of characteristics in intervention group and control group at pre-test (T1).

Variables (category or range)	Intervention group ($N = 20$) N (%) or M ± SD	Control group ($N = 40$) N (%) or M ± SD	p[d]
Gender (male)	8 (40.0)	12 (30.0)	n.s.
Age (66–84)	72.6 ± 4.4	72.8 ± 4.8	n.s.
Marital status (yes)	9 (45.0)	20 (50.0)	n.s.
Living arrangement (alone)	7 (35.0)	12 (30.0)	n.s.
Education (junior college or above)	7 (35.0)	14 (35.0)	n.s.
Basic activities of daily living (independent)	20 (100.0)	39 (97.5)	n.s.
Instrumental activities of daily living (independent)	18 (90.0)	34 (85.0)	n.s.
LSI-A[a] (10–30)	20.9 ± 2.3	21.2 ± 4.4	n.s
GDS[b] (0–15)	4.6 ± 3.5	5.0 ± 3.2	n.s
GDS cut-off score (6 or above)	5 (25.0)	20 (50.0)	n.s.
AOK[c] (10–20)	12.1 ± 2.7	11.9 ± 2.6	n.s
AOK dichotomous score (11 or above)	8 (42.1)	18 (45.0)	n.s.
Social support (0–8)	7.2 ± 1.4	6.7 ± 1.9	n.s
Social contact (1–6)	2.7 ± 1.5	2.9 ± 1.6	n.s
Social activity (1–6)	2.2 ± 1.8	3.2 ± 2.1	n.s
Familiarity with services (0–8)	2.4 ± 2.4	3.9 ± 2.7	$p = 0.041$

[a] LSI-A.
[b] GDS.
[c] AOK loneliness scale.
[d] t-tests were used for the continuous variables and Fisher's exact tests were used for other dichotomous variables. The differences between the two groups were not significant (n.s.) when $p \geq 0.05$.

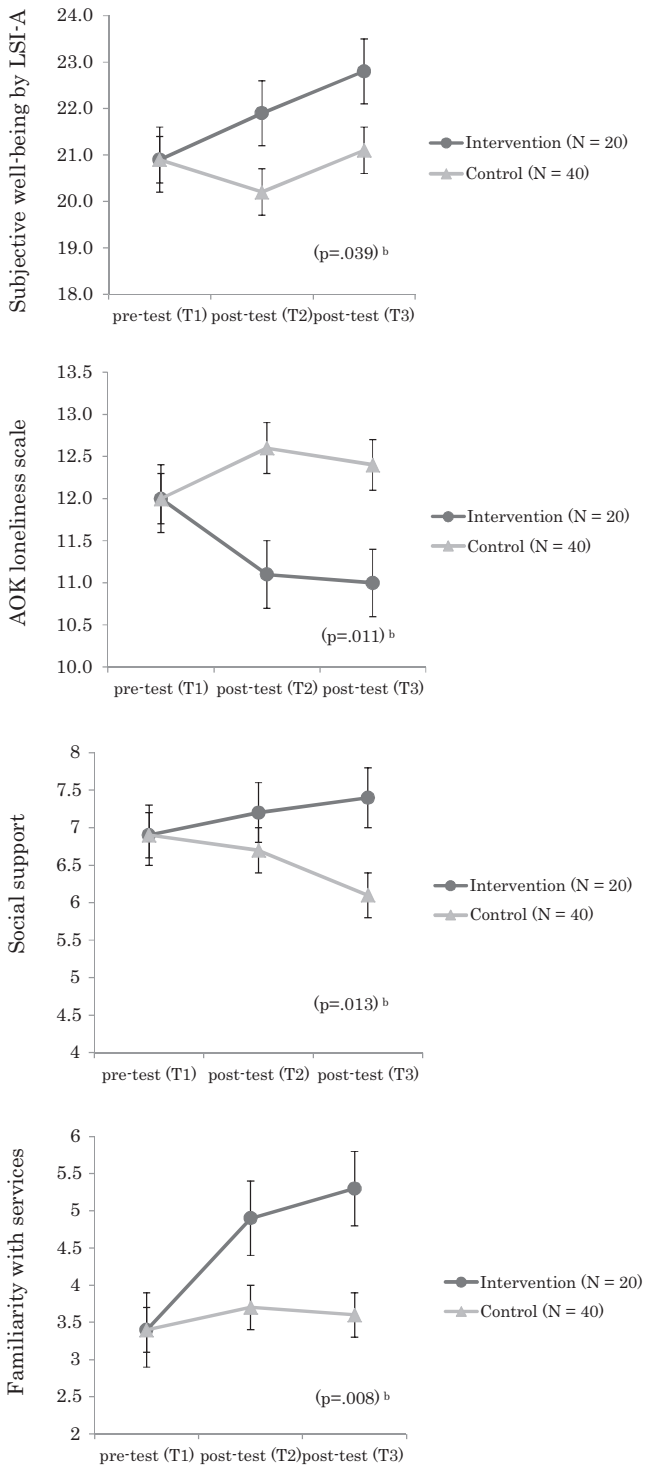

Fig. 2. Effect of intervention program on loneliness, subjective well-being, informal social support, and familiarity with services.[a] *Notes*: [a]Adjusted mean score and 95% confidence interval score of each post-test after 1 month (T2) and 6 months (T3) for each group are shown. Each adjusted mean score and 95% confidence interval for the score was calculated controlling for the score at pre-test (T1). [b]Difference between the two groups over the 6-month follow-up period according to a linear mixed model, controlling for pre-test score, time, and the interaction between group and time.

well-being, informal social support, and familiarity with services in the community and for reducing loneliness among elderly people who experienced a recent residential relocation.

The loneliness scale score for the intervention group decreased after the program and was maintained for 6 months after the program. Previous studies indicated that receiving support from peers was effective at alleviating loneliness (Dennis et al., 2009; Ernst & Cacippo, 1999). The participants in this study shared their common experiences of residential relocation and feelings of loneliness, and that led to support among peers and feelings of togetherness (Savikko, Routasalo, Tilvis, & Pitkala, 2010). This study showed an ameliorative effect on loneliness, in contrast to Routasalo et al. (2009), who found no significant effect. The reason for this difference was not clear since both studies used the UCLA loneliness scale or its revised version, but it might be because of differences in the study populations—ours may have been less lonely than that of Routasalo et al. (2009)—or program content, as our study considered not only networking between participants but also community gatekeepers.

The score for familiarity with the services in the community for the intervention group continued to increase 1 month and 6 months after the program. One reason for this continuing improvement might be that people in the intervention group continued to be motivated to collect the information they needed or would need in the future, and the skills and resources they acquired during the program enabled them to collect this information.

The intervention program in this study had a significant effect on the informal social support score, but the effect on the frequency of social network and social activity scores did not reach statistical significance, although the scores on these variables continued to increase during the follow-up period for the intervention group. The difference in the effect among these variables might be partly due to measurement itself. Each social network and social activity score was measured with only one item, which possibly had a larger measurement error than the social support score that was measured by summing eight different but highly correlated items. On the other hand, it is possible that the follow-up period and sample size were not enough to detect significant effects of the intervention on social support and social activity.

The mean subjective well-being scores for the intervention group were significantly higher than those for the control group. There are two possible explanations for the ameliorative effect of the intervention program on subjective well-being. The first is that improvement in the qualitative dimension of social connectivity, such as a decrease in loneliness and increase in social support, makes a difference. Previous studies indicated that loneliness and social support is a factor that contributes to subjective well-being in later life (McAuley et al., 2000; Neto, 1995; Windle & Woods, 2004). Although not shown in the results section, the correlation between loneliness and subjective well-being in this study was moderate and was stronger than the correlation between subjective well-being and the social networks or social activity variables.

On the other hand, it is also possible that the intervention program had a direct effect on the cognitive aspects of subjective well-being among the program participants. We assessed subjective well-being with the LSI-A, which contains a cognitive evaluation of both the past and present (Lawrence & Liang, 1988). The participants had plenty of opportunities to evaluate their relocation experiences by communicating with other participants during the program in a supportive atmosphere. It is possible that some participants began to accept their experience as a preferable one and evaluated the cognitive aspects of subjective well-being more positively. This might explain the lack of significant effect on GDS scores in this study, as this score solely evaluates short-term affective aspects of depression.

Additional subgroup analyses showed that this study's intervention program had an ameliorative effect on subjective well-being or loneliness among people who felt at least mild loneliness. Regarding people who had no loneliness, the intervention program

Table 2
Subgroup analyses by the level of loneliness.

AOK at T1 ≥ 11	Intervention group (N = 8)				Control group (N = 18)			
Variables	T1	T2	T3	p^a	T1	T2	T3	p^a
	Median	Median	Median		Median	Median	Median	
LSI-A (10–30)	19.5	21.0	22.0	T1 < T3, T2 < T3	20.0	19.5	19.0	n.s.
AOK (10–20)	13.5	11.0	11.0	T1 > T2	12.8	14.0	13.0	n.s.
Social support (0–8)	7.5	7.5	7.5	n.s.	7.0	6.5	7.0	n.s.
Familiarity with services (0–8)	2.0	5.0	3.0	n.s.	3.0	3.5	4.0	n.s.
AOK at T1 = 10	Intervention group (N = 11)				Control group (N = 22)			
Variables	T1	T2	T3	p^a	T1	T2	T3	p^a
	Median	Median	Median		Median	Median	Median	
LSI-A (10–30)	21.0	23.0	22.5	n.s.	23.0	21.0	24.0	n.s.
AOK (10–20)	10.0	10.0	10.0	n.s.	10.0	10.0	10.0	T1 < T2
Social support (0–8)	8.0	8.0	8.0	n.s.	8.0	8.0	7.5	T1 > T3, T2 > T3
Familiarity with services (0–8)	1.5	4.5	6.0	T1 < T3	4.5	4.0	3.5	n.s.

[a] A Wilcoxon signed-rank test was used. The differences between times were shown with a sign of inequality when $p < 0.05$, and n.s. was shown when $p \geq 0.5$.

had no significant effect other than on familiarity with services. However, it is possible that the program helped people maintain high levels for each outcome since the loneliness level and social support level of the control group had significantly deteriorated. Thus, it is suggested that the intervention program of this study had a positive effect on the older people regardless of their level of loneliness.

Using data from elderly Japanese migrants, this study supports the results of previous reviews by Cattan et al. (2005) and Findlay (2003) that report the scarcity of studies in non-western countries. Moreover, our study was designed as a randomized controlled trial, so the results can be considered more reliable than previous intervention studies that used other designs. However, this study has several limitations, which should be addressed in future research.

The sample size in this study was not large enough, as there were ultimately less than 60 participants. Therefore, we should be cautious of type II errors in the results of the statistical analyses. Jané-Llopis, Hosman, Jenkins, and Anderson (2003) showed that the mean effect size of intervention studies aimed at preventing depression in people in general was around 0.3. If we hypothesize that the effect size of this study was as large as previous studies', our study would need 302 people to detect statistical significance; this is much larger than the number of participants in this study. Moreover, the sample was selected based on spontaneous application to the intervention program. It is possible that the characteristics of the study participants, particularly their health status, differed from those of other elderly migrants who chose not to participate. The majority of our study participants was independent and did not suffer from severe depression or loneliness; this might have enabled them to attend the program at the community facility. It is important to develop a program that fits more frail and severely isolated elderly people who have difficulties in going out. All our participants were elderly migrants who lived in City A in a suburb of Tokyo, which also limits the generalizability of the results.

The other limitation relates to study blindness. Double-blinding in a randomized controlled trial is important because knowledge of the intervention will influence the evaluation of the outcome (Rothman, 2002). However, it is not possible for social intervention studies to be blinded like a study with a medication and a placebo. In our study, we do not think the bias was large because we used measurement scales as outcomes that were not explained to the participants as study outcomes, and all of the outcomes were scored by the participants, not by the researcher who conducted the analyses. Still, the group allocation and analyses were not blinded for the authors, which might be a limitation of this study.

With these limitations, this study still has important program and policy implications. First, targeting a specific population might be effective, as indicated in previous studies (Cattan et al., 2005). The program participants in this study could share their common experiences of residential relocation, which helped reduce loneliness and/or improve subjective well-being. Therefore, we can consider a targeted population approach in community settings as a promising option, although it has not typically been part of community services in Japan as in England (Cattan et al., 2005) except with respect to health status or living arrangement. Japan experienced a recent disastrous earthquake that caused many people to be evacuated and relocated to temporary housing where social support systems for elderly people were underdeveloped. We should consider utilizing the concept of the intervention program of this study for the people who are suffering social isolation caused by the earthquake.

Second, our study demonstrated the effectiveness of a program aimed at improving social integration in the community by utilizing existing community resources, particularly community volunteering organizations. The results of this study showed the ameliorative effect of the program on loneliness, subjective well-being, social support, and familiarity with the services provided by the community, which suggests that preventive programs can be effectively implemented without specific professional skills or considerable expense when the program aims to improve social integration for people without severe risk. The intervention program in this study was implemented by collaboration among local government, NPOs, community volunteers, and researchers. This collaboration enables the program to recruit all the elderly people who experienced a recent relocation, to gather various gatekeepers who are suitable for the needs of the elderly migrants, and to evaluate its effect with an adequate study design, as this study did.

Third, the processes that lead to loneliness or disruption of social networks are diverse (Ernst & Cacippo, 1999; Grenade & Boldy, 2008), which suggests that effective intervention may need to be tailor-made for each person. The program assessed in this study enabled participants to collect information and to connect with gatekeepers based on their diverse needs, which may have led to increased familiarity with services.

Thus, it should be important to develop a variety of group-based programs that target specific people, utilize existing resources such as community volunteer organizations, and provide a tailor-made service for individuals needing more social integration in the community setting.

5. Conclusion

Using a randomized design, this study evaluated the effects of an intervention program aimed at preventing social isolation on loneliness, depression, and subjective well-being among elderly Japanese migrants. Our program had an ameliorative effect on loneliness, subjective well-being, informal social support, and familiarity with the services provided by the community until 6 months after the program. The results of this study suggest that programs aimed at preventing social isolation may be effective when they are tailor-made based on the specific needs of the individual, utilize existing community resources, and target people who can share similar experiences.

Conflict of interest statement

None.

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