



Social participation among residents of serviced housing for older people versus community-dwelling older people in Japan: a propensity score matching analysis

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Abstract

Aim Housing has a significant impact on the health, safety, and social participation of older individuals. Japan's Serviced Housing for Older People (SHOPs) is one such model that provides supportive services and accessible living spaces.

Method This cross-sectional study examined the relationship between living in SHOPs with social activity programs (SAPs) and levels of social participation. We conducted a self-reported survey of SHOP residents and compared the proportions of participants who participated in social activities in the SHOP with a control group of community-dwelling older people selected from the Japan Gerontological Evaluation Study using propensity score matching.

Results The survey obtained responses from 189 eligible participants. SHOP residents were primarily female, older, educated, unmarried, and had a better financial status than the control group. SHOP residents ($n = 143$) were 2.57 times more likely to exercise ($p < 0.001$), 1.62 times more likely to participate in hobbies ($p = 0.004$), and 4.37 times more likely to participate in learning activities ($p < 0.001$) than the control group ($n = 398$). However, volunteering, senior citizen clubs, neighborhood associations, and community gathering places participation did not differ significantly between the SHOP and control groups.

Conclusion The findings suggest that SHOPs with SAPs have the potential to promote social participation and healthy aging among older people.

Keywords Active aging · Age-friendly · Senior housing · Social activities · Social participation

Introduction

The global population is aging. Between 2015 and 2050, the number of individuals over 60 will rise from 900 million to 2 billion, accounting for 12–22% of the total global population (World Health Organization 2022). In response

to this demographic shift, the World Health Organization has introduced the concept of Age-friendly Cities (World Health Organization 2007). This concept aims to adapt environments to the evolving needs of the aging population and promote active aging, defined as “the process of optimizing opportunities for health, participation, and security in order to enhance the quality of life as people age” (World Health Organization 2007; United Nations Department of Economic and Social Affairs, Population Division 2013). Housing, one of eight domains in the Age-Friendly City framework, is critical in building age-friendly environments and improving the lives of older people in their communities (Oswald and Wahl 2005). Housing is particularly significant for older people, who are more susceptible to environmental challenges than younger counterparts due to varying competence levels (Iwarsson 2005). As people age, the relationship with their housing becomes more significant (Löfqvist et al. 2017; Oswald et al. 2007; Sixsmith et al. 2014).

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Various housing models for older people exist globally, such as retirement villages, senior cohousing, multigenerational cohousing, and collaborative senior housing (Jolanki 2020). These senior housing models vary in terms of funding, age of residents, tenancy period, administration, and building maintenance (Jolanki 2020). Despite such variations, these housing models have a common goal of promoting living in the community through flexible and adaptive physical layouts as well as opportunities to participate in formal and informal activities and build social connections (Bookman 2008; Rowles and Bernard 2013).

Japan, one of the world's most aged countries, introduced Serviced Housing for Older People (SHOP) in 2011 to address the growing demand for housing to allow older people to live safely and comfortably (Sugimoto et al. 2017). SHOPS are barrier-free apartments for people aged over 60 living alone or in couples, primarily operated by for-profit companies. They provide supportive services that facilitate independent living, such as safety guarantees, daily life consultations, and staff to assist residents with daily living activities (Kakinuma et al. 2021). Since the introduction of government subsidies, the number of SHOPS has increased significantly, from 70,000 in 2012 to 280,000 in 2022 (Senior Housing Association 2023). These supportive designed and service-enriched housing options may ensure that older people can continue to live longer in non-care settings.

Housing models that assist residents to age well in community have gained attention as a viable solution to the problems of loneliness and social isolation among older people (Nguyen and Levasseur 2023). These models are designed to help older people feel less lonely and isolated by providing opportunities for social interaction. For example, by providing common spaces and recreational activities, assisted living facilities try to maximize the opportunity for older residents to participate in social activities (Hanson et al. 2014; Herron et al. 2020). SHOPS, particularly those that provide regular social activity programs (SAPs) as part of their services, may also provide such opportunities. To the best of our knowledge, no study has investigated whether living in SHOPS with regular SAPs for residents effectively promote social participation.

Therefore, this study aims to examine the relationship between living in SHOPS with SAPs and levels of social participation. We hypothesize that SHOP residents with SAPs will be more active in social participation than community-dwelling older people. This suggests that this novel housing model could promote active aging among residents.

Methods

Study design

This cross-sectional study compared the proportions of older people living in SHOPS with SAPs who participated in social activities with those of a control group of older people living in the community. The control group was drawn from the Japan Gerontological Evaluation Study (JAGES) using propensity score matching (PSM) analysis. JAGES is an ongoing, nationwide, prospective cohort study investigating the social determinants of health among non-institutionalized Japanese people aged over 65 years (Kondo et al. 2018).

Study participants

SHOP group

We conducted a self-reported survey of residents of OUKAS, a brand of SHOPS operated by Nomura Real Estate Wellness Co., Ltd., a Japanese real estate firm, between November and December 2021. OUKAS aims to provide a consistent supply of homes for older persons, as well as a variety of services that help residents to stay healthy, active, and socially engaged. To keep residents engaged in social activities, a variety of regular activities (e.g., exercise or sports, hobbies, and learning or cultural activities) and non-care-related communal amenities (e.g., a restaurant, lounge, and karaoke room) are provided. Activity programs last 30–60 min per session. Exercise programs are led by instructors on average one or two times a day, hobbies such as singing and listening to music are offered on average twice a week, and learning or cultural activities such as playing intellectual games and appreciating traditional performing arts are offered on average once a week.

The four apartment complexes of OUKAS, each with an average of 80 units, are located in different urban districts within Tokyo and its two neighboring prefectures (Chiba and Kanagawa): Kichijoji, Funabashi, Makuahari, and Hiyoshi. We distributed copies of a paper-based survey questionnaire to the residents of the four apartments; residents who completed and returned the questionnaire were included in the study and constituted the SHOP group. We excluded the residents certified as having care needs levels of requiring long-term care 1 or greater under long-term care insurance because the JAGES data used to form the

control group contained very few participants with certifications of requiring long-term care 1 or greater, those who reported sex different from the actual, those > 2 years older or younger than their actual age, and those younger than 65 years of age.

Control group

The control group was built using JAGES data. Since 2003, approximately every 3 years, surveys have been performed to inquire about health behaviors, psychological factors, and various socioeconomic determinants (Kondo et al. 2018). We used JAGES data from the 2019 wave, when self-reported questionnaires were delivered to 345,356 community-dwelling individuals over the age of 65 in 60 municipalities across 24 prefectures in Japan between December 2019 and January 2020. A random sample of residents from the 43 large municipalities was obtained, as well as a complete census of the other 17 smaller municipalities' older residents. The questionnaire was completed by 192,484 people (response rate 55.7%). Approximately 80% of participants lived in detached houses, with the remaining 20% living in apartment complexes (data not shown). To match the SHOP group's characteristics, we restricted the JAGES sample to participants who lived alone or with a spouse in urban regions of 15 municipalities with a population density equivalent to that of the SHOP apartment buildings. The control group included 58,643 people.

Questionnaire development

For participants in the SHOP group, we developed a paper-based survey questionnaire based on the 2019 JAGES survey questionnaire. Thus, these questionnaires shared several common questions. The questionnaire comprised 220 items on demographic characteristics, physical and psychological health, and social factors, including the frequency of participation in social activities.

Outcome measure: social participation

Social participation was determined using the following same question as the 2019 JAGES survey questionnaire: "How often do you participate in the following social activities?" The participants were given the following response options: four or more times a week, two or three times a week, once a week, one to three times a month, a few times a year, and never. Operationally, we defined social participation as participation in a social activity once or more a week. The social activities included exercise or sports groups (exercises), hobby groups (hobbies), learning or cultural groups (learning), volunteer groups (volunteering), senior citizen clubs (seniors), neighborhood associations/

residents' associations (neighborhoods), community gathering places (gathering places), activities in which skills and experiences are shared (skills), and any of these eight activities (any). Senior citizen clubs are local communities devoted to the welfare of community-dwelling older people: they offer their members a variety of social activities, such as sports, hobbies, and vacations. Community gathering places, called "Kayoi-no-ba" in Japanese, are characterized as places where local older people can assemble to improve their health through physical activity, hobbies, or other activities, supported by local activists and the local government (Kojima et al. 2021). Additionally, we asked the residents, "Compared with before you moved, has your participation in group activities (exercises, hobbies, volunteers, etc.) changed?" with possible responses including increased, slightly increased, stable, slightly decreased, and decreased.

Covariates

Covariates were selected from common question items between the two questionnaires that were hypothesized to be associated with social participation (Brookhart et al. 2006). Sociodemographic factors included sex (male or female), age, number of years of education (< 9 years, 10–12 years, ≥ 13 years, and other), marital status (married, widowed, divorced, never married, and other), subjective financial status (very poor, poor, fair, good, and very good), and frequency of participation in income-generating activities (none, a few times a year, one to three times a month, once a week, two or three times a week, and four or more times a week). Health-related factors included number of comorbidities (0, 1, 2, 3, 4, and ≥ 5), depressive symptoms (continuous), body mass index (continuous), self-rated health (poor, fair, good, and very good), long-term care (necessary, and not necessary), instrumental activities of daily living (IADL) abilities (continuous), receipt of instrumental support (present or absent), receipt of emotional support (present or absent), community attachment (not at all, slightly attached, undecided, moderately attached, and strongly attached), and level of care needs (none, requiring support 1, and requiring support 2). Depressive symptoms were assessed using the Japanese short version of the Geriatric Depression Scale (score range, 0–15; higher scores indicated worse depressive symptoms) (Nyunt et al. 2009). IADL abilities were measured using the five-item Tokyo Metropolitan Institute of Gerontology Index of Competence (Koyano et al. 1991), which examines five activities through five questions: (1) using public transportation, (2) shopping for daily necessities, (3) preparing meals, (4) paying bills, and (5) handling their own banking. We used the sum of the binary answers for each question (score range, 0–5; higher scores indicated more independence). Regarding the receipt of emotional and instrumental support, we

asked, “Do you have someone who listens to your concerns and complaints?” (receipt of emotional support) and “Do you have someone who looks after you when you are sick and confined to bed for a few days?” (receipt of instrumental support), with possible response categories as follows: spouse, children living together, children living apart, relatives, neighbors, friends, others, and none. The respondents who selected “none” were categorized as having no social support, whereas the others were categorized as having social support. The degree of community attachment was assessed by asking, “How attached are you to the area in which you reside?”.

Propensity score matching of control participants to SHOP participants

PSM analysis was conducted to compare social participation between the SHOP and control groups. We estimated propensity scores using a logistic regression model with the above-mentioned 16 covariates. We performed 1:3 caliper matching with replacement using the nearest neighbor matching method to reach the predetermined sample size of 500, which was sufficient for an effect size of 0.25, significance level of 0.05, and power of 0.80. The caliper width was determined to be equal to 0.2 of the standard deviation of the logit of the propensity score. After matching, we graphically compared the distribution of the propensity scores between the SHOP and control groups to check the balance of the covariates. We also calculated the absolute standardized differences between the two groups to assess the post-matching covariate balance. An absolute standardized difference of less than 10% indicates a good covariate balance (Sainani 2012).

Statistical analysis

After PSM, we used the chi-square test and Fisher’s exact test to evaluate group differences in the proportions of social participation between the SHOP and control groups. When calculating the proportions, we omitted cases with missing values for the outcome of interest.

In addition, we conducted two sensitivity analyses. First, we changed the definition of social participation from once or more a week to once or more a month to rule out the possibility of obtaining different results due to a different definition of the outcome variable. Second, we constructed another wealthier control group consisting of participants with assets in the top 20% of the JAGES survey participants. Previous research has indicated that new models of senior housing generally target more affluent older people rather than older people of average income (Scharlach et al. 2014). Financial status is likely to confound the relationship between living in a SHOP and social participation. However,

information on the financial status of the SHOP residents, other than their subjective financial status, was not available for this study. Therefore, we constructed a wealthier control group comprising participants with higher financial status. We assessed financial status using the question “What is the total value of your household assets, including savings, real estate (e.g., house, land, condominium), stocks, golf membership, etc.?” with possible responses being “less than 500,000 yen,” “500,000 to less than one million yen,” “one million to less than five million yen,” “five million to less than ten million yen,” “ten million to less than 50 million yen,” and “over 50 million yen” (in 2021, the yen exchange rate was 105–115 yen per United States dollar). We included only participants with assets of over 50 million yen ($n=9,414$, 18.3%).

We used Stata/SE 17.0 (StataCorp, College Station, TX, USA) for all analyses. We addressed the issue of multiple testing using the Bonferroni correction and set the significance level at $\alpha=0.0063$ (0.05/8).

Results

The survey questionnaire was distributed to 247 of the 302 residents in the four SHOP apartment buildings by staff at each apartment. The questionnaire was not distributed to the remaining residents because of difficulty in obtaining responses due to functional or cognitive decline ($n=19$ and $n=18$, respectively), moving out ($n=11$), long-term hospitalization ($n=3$), or other reasons ($n=4$). We received responses from 237 residents (response rate, 96.0%); their average age was 83.4 years (standard deviation, 6.5); 162 were female (68.4%), and 154 were single (65.0%). Eighty-eight respondents were certified under Japan’s public long-term care insurance (requiring support 1, $n=29$; requiring support 2, $n=26$; requiring long-term care 1–4, $n=33$). Requiring support 1 represents the lowest need for care, and requiring long-term care 5 represents the highest need for care. Of the 237 respondents, we excluded 33 individuals certified as having care needs levels of requiring long-term care 1 or greater under long-term care insurance. Additionally, we excluded those who reported sex different from the actual ($n=9$), those > 2 years older or younger than their actual age ($n=4$), and those younger than 65 years ($n=2$). The final SHOP group comprised 189 participants.

Table 1 shows the baseline characteristics of the SHOP and control participants. Compared with participants in the control group, those in the SHOP group were predominantly female, older, more educated, and less likely to have a partner, and reported a better financial status. In response to the question on changes in their social participation before and after relocation, 33.8% of the participants in the SHOP group answered “increased” or “slightly increased,” 21.1%

Table 1 Characteristics of the SHOP and control groups before propensity score matching

Variables	Categories	Before propensity score matching	
		SHOP group n (%) <i>n</i> = 189	Control group n (%) <i>n</i> = 58,643
Sex	Female	133 (70.4)	30,167 (51.4)
Age, years	Continuous	83.5 (6.3) ^a	75.2 (6.1) ^a
Number of years of education, years	<9	15 (8.1)	10,320 (17.8)
	10–12	70 (37.8)	23,965 (41.3)
	≥13	97 (52.4)	23,198 (39.9)
	Other	3 (1.6)	588 (1.0)
Marital status	Single	130 (69.1)	18,256 (31.3)
Subjective financial status	Poor	5 (2.6)	14,246 (25.1)
	Fair	85 (45.0)	31,769 (55.9)
	Good	99 (52.4)	10,849 (19.1)
Employment status	Unemployed	169 (93.9)	39,748 (73.2)
Number of comorbidities	0	30 (15.9)	13,654 (23.3)
	1	43 (22.8)	19,324 (33.0)
	2	59 (31.2)	13,990 (23.9)
	3	28 (14.8)	6969 (11.9)
	4	17 (9.0)	2944 (5.0)
	≥5	12 (6.3)	1762 (3.0)
Depressive symptoms	Continuous	3.9 (3.3) ^a	3.0 (3.1) ^a
Body mass index	Continuous	21.6 (3.0) ^a	22.7 (3.1) ^a
Self-rated health	Good	148 (81.3)	49,195 (85.7)
Long-term care	Necessary	46 (25.0)	3912 (7.0)
IADL abilities	Continuous	4.8 (0.6) ^a	4.9 (0.6) ^a
Receipt of instrumental support	Present	142 (78.0)	53,225 (92.1)
Receipt of emotional support	Present	165 (89.7)	54,063 (93.7)
Community attachment	Slightly attached	20 (11.1)	3317 (5.7)
	Moderately attached	67 (37.2)	9365 (16.2)
	Strongly attached	93 (51.7)	45,087 (78.0)
Level of care needs	None	138 (73.0)	56,079 (95.6)
	Requiring support 1	27 (14.3)	1547 (2.6)
	Requiring support 2	24 (12.7)	1017 (1.7)

SHOP, serviced housing for older people; IADL, instrumental activities of daily living

^aMean (standard deviation)

answered “decreased” or “slightly decreased,” and 45.1% answered “stable.”

We performed PSM analysis at a 1:3 ratio, resulting in 143 participants in the SHOP group and 398 participants in the control group. The differences in baseline characteristics between the two groups before and after PSM are presented in Tables 1 and 2, respectively. The absolute standardized difference values for all variables were less than 0.10. Additionally, the distribution of propensity scores was comparable across the two groups (Fig. 1). These findings indicate that the covariates of the two groups were well balanced. After PSM, the mean age in both groups was 82.2 (standard deviation, 6.4) years; 65.3% of participants were female,

and 66.2% were single (Table 2). One-half of each group had over 13 years of education and one-third had a partner (Table 2).

Table 3 provides the proportions of participants in the SHOP and control groups who participated in social activities once or more a week. A total of 73.9% in the SHOP group participated in any of the social activities mentioned above once or more a week.

Compared with participants in the control group, those in the SHOP group were 2.57 times more likely to participate in exercises, 1.62 times more likely to participate in hobbies, 4.37 times more likely to participate in learning, and 1.59 times more likely to participate in any social activities

Table 2 Characteristics of the SHOP and control groups after propensity score matching

Variables	Categories	After propensity score matching		
		SHOP group	Control group	Absolute standardized difference
		n (%)	n (%)	
		<i>n</i> = 143	<i>n</i> = 398	
Sex	Female	48 (66.4)	258 (64.8)	0.03
Age, years	Continuous	82.6 (6.1) ^a	82.0 (6.6) ^a	0.09
Number of years of education, years	< 9	9 (6.3)	23 (5.8)	0.02
	10–12	55 (38.5)	147 (36.9)	0.03
	≥ 13	76 (53.1)	219 (55.0)	0.04
	Others	3 (2.1)	9 (2.3)	0.01
Marital status	Single	96 (67.1)	262 (65.8)	0.03
Subjective financial status	Poor	4 (2.8)	16 (4.0)	0.07
	Fair	66 (46.2)	196 (49.2)	0.06
	Good	73 (51.0)	186 (46.7)	0.09
Employment status	Unemployed	132 (92.3)	372 (93.5)	0.05
Number of comorbidities	0	20 (14.0)	54 (13.6)	0.01
	1	37 (25.9)	98 (24.6)	0.02
	2	47 (32.9)	119 (29.9)	0.05
	3	19 (13.3)	63 (15.8)	0.06
	4	10 (7.0)	33 (8.3)	0.05
	≥ 5	10 (7.0)	31 (7.8)	0.03
Depressive symptoms	Continuous	3.7 (3.1) ^a	3.9 (3.4) ^a	0.03
Body mass index	Continuous	21.7 (3.0) ^a	21.7 (3.0) ^a	0.01
Self-rated health	Good	118 (82.5)	323 (81.2)	0.04
Long-term care	Necessary	34 (23.8)	95 (23.9)	< 0.01
IADL abilities	Continuous	4.8 (0.7) ^a	4.8 (0.7) ^a	0.02
Receipt of instrumental support	Present	116 (81.1)	323 (81.2)	< 0.01
Receipt of emotional support	Present	128 (89.5)	347 (87.2)	0.07
Community attachment	Slightly attached	18 (12.6)	47 (11.8)	0.01
	Moderately attached	48 (33.6)	135 (33.9)	0.01
	Strongly attached	77 (53.8)	216 (54.3)	0.02
Level of care needs	None	109 (76.2)	312 (78.4)	0.04
	Requiring support 1	15 (10.5)	42 (10.6)	< 0.01
	Requiring support 2	19 (13.3)	44 (11.1)	0.05

SHOP, serviced housing for older people; IADL, instrumental activities of daily living

^aMean (standard deviation)

(Table 3). The proportion of participants who took part in volunteering, seniors, neighborhoods, gathering places, and skills did not significantly differ between the SHOP and control groups (Table 3).

In the sensitivity analysis, when the threshold for social participation was changed from once or more a week to once or more a month, similar results were obtained for exercises, learning, and any social activities (Table 4). However, we also found that SHOP participants were less likely to participate in seniors and neighborhoods (Table 4). We did not observe a significant difference in the proportion of older

people participating in hobbies, contrary to the results of our initial analysis.

In the other sensitivity analysis, when we used the control group with assets of over 50 million yen, the absolute standardized differences in covariates between the SHOP and control groups exceeded 0.10 for age, marital status, and community attachment, indicating that participants in the SHOP group were more likely to be older and single and have stronger community attachment than those in the control group (Table 5). These results are similar to those obtained in the initial analysis, the only difference being

Fig. 1 Distribution of propensity scores between the SHOP and control groups after propensity score matching. *Notes:* SHOP, serviced housing for older people

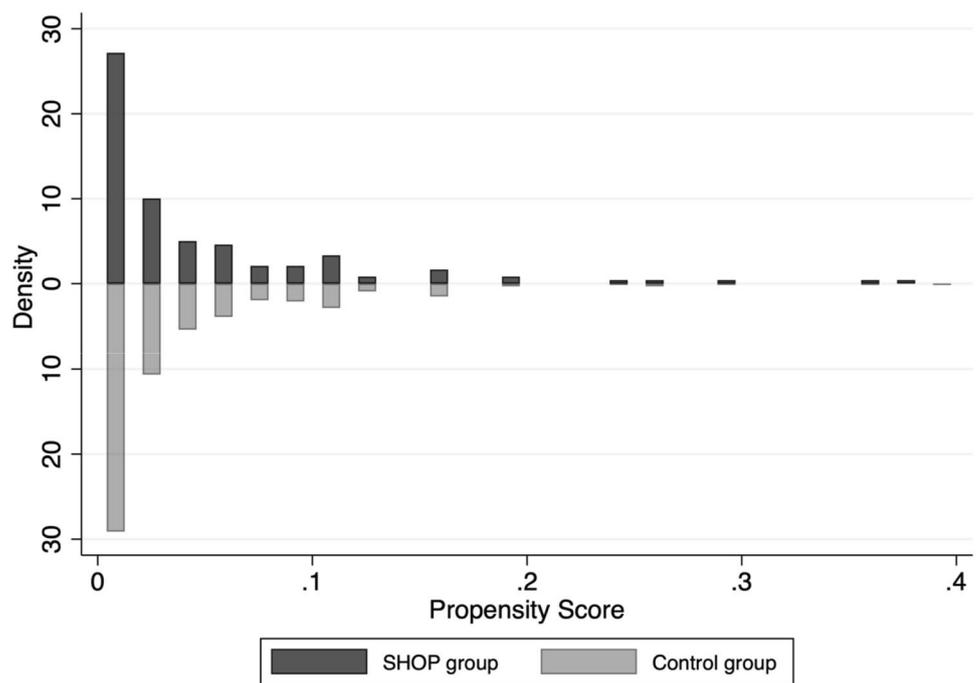


Table 3 Comparison of participation in social activities between the SHOP and control groups after propensity score matching

Social activities	SHOP group <i>n</i> = 143 % (95% CI)	Control group <i>n</i> = 398 % (95% CI)	<i>p</i> -value
Exercises	65.2 (56.8–73.1)	25.4 (20.9–30.3)	<0.001
Hobbies	31.7 (24.1–40.0)	19.6 (15.6–24.1)	0.0039
Learning	29.8 (22.4–38.1)	6.3 (4.0–9.4)	<0.001
Volunteering	5.3 (2.2–10.6)	7.1 (4.6–10.3)	0.68
Seniors	0.0 (0.0–2.6)	3.5 (1.8–6.0)	0.02
Neighborhoods	0.0 (0.0–2.6)	1.7 (0.6–3.7)	0.19
Gathering places	9.3 (5.0–15.4)	12.7 (9.3–16.6)	0.29
Skills	2.8 (0.8–7.1)	2.0 (0.8–4.1)	0.74
Any ^a	73.9 (65.8–81.0)	46.4 (41.1–51.7)	<0.001

CI, confidence interval; SHOP, serviced housing for older people
^aAny social activities: exercises, hobbies, learning, volunteering, seniors, neighborhoods, gathering places, and/or skills

that the SHOP residents were less likely to participate in gathering places compared with JAGES residents (Table 6).

Discussion

This is the first study to investigate the level of social participation among residents in SHOPS that offer SAPs. Participants in the SHOP group reported greater participation in exercises, hobbies, and learning than those in the control

Table 4 Comparison of proportions of participation in social activities between the SHOP and control groups after propensity score matching (social participation ≥ 1 per month)

Social activity	SHOP group <i>n</i> = 143 % (95% CI)	Control group <i>n</i> = 398 % (95% CI)	<i>p</i> -value
Exercises	75.9 (68.0–82.7)	32.3 (27.4–37.5)	<0.001
Hobbies	47.2 (38.8–55.7)	37.8 (32.7–43.1)	0.05
Learning	41.1 (32.9–49.7)	14.7 (11.1–18.8)	<0.001
Volunteering	9.8 (5.3–16.3)	14.4 (10.9–18.6)	0.19
Seniors	0.7 (0.0–3.9)	8.7 (5.9–12.1)	<0.001
Neighborhoods	0.7 (0.0–3.9)	7.8 (5.2–11.2)	<0.001
Gathering places	10.7 (6.1–17.1)	17.2 (13.4–21.5)	0.07
Skills	5.0 (2.0–10.0)	3.5 (1.8–6.0)	0.45
Any ^a	85.1 (78.1–90.5)	63.6 (58.5–68.5)	<0.001

CI, confidence interval; SHOP, serviced housing for older people
^a Any social activities: exercises, hobbies, learning, volunteering, seniors, neighborhoods, gathering places, and/or skills

group selected from community-dwelling older people, while reporting less participation in seniors, neighborhoods, and gathering places. These results remained consistent in sensitivity analyses, even when we changed the definition of social participation and limited comparisons to participants of higher economic status.

Our findings imply that living in SHOPS with SAPs could influence social participation levels. The living environment has a significant impact on the quality of life in old age

Table 5 Characteristics of the SHOP and control groups with the top 20% of assets only, before and after propensity score matching

Variables	Categories	Before propensity score matching		After propensity score matching		Absolute standardized difference
		SHOP group n (%)	Control group n (%)	SHOP group n (%)	Control group n (%)	
		<i>n</i> = 189	<i>n</i> = 9,414	<i>n</i> = 133	<i>n</i> = 326	
Sex	Female	133 (70.4)	30,167 (51.4)	85 (63.9)	211 (64.7)	0.02
Age, years	Continuous	83.5 (6.3) ^a	75.2 (6.1) ^a	82.3 (6.2) ^a	81.4 (7.1) ^a	0.14
Number of years of education, years	< 9	15 (8.1)	10,320 (17.8)	8 (6.0)	21 (6.4)	0.02
	10–12	70 (37.8)	23,965 (41.3)	45 (33.8)	109 (33.4)	0.01
	≥ 13	97 (52.4)	23,198 (39.9)	77 (57.9)	193 (59.2)	0.03
	Other	3 (1.6)	588 (1.0)	3 (2.3)	3 (0.9)	0.08
Marital status	Single	130 (69.1)	18,256 (31.3)	86 (64.7)	195 (59.8)	0.10
Subjective financial status	Poor	5 (2.6)	14,246 (25.1)	4 (3.0)	11 (3.4)	0.02
	Fair	85 (45.0)	31,769 (55.9)	58 (43.6)	137 (42.0)	0.03
	Good	99 (52.4)	10,849 (19.1)	71 (53.4)	178 (54.6)	0.02
Employment status	Unemployed	169 (93.9)	39,748 (73.2)	122 (91.7)	295 (90.5)	0.04
Number of comorbidities	0	30 (15.9)	13,654 (23.3)	20 (15.0)	41 (12.6)	0.01
	1	43 (22.8)	19,324 (33.0)	34 (25.6)	80 (24.5)	0.03
	2	59 (31.2)	13,990 (23.9)	41 (30.8)	109 (33.4)	0.06
	3	28 (14.8)	6,969 (11.9)	20 (15.0)	47 (14.4)	0.07
	4	17 (9.0)	2,944 (5.0)	10 (7.5)	27 (8.3)	0.05
	≥ 5	12 (6.3)	1,762 (3.0)	8 (6.0)	22 (6.7)	0.03
Depressive symptoms	Continuous	3.9 (3.3) ^a	3.0 (3.1) ^a	3.7 (3.2) ^a	3.5 (3.4) ^a	0.05
Body mass index	Continuous	21.6 (3.0) ^a	22.7 (3.1) ^a	21.8 (2.9) ^a	21.9 (3.1) ^a	0.01
Self-rated health	Good	148 (81.3)	49,195 (85.7)	108 (81.2)	266 (81.6)	0.01
Long-term care	Necessary	46 (25.0)	3,912 (7.0)	31 (23.3)	63 (19.3)	0.09
IADL abilities	Continuous	4.8 (0.6) ^a	4.9 (0.6) ^a	4.8 (0.7) ^a	4.8 (0.7) ^a	0.03
Receipt of instrumental support	Present	165 (89.7)	53,225 (92.1)	110 (82.7)	273 (83.7)	0.03
Receipt of emotional support	Present	142 (78.0)	54,063 (93.7)	119 (89.5)	297 (91.1)	0.06
Community attachment	Slightly attached	20 (11.1)	3,317 (5.7)	16 (12.0)	32 (9.8)	0.18
	Moderately attached	67 (37.2)	9,365 (16.2)	42 (31.6)	84 (25.8)	0.13
	Strongly attached	90 (53.6)	45,087 (78.0)	76 (57.1)	214 (65.6)	0.09
Level of care needs	None	138 (73.0)	56,079 (95.6)	107 (80.5)	267 (81.9)	0.05
	Requiring support 1	27 (14.3)	1,547 (2.6)	10 (7.5)	27 (8.3)	< 0.01
	Requiring support 2	24 (12.7)	1,017 (1.7)	16 (12.0)	32 (8.6)	0.07

SHOP, serviced housing for older people; IADL, instrumental activities of daily living

^aMean (standard deviation)

(World Health Organization 2007). Residents' participation in social activities may be influenced by the physical and social environments of SHOPS with SAPs. A cross-sectional study of older persons living in residential care facilities found that an accessible design was associated with greater participation (Nordin et al. 2017). Within the residential buildings, the SHOP in this study provides regular SAPs such as exercise, hobbies, and learning or cultural programs, as well as barrier-free facilities (e.g., automatic doors, elevators, and flat floors), which may foster socialization. In terms of the social environment, Buckley and McCarthy (2009)

found that staff members who had a good understanding of the needs of residents played a key role in increasing social participation in a qualitative study of female residents in a long-term care facility. Staff members in SHOPS must be on-site during the day and ready to assist residents in need (Sugimoto et al. 2018). Residents' social participation may be facilitated by an accessible environment within SHOP buildings and staff members who have positive relationships with residents (Nguyen and Levasseur 2023).

Participants in the SHOP group were less likely to participate in seniors, neighborhoods, and gathering places

Table 6 Comparison of proportions of social participation in social activities among older people in the SHOP and control groups with the top 20% of assets only after propensity score matching

Social activity	SHOP group <i>n</i> = 133 % (95% CI)	Control group <i>n</i> = 326 % (95% CI)	<i>p</i> -value
Exercises	64.9 (56.1–73.0)	25.6 (20.7–31.0)	<0.001
Hobbies	33.3 (25.4–42.1)	23.2 (18.5–28.5)	0.03
Learning	27.5 (20.0–36.0)	7.5 (4.7–11.1)	<0.001
Volunteering	4.9 (1.8–10.4)	6.0 (3.6–9.5)	0.82
Seniors	0.0 (0.0–2.8)	2.4 (0.1–4.9)	0.11
Neighborhoods	0.0 (0.0–2.8)	1.7 (0.6–3.9)	0.33
Gathering places	7.7 (3.8–13.7)	14.6 (10.8–19.2)	0.05
Skills	3.1 (0.8–7.6)	2.7 (1.2–5.3)	1.00
Any ^a	73.4 (64.9–80.9)	48.5 (42.7–54.3)	<0.001

CI, confidence interval; SHOP, serviced housing for older people

^aAny social activities: exercises, hobbies, learning, volunteering, seniors, neighborhoods, gathering places, and/or skills

than those in the control group, according to the criteria of social participation as participating in social activities once a month or more. Given their proximity to on-site opportunities, people may not need to participate in off-site social participation opportunities. However, this may also reflect the detrimental impacts of relocation on older people's social interactions. Relocation can disrupt existing social networks and make it challenging to recreate them in a new context (Dupuis-Blanchard et al. 2009). Seniors, neighborhoods, and gathering spaces rely on local community networks, which may have inhibited SHOP participants from participating in these activities. Furthermore, disparities in participants' socioeconomic status may have contributed to this gap (Beenackers et al. 2012; Kirk and Rhodes 2011; Yamakita et al. 2015), despite efforts to account for differences in participants' background characteristics.

We must emphasize that the SHOP survey was undertaken during the COVID-19 pandemic, but the JAGES survey was conducted prior to the pandemic in 2019. To limit the spread of COVID-19 infection, several public health interventions, including stay-at-home policies and physical distancing strategies, were used (Hartley and Perencevich 2020). Although these precautions helped to reduce COVID-19 transmission, they imposed significant constraints on social behavior. During the pandemic, people's social interactions changed, increasing loneliness and decreasing sentiments of friendship (Philpot et al. 2021). As a result, these social constraints may have influenced SHOP residents' low degree of participation in community-based activities.

The current study's findings indicate that SHOPS with on-site SAPs and SHOP staff members could promote social

participation among residents. Several systematic reviews have discovered that social participation can benefit older people's physical, psychological, and social health (Bourassa et al. 2017; Holt-Lunstad et al. 2010; Kelly et al. 2017; Stuck et al. 1999; Webber and Fendt-Newlin 2017). Furthermore, active social participation among older people can lower the overall cost of long-term care services (Saito et al. 2021). According to Graham et al. (2018), the unique housing plan may help older persons preserve functional independence, avert long-term care needs, and minimize future long-term care costs. Although the extensive implementation and spread of SHOPS with SAPs may be beneficial to older people's health, there are currently no common criteria for assessing the quality of this type of housing (Kakinuma et al. 2021). Developing guidelines for assessing service quality could enhance quality SHOPS with SAPs.

The study's strength is that we used a control group of community-dwelling older individuals to compare the proportions of SHOP participants who participated in social activities and measure the relationship between SHOP living and social participation. There have been few studies of senior housing models that utilized a control group (Schwitter 2022). To the best of our knowledge, this is the first study that focuses on the social benefits of SHOPS and demonstrates residents' levels of social participation.

There are some limitations to the current study. First, it excluded residents from rural areas because the SHOP's apartment buildings were all in urban neighborhoods. Future research must involve additional participants from a variety of backgrounds. Second, we cannot exclude the possibility of reverse causality, which would imply that older people who actively participate in social activities are more likely to relocate to SHOPS with activity programs. To establish causation, a longitudinal or experimental investigation is required. Third, as previously stated, we compared participants in the COVID-19 pandemic survey to those in the 2019 JAGES survey. As a result, we may have underestimated the extent to which SHOP group participants could participate in social activities. Nonetheless, we discovered that SHOP residents participated in more activities than those living in the community. This could provide substantial evidence of a relationship between living in SHOPS with SAPs and social participation. Fourth, we should consider the extent to which the results of this study may be applicable to other countries and cultural settings. While the similar senior housing arrangements that combine residential living with on-site services and activities exist in other parts of the world, such as retirement villages or senior cohousing, the generalizability of the findings may be influenced by various factors, including differences in healthcare and social welfare systems, socioeconomic and demographic characteristics of older adult populations, and policy that shape senior housing provision.

Conclusion

As the global population ages, there is a growing demand for secure housing where older people can live healthy, safe, and comfortable lives. The findings of this study suggest that SHOPS with SAPs, communal facilities, and on-site staff members within residential buildings may be a promising new model to address such requirements, with the potential to positively influence older people to maintain or enhance social participation. Future research should explore how residing in these facilities influences residents' self-reported quality of life and overall well-being, in addition to examining the long-term causal effects of living in SHOPS on social participation and the subsequent physical and psychological health outcomes.

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Data availability The JAGES data is available upon reasonable request at <https://www.jages.net/>. However, the data collected specifically for this study, known as the OUKAS data, cannot be made publicly available since the participants in this study did not provide consent for their data to be shared publicly.

Declarations

Ethical approval This study was approved by the relevant ethics committees of our institutions (approval numbers 2493, M10166, and 992). Participants were informed that checking an acceptance checkbox and returning the questionnaire would signify their consent to participate.

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