



Title	Effects of a 'social activity program that encourages interaction' on rural older people's psychosocial health : Mixed-methods research
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# **Effects of a “Social Activity Program that Encourages Interaction” on rural older people’s psychosocial health: Mixed-methods research**

## **Abstract**

### **Introduction**

We developed a program that encourages interaction among older people living at home by combining face-to-face and online activities and examined its effects on older adults’ psychosocial health.

### **Methods**

In this mixed-methods study, we recruited 11 women and 6 men ( $M_{age} = 79.5 \pm 6.4$  years), who lived in a rural community and participated in a senior citizen club. The intervention was conducted for 13 months, comprising monthly face-to-face group and social media activities. For the program process evaluation, we collected focus-group interview data on participants’ perceptions of their personal lives, club membership, and community post-intervention. For the outcome evaluation, we collected six outcome measures pre- and post-intervention: loneliness, subjective health, subjective well-being, self-esteem, social support, and social activity satisfaction. Finally, through the integration of the process-outcome evaluation, we inferred what effects the program had on participants’ psychosocial health.

### **Results**

In the process evaluation, we identified four themes: “Stimulation brought about by relationships with peers,” “Realization as to where they feel they belong,” “Rethinking of oneself in the community,” and “Awareness of attachment to and coexistence with the community.” In the outcome evaluation, the outcome measures were maintained without significant decline post-intervention. Through the integration of the process-

outcome evaluation, we deduced three effects of the program on psychosocial health:

(1) fulfillment of subjective health, (2) maintenance and assurance of moderate distance connectedness, and (3) orientation toward aging in place.

### **Conclusion**

This study offers a promising opportunity for further development and research into community-based preventive nursing care intervention strategies to maintain the psychosocial health of homebound older people in communities with social activity groups.

### **Keywords**

older people, healthy aging, social interaction, social participation, communication application, rural population, mixed methods

## **SUMMARY STATEMENT OF IMPLICATIONS FOR PRACTICE**

### **What does this research add to existing knowledge in gerontology?**

- We developed a face-to-face social interaction program that utilizes existing social activities in the community and combines them with the use of technology.
- Our program can be a preventive nursing care intervention strategy to contribute to the maintenance of psychosocial health of older people at home.

### **What are the implications of this new knowledge for nursing care with older people?**

- Promoting social interaction through a combination of face-to-face and online group activities gives older people a sense of fulfillment in their subjective health.
- It is essential to ensure that older people have some time and space for solitude and reflection. A moderate level of connectedness with some distance helps maintain their psychosocial health.
- Spending time talking about their hometown can encourage older people to coexist with the community and age at home.

### **How could the findings be used to influence policy or practice or research or education?**

- We offer suggestions for program strategies that can be implemented proactively among older people to foster participants' health promotion and protect them from psychosocial health decline in practice activities.
- Our intervention model offers a promising opportunity for further research development of community-based group interventions with information and communication technology support.

## **Introduction**

Psychosocial health is defined as “a changing condition that involves the reciprocal adjustment and dependency between an individual and their social environment” (Peter et al., 2021, p. 24). Peter et al. (2021) emphasized that it is necessary to focus on psychosocial health in health promotion and prevention practices. Studies have assessed older adults’ psychosocial health using many variables, including loneliness (Hill et al., 2006), subjective health (Toselli et al., 2014), subjective well-being (Kuru Alici & Arikan Dönmez, 2020), self-esteem (Hill et al., 2006), and social support (Hill et al., 2006). Maintaining psychosocial health is an essential component of healthy aging and contributes to quality of life; thus, it is vital in gerontological and community nursing.

Nursing care focused on social activities is a means of promoting healthy aging, especially for homebound older adults. Social activities are categorized into formal and informal (Lemon et al., 1972). Formal activities include organizational groups and volunteer activities (Choi et al., 2021), while informal activities include sports and cultural club activities (Choi et al., 2021). Social activities contribute to improved cognitive function (Bae, 2020) and activities of daily living (Tomioka et al., 2016). Consequently, the Japanese government is promoting the participation of older people in social activities to reduce the need for caregiving in the community (Ministry of Health, Labour, and Welfare, 2017).

The COVID-19 pandemic has successively halted the social activities of older people, and the negative effects on their psychosocial health have been revealed, including increased anxiety about falls and walking ability (Nakamura et al., 2021) and depression (Noguchi et al., 2021). Damage to psychosocial health is a concern because it may hinder homebound older people from maintaining an independent social life.

Therefore, exploring alternative modes of providing social activities is an urgent issue.

Information and communication technology (ICT) may be useful in maintaining older adults' psychosocial health. Banskota et al. (2020) indicated that several smartphone applications have the potential to help maintain interactions and navigate isolation among older adults during the pandemic. ICT provides support after the reduction of activities and communication due to COVID-19 (Daly et al., 2021). There is evidence to support the success of both face-to-face and online delivery methods for older people. Face-to-face social activities lead to satisfaction with health, friends, learning, and contributions to others and society (Okamoto, 2010). Online interactions among older people reduce loneliness and promote communication (Cotten et al., 2013). We expect that a combination of face-to-face and online social activities will provide nursing care for homebound older people that reduces the psychosocial health deterioration associated with COVID-19.

We developed a preventive nursing care intervention strategy for homebound older people that combines face-to-face group and non-face-to-face online group activities using a communication application, the "Social Activity Program that Encourages Interaction" (SAPEI) among older people. The SAPEI utilizes existing social activity groups in the community (i.e., senior citizen clubs). We designed this study with the following process-outcome evaluation in terms of intervention evaluation:

RQ1: Process evaluation: What were participants' perceptions of their personal lives, club membership, and community according to the SAPEI?

RQ2: Outcome evaluation: Does SAPEI change participants' psychosocial outcome measures (loneliness, subjective health, subjective well-being, self-esteem, social support, and social activity satisfaction)?

RQ3: Process-outcome evaluation integration: What effect did SAPEI have on the psychosocial health of participants?

## **Materials and Methods**

### **Research design**

We conducted this study between June 2019 and August 2020 using a convergent design with a mixed-methods design. This design involves parallel qualitative and quantitative data collection, separate analysis, and subsequent integration to develop a nuanced understanding of the phenomenon and compare and validate results from different datasets (Creswell & Clark, 2018). Lewin et al. (2009) stated that complex health care interventions need to evaluate both quantitative and qualitative data; the effectiveness of intervention programs must be carefully examined from multiple perspectives. We conducted a process evaluation based on qualitative data (RQ1) and an outcome evaluation based on quantitative data (RQ2). Then, we integrated and compared the findings (RQ3). The analytical framework and results correspond to each RQ (Figure 1).

### **Participants**

Twenty-five residents of District B in Town A were registered as members of the club, and 19 joined the activities held once per month. We included participants based on three criteria: not receiving inpatient treatment for dementia, not paralyzed or with significant visual or hearing impairment, and completing both pre- and post-surveys. We excluded two participants because they did not complete the post-survey; thus, we included 17 participants in the analyses.

### ***Target selection***

The Community Support Center in Town A in Hokkaido, located in rural northern Japan, cooperated for this study. Town A has a population of approximately

6000, with 29.3% of the population aged  $\geq 65$  years (as of 2015). We selected these groups by consulting public health nurses at the center based on two criteria: the group must already be engaged in social activities, and the group leader and members must be available for research cooperation.

### ***Target senior citizens club***

Senior citizens' clubs are informal organizations managed by older adults. Such clubs are found throughout Japan and provide a comfortable setting for the social activities of older people, which are mainly based on community relations. The selected club, Town A District B senior citizens' club, was established approximately 10 years ago. The club meets once a month for about three hours and primarily offers discourse, cooking and eating activities, exercises, and recreation.

### **SAPEI**

The intervention period is from July 2019 to August 2020.

### ***Face-to-face group activities (Appendix 1)***

The face-to-face group activities took place over eight sessions over 13 months. We structured the SAPEI based on the results of our previous interview survey on social activities, which revealed that rural older people value social activities as a place where they feel safe, can have a good time with friends, and feel connected to other people and the community. We designed face-to-face group activities to promote interactions among the members. We asked group members to create a handbook—"District B's Lifestyle Handbook" (Figure 2)—summarizing useful information about the local community and region. This was a pamphlet for local residents that presents the charms of District B from participants' perspective, who are residents of District B.

We designed each SAPEI session with four sections as a starting topic to help participants realize the value of social activities: (1) local cuisine; (2) local crime



prevention, disaster prevention, and problem solving; (3) local nature and tourism; and (4) local history and tradition. The second, third, and last authors conceived the session content and implemented it after thorough discussions with the club's four leaders.

We conducted the SAPEI during the club's activity time, for 30 minutes per session. Sections (1), (2), and (4) were implemented twice and section (3) once; the final session was a summary of the entire program. All sessions comprised about 15 minutes of small group discussions followed by about 15 minutes of sharing ideas with the entire group. First, small groups of three to four participants held group discussions. Each group had a leader who acted as a facilitator. Then, the leader of each group summarized the content of the discussion and presented it to participants. Our intervention program emphasized ongoing discussion efforts on one common theme, which differed from the usual discourse and recreation.

### ***Online group activities***

Online group activities were available to be utilized daily during the 13-month period. Online group activities used Kikoeru—a communication application for smartphones, which was developed based on the results of the research team's needs survey on ICT among older people (Abe et al., 2021). Kikuchi et al. (2021) researched the perception of connectedness through the communication application among 10 participants in 2019 and found that the perceived connectedness was a sense of security, empathy, and belonging.

In July 2019, we gave participants a smartphone pre-installed with Kikoeru. Participants used Kikoeru at any time during the period, both inside and outside their homes, at their own convenience. Kikoeru communicated using voice and photos (Figure 3-1) and a pedometer (Figure 3-2). During the intervention period, 11 club members participated in the online group activity. Data on participants' use of the

application were collected in August 2020. We analyzed the number of posts and pedometer views for each day as usage data. All 11 participants continued to use Kikoeru.

## **Process evaluation**

### ***Qualitative data collection***

We conducted focus-group interviews in August 2020 post-intervention. We examined three focus groups, with each group comprising four or five participants, and conducted all sessions face-to-face in a private room of a public facility. The second, third, and last authors interviewed all participants. All authors have qualitative research experience. We conducted the interviews using an interview guide (Table 1) comprising questions on participants' perceptions of the effectiveness of the SAPEI. However, the interviews were semi-structured, allowing participants to speak freely about their experiences. We recorded the interviews using a digital voice recorder, with participants' consent.

### ***Qualitative data analysis***

We employed a qualitative descriptive approach, supported by the philosophical position of naturalistic inquiry (Sandelowski, 2000). This method provides a comprehensive summary of a particular phenomenon using everyday terms (Sandelowski 2000). First, the first and last authors read all the interviews and focused on the context in which perceptions of personal life, club membership, and community, as captured through the program, could be detected and translated into codes. Subsequently, we aggregated similar codes and extracted subthemes. Then, we examined commonalities between the subthemes by aggregating similar subthemes to generate themes with a higher level of abstraction. We performed continuous comparative analysis. The first and last authors conducted this process. The first author

is a doctoral student and public health nurse with experience in qualitative research. The first author analyzed and modified until the last author approved it. After reaching a consensus, they shared the themes and subthemes with all coauthors for confirmation.

### ***Rigor and trustworthiness***

We adopted different strategies throughout the research process to ensure rigor and trustworthiness. The coauthors thoroughly reviewed the data during the analysis (confirmability and dependability). This study followed the COREQ checklist criteria for reporting qualitative research (Tong et al., 2007).

### **Outcome evaluation**

#### ***Quantitative data collection***

We collected the data in June 2019 pre-intervention and in August 2020 post-intervention, using a self-administered questionnaire. The post-intervention questionnaire used the same questionnaire as the pre-intervention one. It was collected prior to the focus-group interviews. The survey items included demographic attributes and psychosocial outcomes.

**(1) Demographic attributes:** These included participants' sex, age, family structure, residential history, educational background, living arrangements, and physical health status. We assessed physical health status according to the certification of the need for nursing care and physical frailty; we assessed frailty using the "FRAIL" screening tool (Morley & Al, 2014). Participants were considered frail if they met three or more of the five head values, pre-frail if they met two of the five head values, and non-frail otherwise.

**(2) Psychosocial outcomes (Table 2):** We measured six variables: loneliness (Ando et al., 2000), subjective health, subjective well-being, self-esteem (Sakurai, 2000), social support (Iwasa et al., 2007), and satisfaction with the way of spending

time in social activities (SARDLS; Okamoto, 2010). We assessed four items—loneliness (score range: 0–10), self-esteem (score range: 10–40), social support (score range: 1–7), and SARDLS—using scales with confirmed reliability and validity. We analyzed SARDLS for each of the four subscales: learning (score range: 4–20), contribution (score range: 4–20), health (score range: 3–15), and friends (score range: 3–15). We also assessed subjective health and subjective well-being with one item each. We measured subjective health with a four-point Likert scale and subjective well-being with a numerical scale.

### ***Quantitative data analysis***

We conducted descriptive statistics for the demographic attributes and psychosocial health outcomes pre- and post-SAPEI. For each outcome, we conducted pre/post comparisons using t- and Wilcoxon’s signed-rank tests for mean scores before and after the SAPEI, and we performed exact probability tests. Wilcoxon’s signed-rank test was performed by IBM SPSS Exact Tests—an exact probability test that accurately handles small samples. We also performed a comparative analysis by communication application utilization. Pre- and post-intervention comparisons were made for each psychosocial outcome measure; then, group comparisons of each psychosocial outcome were made for the application utilization group (AUG) and non-application utilization group (NAUG), pre- and post-intervention, respectively. We used IBM SPSS Statistics (version 26.0 J, IBM SPSS Inc., Chicago, IL, USA) for data analysis. Significance was set at 5%.

### **Process-outcome evaluation integration**

We combined each dataset for the integration of the process-outcome evaluation. According to Lewin et al. (2009), complex health care interventions need to evaluate both quantitative and qualitative data in order to take a holistic view and show

the process and outcomes of the practice. For this reason, we considered a mixed methods approach appropriate, as it considers the “whole through integration that is greater than the sum of the individual qualitative and quantitative parts” (Fetters & Freshwater, 2015, p. 115). The integration of the data involved three phases. First, we analyzed qualitative and quantitative data. Second, from the quantitative data, we extracted results that deepened the interpretation of the themes extracted in the qualitative analysis. Third, we interpreted the effects of the SAPEI as indicated by each theme and related quantitative data. These interpretations are presented in a joint display (Table 6). Integration is a deliberate process by which a researcher combines quantitative and qualitative approaches (Creswell & Clark, 2018). Joint displays provide a structure for discussing the results of integrated analyses, allowing us to visually move beyond the information obtained from individual results and draw new insights (Guetterman et al., 2015). The first and last authors conducted all phases and then shared the results with all coauthors.

### **Ethical considerations**

This study was approved by the Ethics Review Committee of the Faculty of Health Sciences, Hokkaido University (approval number: 19–8). We provided oral and written explanations to the Community Support Center in Town A, the representative of the senior citizens’ club, and participants that their cooperation was voluntary, their personal information would be protected, and the survey data would be managed appropriately. We obtained participants’ written consent.

## **Results**

### **Demographic attributes (Table 3)**

Participants were 11 women and 6 men ( $M_{\text{age}} = 79.5 \pm 6.4$  years). Six (35.3%) agreed to participate in face-to-face group activities only; 11 (64.7%) agreed to

participate in both face-to-face and online group activities. There were no significant differences in demographic attributes between the AUG (11 participants) and NAUG (6 participants). Two (11.8%) participants were certified as requiring nursing care support, while 15 (88.2%) did not require such support. Regarding frailty status (pre-test/post-test), patients were frail (n = 2; 11.8%/n = 2; 11.8%), pre-frail (n = 3; 17.6%/n = 2; 11.8%), or non-frail (n = 12; 70.6%/n = 13; 76.5%).

### **Process evaluation (Appendix 2)**

We identified participants' perceptions of their personal lives, club membership, and community. Following a qualitative descriptive analysis, we discovered four themes (and 13 subthemes).

#### ***Stimulation brought about by relationships with peers***

SAPEI stimulated intellectual activity by motivating participants to think deeply about something, which they had never done before as part of the club activities. They perceived natural contact with other members, while exercising their cognitive functions, by holding discussions and communicating with them.

*So far, our club activities have been talking, cooking, eating lunch, and playing games. However, in addition, we have more opportunities to think about making a handbook, although it may not be the same as studying. (AA, man in his 70s)*

*I think it was good in the sense that it gave us homework to think more and train our minds. (GG, man in his 70s)*

#### ***Realization as to where they feel they belong***

Participants described a sense of satisfaction related to their relationships with group members, such as a sense of acceptance and enjoyment in meeting them.

*I think it's important to talk. If we just participate in a game and laugh, we do not get to talk and think. Thanks to the handbook, we can say something like, "I used to be this way," or "There are things like this." (QQ, woman in her 60s)*

*I feel more cheerful. Even if it was only once a month, it made me happy (NN, woman in her 80s)*

### ***Rethinking of oneself in the community***

During their independent time, the program content motivated participants to reflect. Owing to the program content, participants made minor discoveries in their daily lives and broadened their perspectives. They also experienced a deepening of their relationships with friends and loved ones.

*I can look at the history of District B with different eyes if I think that there was this kind of story in the SAPEI the other day and that it was in the handbook. (GG, man in his 70s)*

*In the food section, we were reminded of the times I used to make things by myself, such as rice cakes. We used to make beko-mochi and kashiwa-mochi (rice cakes) during the Dragon Boat Festival. So, some members have not made it for a while, but when their grandchildren come, they will make it. (MM, man in his 60s)*

### ***Awareness of attachment to and coexistence with the community***

By verbalizing and communicating their own contributions to the local community, participants experienced renewed motivation. They also mentioned that they had developed a sense of pride and responsibility toward the community. They

described their experience of discovering local issues and the need to help each other in the neighborhood.

*Many members learned about my activities. It really boosts me. (MM, man in his 60s)*

*Well... I spent my whole life here, not really being aware of the goodness of the community. However, when the theme came up, I realized again that there were many things like this. It is reconfirmation that I need to cherish these things. (JJ, man in his 80s)*

*What should be done with people who have difficulty evacuating? For example, if a neighbor looks like she has a bad leg, then when she evacuates, it would be better if someone from the neighborhood goes with her. I think it would be beneficial to have such discussions in the community. (QQ, woman in her 60s)*

### **Outcome evaluation**

We determined whether SAPEI changes psychosocial outcomes (loneliness, subjective health, subjective well-being, self-esteem, social support, and SARDLS). For psychosocial outcomes, the results of the pre- and post-intervention comparisons showed that there were no significant changes in any of the outcomes except for self-esteem. Self-esteem significantly decreased post-intervention (Table 4).

We also conducted comparative analyses. First, the results of the pre- and post-intervention comparisons showed no significant changes in any psychosocial outcomes for both the AUG and NAUG pre- and post-intervention. However, in between-group comparisons, post-intervention scores of the AUG were significantly higher than the NAUG for subjective well-being and self-esteem ( $p = .027$ ;  $p = .038$ ; Table 5).



### **Process-outcome evaluation integration (Table 6)**

We inferred what effects SAPEI had on participants' psychosocial health and categorized these effects into three levels. At the individual level, we inferred an effect of "fulfillment of subjective health." In the outcome evaluation, no significant change was observed in subjective health and health satisfaction. However, the integration results suggest that the SAPEI program helped participants feel that they could participate in activities while interacting with group members in a lively manner, which they interpreted as a positive perception of their own health status that could not be quantified.

At the group level, we inferred an effect of "maintenance and assurance of moderate distance connectedness." We did not find a significant reduction in loneliness or a significant improvement in subjective well-being were found in the outcome evaluation. However, we interpreted the synthesis results as finding a sense of belonging in the group through SAPEI, which resulted in the retention and assurance of desirable relationships with group members.

At the community level, we inferred an effect of "orientation toward aging in place (AIP)." In the outcome assessment, there were no significant changes in satisfaction related to multiple social activities (satisfaction with learning, friends, and contributions) and social support. However, we interpreted the results of the integration as indicating that through SAPEI, a sense of self-reconsideration, attachment to the community, and symbiosis were generated, and a perspective on the community was fostered.

### **Discussion**

We developed and implemented a program to increase interactions among older people. We used both quantitative and qualitative data to investigate the impact of

this program on the psychosocial health of rural homebound older people.

In the process evaluation, we explored participants' perceptions of their lives, club members, and community as perceived through SAPEI. Four themes emerged. Participants indicated that SAPEI changed their personal perceptions, such as sense of belonging and sense of attachment and coexistence, which cannot be measured by quantitative data. These results allow for a deeper interpretation of the context in which the psychosocial outcome did not decline.

In the outcome evaluation, we researched changes in the psychosocial outcome of participants. The analysis showed no negative impact on most indicators except for self-esteem. The fact that pre-intervention scores on most psychosocial outcomes did not decline indicates the potential for further development of a community-based group intervention for homebound older adults that combines face-to-face and online group activities. However, there was a post-intervention decrease in self-esteem and, although non-significant, an augmentation of loneliness, and a decrease in social support and social activity satisfaction. This may be influenced by the timing of data collection post-intervention. Self-esteem has been reported to be associated with social participation status (Hashimoto & Motomura, 1997). However, it cannot be denied that the post-intervention evaluation may have been significantly negatively affected by the suspension of social activities owing to COVID-19 and the fact that the closure of the senior citizens' club activities coincided with the period when the club had been in operation until the previous month. Nevertheless, even under these circumstances, there was only a slight decline in psychological health. t

We conducted comparative analyses based on the use of the communication application. The post-intervention scores for subjective well-being and self-esteem were significantly higher in the AUG than in the NAUG. These findings are consistent with

previous evidence that ICT use enhances older adults' well-being (Sims et al., 2017). Ronzi et al. (2018) showed that ICT use among older adults improved well-being through the perception of self-worth. Our participants engaged in the use of technology in the form of a smartphone application. This may have enhanced their self-esteem as they were encouraged to tackle new challenges. Llorente-Barroso et al. (2021) reported that ICT use played a role in enhancing self-esteem in older adults confined to their homes owing to COVID-19. The intervention period coincided with the cessation of club activities during COVID-19. However, the AUG could substitute face-to-face social activities with the application during this period. This may have contributed not only to securing opportunities for social interaction but also to the maintenance of self-esteem. There was no change in the psychosocial outcome measures pre- and post-intervention depending on the use of the application. However, using the communication application, in addition to group activities in the SAPEI, helped maintain subjective well-being and self-esteem.

Complex health care interventions need to evaluate both quantitative and qualitative data (Lewin et al., 2009). Therefore, we inferred three levels of effects (i.e., individual, group, and community) by integrating different data in order to further understand the overall intervention process and outcomes of the intervention. At the individual level, the SAPEI promoted fulfillment of subjective health through interactions with others. Participants maintained their subjective health, regardless of their actual state of physical functioning. Saito et al. (2021) clarified the relationship between subjective health and interaction in older adults. Rural older people reported valuing interactions with their neighbors and peers (Neville et al., 2018). Since subjective sense of health is a predictor of the occurrence of frailty and life satisfaction, improving subjective health is vital. When considering a community-based group

intervention for older adults at home, it is important to develop activities that meet the needs of the target population and prevent nursing care.

At the group level, the effect of the SAPEI was the maintenance and assurance of moderate distance connectedness. By integrating quantitative data, we reasoned the importance of balancing a sense of connectedness with a moderate level of loneliness. Rural older people emphasize the importance of staying connected with neighbors and friends (Neville et al., 2016). The SAPEI included sections that were familiar to everyone and could be shared by all participants, such as traditional local cuisine or nature. This may have promoted acceptance and belongingness, which are valued by rural older adults. However, it is also important to balance interaction with solitude. We found a mild (non-significant) enhancement in loneliness and improvement in subjective well-being post-intervention. Loneliness in older people has serious negative effects not only on their mental health but also on their physical health, in the form of cardiovascular diseases or even mortality (Leigh-Hunt et al., 2017). According to the World Health Organization (WHO; 2021), the health risks of loneliness are critical, and its negative effects cannot be denied. Contrastingly, some reports suggest the need for solitude. For example, Lay et al. (2019) reported that older people perceive solitude as both a positive and negative experience. Weinstein et al. (2021) stated that older people feel most at ease in solitude. Although the concepts of loneliness and solitude share some similarities, they refer in fact to two different feelings. Loneliness is “the painful subjective feeling—or ‘social pain’— that results from a discrepancy between desired and actual social connection” (WHO, 2021, p. 2). Solitude, on the other hand, Lay et al. (2019) clearly distinguished solitude from loneliness as a multifaceted element with two connotations, positive and negative, most clearly defining solitude by the lack of social interaction. Therefore, having time for solitude, while not feeling excluded from others

may help older adults face the challenges of aging and support their well-being. These should be considered when developing community-based nursing care.

At the community level, the SAPEI affected orientation toward AIP. Participants felt encouraged to rediscover and be proud of talking about their town in the SAPEI and reflected on the necessity of daily discussions and mutual aid among local residents, especially during emergencies. Participants expressed a common awareness of AIP— “the ability to live in one’s own home and community safely, independently, and comfortably, regardless of age, income, or ability level” (Centers for Disease Control and Prevention, 2013). Rural older people are attached to their native place (Wiles et al., 2017) and display a desire to live independently (Neville et al., 2016). Moreover, social connectedness is strongly associated with AIP (Ahn et al., 2020). The fact that the program offered time and opportunity to talk about their hometown may have contributed not only to their attachment to the community but also reaffirmed the importance of daily connectedness with familiar people. Since AIP is related to psychosocial health, the development of care programs that work on AIP may be linked to older adults’ health.

The integration of quantitative and qualitative data showed that SAPEI met the needs of rural homebound older adults and had no negative impact on psychosocial aspects. Community-based programs such as SAPEI may allow homebound older adults to benefit from two processes. The combination of face-to-face interaction and ICT may help them to continue interacting with others with ICT support even when face-to-face social activities are difficult, thus protecting them from psychosocial health deterioration. Because it is a program that can be implemented independently among older adults, health promotion is fostered, and psychosocial health is protected from declining. This study suggests the possibility of using existing social activity groups as a

preventive nursing care intervention method to prevent psychosocial health decline. The development of such groups could help older people continue to live in their own neighborhoods, regardless of declining physical functioning or geographic inconvenience, and could serve as an inspiration for considering sustainable communities.

Future research should include more rigorous investigation of the feasibility and cost of this type of intervention in order to develop and refine this design. Future research might also contribute to community nurses continuing to look for opportunities to design community-based social group interventions for older people and evaluate their effectiveness.

### **Limitations**

The intervention period was interrupted owing to COVID-19, and older people's daily activities were restricted, which affected their psychological health (Takashima et al., 2020). During said period, social interaction was maintained through the communication app. Therefore, the group using the app received the intervention longer and continued to interact even during the pandemic. This may have influenced the post-intervention results. Second, there were no significant differences in demographic attributes between participants who used the application and those who did not, which could be due to the small sample and high within-group variance. Third, we cannot exclude the possibility that the non-significant results concerning post-test learning satisfaction were because of a lack of control during the pre-test. Fourth, this study was conducted with participants in a specific senior citizens' club, which limits generalizability. However, many participants lived alone, had been living in the area for a long time, and had been active in the club for approximately 10 years. Therefore, the results can be applied to existing social activity groups in rural areas with similar

backgrounds. Finally, this study did not include a control group; thus, we cannot claim quantitative intervention effects. Future studies should include a control group and larger sample size to implement the SAPEI.

### **Conclusion**

We implemented the SAPEI in a rural community by combining online and face-to-face group activities, utilizing existing social activity groups. We examined the effects of this intervention on psychosocial health with a mixed-methods research design. The results revealed three effects of the SAPEI: “fulfillment of subjective health” at the individual level, “maintenance and assurance of moderate distance connectedness” at the group level, and “orientation toward AIP” at the community level. Our findings provide a promising opportunity for further development and research of community-based group interventions with ICT support.

### **Data sharing and data availability**

Research data are not shared.

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## Tables

**Table 1.** Interview guide

- 
- Q1 How did you feel about making District B's Lifestyle Handbook? What were some of the things that were fun or difficult for you?
- 
- Q2 Did you experience any changes in the way you enjoyed or participated in the club while creating District B's Lifestyle Handbook?
- 
- Q3 Before and after making District B's Lifestyle Handbook, what changes did you notice in your feelings toward the community and local people? How did you relate to them?
-

**Table 2.** Psychosocial health outcomes

Variables	Scales	Questionnaire items	Scale reliability
Loneliness	Ando, Osada, and Kodama Loneliness Scale (Ando et al., 2000)	Ten items, two-point Likert scale; each item is scored and added to the total. e.g., “Are there people around you with whom you share a good rapport?”	Cronbach’s $\alpha$ = 0.836 (Ando et al., 2000)
Subjective health		One item, four-point Likert scale. “Do you consider yourself healthy in general?”	
Subjective well-being		One item, numerical rating scale. “How happy are you now?”	
Self-esteem	Japanese version of Rosenberg’s Self-esteem Scale (Sakurai, 2000)	Ten items, four-point Likert scale. e.g., “On the whole, I am satisfied with myself.”	Cronbach’s $\alpha$ = 0.840 (Sakurai, 2000)
Social support	Japanese version of the Multidimensional Scale of Perceived Social Support (Iwasa et al., 2007)	Seven items, seven-point Likert scale; all items are totaled, and the average score is calculated. e.g., “There is a special person who is around when I am in need.”	Cronbach’s $\alpha$ = 0.850 (Iwasa et al., 2007)
Social activities-related daily life satisfaction	Social Activities-related Daily Life Satisfaction Scale (Okamoto, 2010)	Fourteen items, five-point Likert scale; the overall scale score and each subscale score is calculated. This scale has a four-factor model, and it is possible to examine each subscale score in addition to the overall scale score. (1) Satisfaction with learning (4 items). e.g., “I am able to learn in my own way what I am interested in.” (2) Satisfaction with usefulness to others and the society (4 items). e.g., “I am doing something useful for society in my own way.” (3) Satisfaction with health and physical strength (3 items). e.g., “I feel more confident about my health in my own way.”	Overall scale score: Cronbach’s $\alpha$ = 0.919 Subscale scores: (1) Cronbach’s $\alpha$ = 0.881 (2) Cronbach’s $\alpha$ = 0.814 (3) Cronbach’s $\alpha$ = 0.887 (4)

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(4) Satisfaction with friends (3 items). e.g., “I am satisfied with the companionship of my friends.”	Cronbach’s $\alpha$ = 0.869 (Okamoto, 2010)
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*Note.* For each variable, a higher score indicates a stronger outcome.



**Table 3.** Demographic attributes of the participants

N = 17

	Total	AUG (n = 11)	NAUG (n = 6)	<i>p</i>
	n	n (%)	n (%)	
Sex <sup>a</sup>				1.000
Man	6	4 (66.7)	2 (33.3)	
Woman	11	7 (63.6)	4 (36.4)	
Mean age (years) <sup>b</sup>		76.2 ± 6.9	81.7 ± 3.1	.140
Family structure <sup>a</sup>				.600
Living alone	12	7 (58.3)	5 (41.7)	
Living with family	3	2 (66.7)	1 (33.3)	
Residential history <sup>a</sup>				.464
< 10 years	1	0 (0)	1 (100)	
11–20 years	4	2 (50.0)	2 (50.0)	
21–30 years	1	1 (100)	0 (0)	
31–40 years	2	1 (50.0)	1 (50.0)	
≥ 41 years	9	7 (77.8)	2 (22.2)	
Educational background <sup>a</sup>				.762
Secondary school	9	5 (55.6)	4 (44.4)	
High school	7	5 (71.4)	2 (28.6)	
University	1	1 (100)	0 (0)	
Living arrangement <sup>a</sup>				.131
Have worries	9	4 (44.4)	5 (55.6)	
No worries	8	7 (87.5)	1 (12.5)	

Note. <sup>a</sup> Fisher's exact test; <sup>b</sup> t-test.

AUG = application utilization group; NAUG = non-application utilization group.

**Table 4.** Pre- and post-intervention comparison of each outcome

N=17

Variables	Score range	Pre-test score <i>M ± SD</i>	Post-test score <i>M ± SD</i>	<i>p</i>
Loneliness	0–10	0.71 ± 1.93	0.88 ± 1.36	.613
Subjective well-being	0–10	6.06 ± 2.04	6.76 ± 1.93	.178
Self-esteem	10–40	29.29 ± 5.19	26.65 ± 4.03	.026
SS	1–7	5.53 ± 0.54	5.29 ± 1.01	.293
SARDLS_ learning	4–20	13.76 ± 2.80	13.18 ± 2.10	.580
SARDLS_ usefulness	4–20	13.53 ± 3.09	13.18 ± 2.48	.483
SARDLS_ health	3–15	10.47 ± 2.67	9.47 ± 2.18	.081
SARDLS_ friends	3–15	12.41 ± 1.50	11.82 ± 1.38	.240

*Note.* Wilcoxon signed-rank test was used.

SS = social support; SARDLS = social activities-related daily life satisfaction; SARDLS\_ learning = satisfaction with learning; SARDLS\_ usefulness = satisfaction with usefulness to others and the society; SARDLS\_ health = satisfaction with health and physical strength; SARDLS\_ friends = satisfaction with friends.

**Table 5.** Comparison of each outcome between subgroups according to application use in the pre-test and post-test N = 17

	Pre-test			Post-test		
	AUG	NAUG	<i>p</i>	AUG	NAUG	<i>p</i>
	(n = 11) <i>M ± SD</i>	(n = 6) <i>M ± SD</i>		(n = 11) <i>M ± SD</i>	(n = 6) <i>M ± SD</i>	
Loneliness	0.18 ± 0.39	1.67 ± 2.87	.209	0.64 ± 0.88	1.33 ± 1.80	.649
Subjective well-being	6.73 ± 2.00	4.83 ± 1.46	.073	7.55 ± 1.44	5.33 ± 1.89	.027
Self-esteem	31.00 ± 3.49	26.17 ± 5.87	.082	28.18 ± 3.07	23.83 ± 3.72	.038
SS	5.57 ± 0.64	4.78 ± 1.25	.329	5.54 ± 0.54	5.52 ± 0.51	.785
SARDLS_ learning	15.00 ± 1.76	11.50 ± 2.69	.008	14.00 ± 1.48	11.67 ± 2.05	.047
SARDLS_ usefulness	14.91 ± 2.31	11.00 ± 2.38	.009	14.09 ± 1.78	11.50 ± 2.50	.053
SARDLS_ health	11.45 ± 1.37	8.67 ± 3.25	.087	10.18 ± 1.47	8.17 ± 2.48	.136
SARDLS_ friends	12.55 ± 1.08	12.17 ± 1.95	.640	11.55 ± 0.99	12.33 ± 1.70	.524

*Note.* Mann–Whitney U test was used.

AUG= application utilization group; NAUG= non-application utilization group; SS= social support; SARDLS = social activities-related daily life satisfaction; SARDLS\_ learning = satisfaction with learning; SARDLS\_ usefulness = satisfaction with usefulness to others and society; SARDLS\_ health = satisfaction with health and physical strength; SARDLS\_ friends = satisfaction with friends.

**Table 6:** Effects of the SAPEI on psychosocial health shown by the integrated qualitative and quantitative data

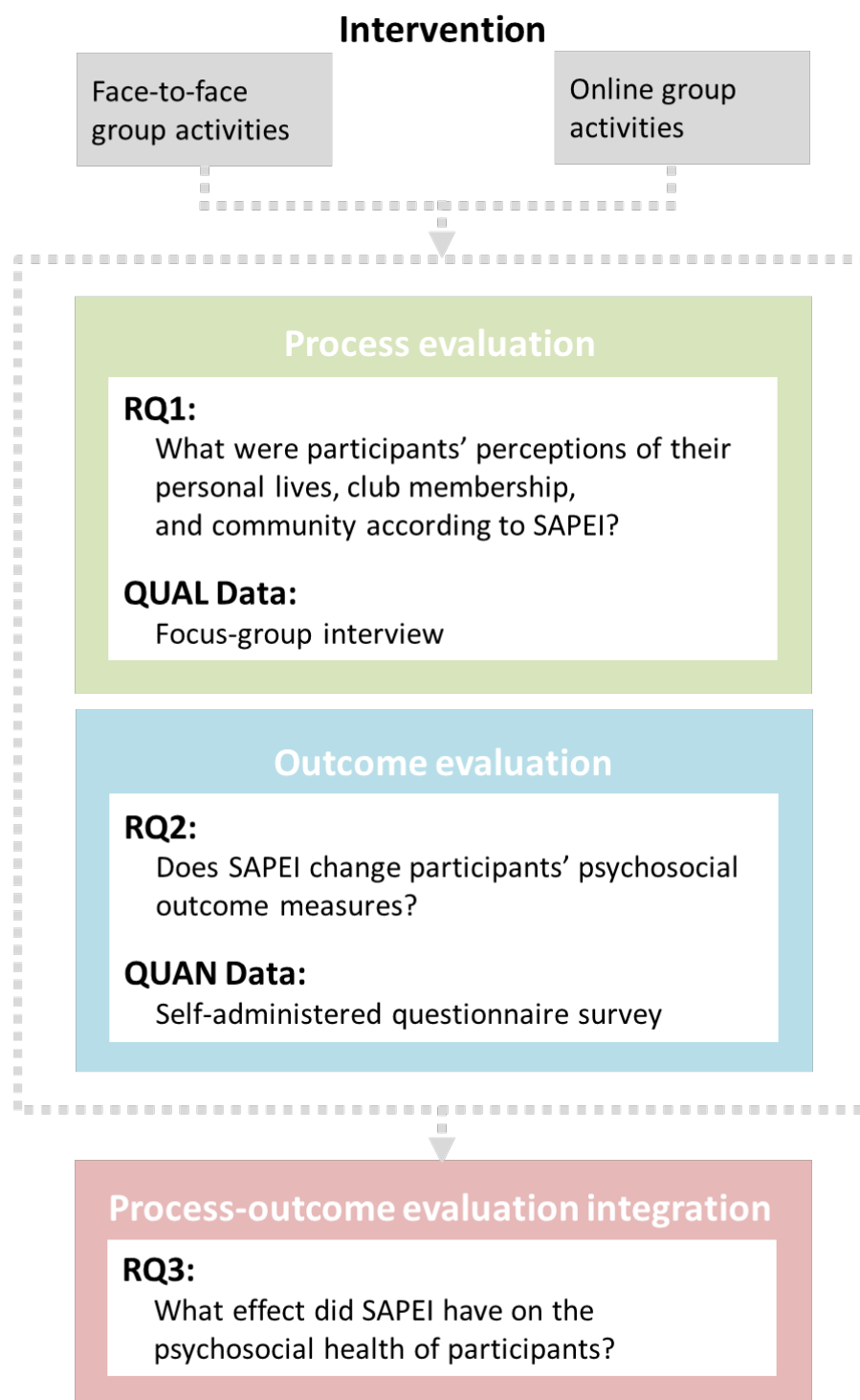
Qualitative data		Quantitative data	Meta-inferences	
<i>Stimulation brought about by relationships with peers</i>	SARDLS_ health	Pre: 10.47 ± 2.67 Post: 9.47 ± 2.18 <i>p</i> = .080	<b>Individual level</b> <i>Fulfillment of subjective health</i>	Subjective health and health satisfaction were maintained at high levels. Participants reported feeling a definite vitality in conversations that required intellectual activity and the participation of peers, which they had not experienced in previous activities. “Stimulation brought about by relationships with peers” was recognition of the fact that they could participate in activities and interact with others in a lively manner. This perception is an important part of the psychosocial health of older people.
	Subjective health	Pre: Good → Post: Good: n = 12		
<i>Realization as to where they feel they belong</i>	Loneliness	Pre: 0.71 ± 1.93 Post: 0.88 ± 1.36 <i>p</i> = .454	<b>Group level</b> <i>Maintenance and assurance of moderate distance connectedness</i>	Subjective well-being showed improvement after the intervention, although the change was non-significant. Loneliness was also observed but at a relatively low level (around 1 point). Participants perceived a sense of belonging as a member of the group and a sense of security in being accepted by other members in the SAPEI. Thus, a relatively negligible low level of loneliness did not directly affect subjective well-being. In fact, connectedness with others along with a moderate level of loneliness promoted self-affirmation. In the case of older people, “Realization as to where they feel they belong” was established with a moderate sense of distance, which supported their well-being.
	Subjective well-being	Pre: 6.06 ± 2.04 Post: 6.76 ± 1.93 <i>p</i> = .150		
<i>Rethinking of oneself in the community</i>	SARDLS_ learning	Pre: 13.76 ± 2.80 Post: 13.18 ± 2.10 <i>p</i> = .550	<b>Community level</b> <i>Orientation toward aging in place</i>	Satisfaction with learning was maintained. After the monthly face-to-face group activities, participants returned home and recalled the program contents in their daily lives. This was related to maintenance through positive reflection on one’s past and a modest expansion of perspective that inspired intellectual curiosity. The SAPEI provided a
	SARDLS_	Pre: 12.41 ± 1.50		

	friends	Post: 11.82 ± 1.38 <i>p</i> = .214		
	SS	Pre: Poor → Post: Normal n = 2 Common points: • Living alone • Pre: subjective impairment • Pre: loneliness		self-contained and enriching way to spend time in daily life without club activities. Thus, it enriched the time spent with loved ones too. “Rethinking of oneself in the community” indicated a sense of fulfillment in spending time alone and with others and boosted older people’s confidence in independent living with SS, despite their physical and psychological concerns.
<b><i>Awareness of attachment to and coexistence with the community</i></b>	SARDLS_ usefulness	Pre: Normal → Post: Good n = 2 • Persons who have served as officers in community activities • Civil welfare officer	<b>Community level Orientation toward aging in place</b>	The level of satisfaction with contribution to the community was maintained and even improved. In particular, participants who had taken a central role in community activities showed an improved level of satisfaction because they had an opportunity to share their activities with others and receive acknowledgment. However, even those participants who did not make a direct contribution developed a feeling of love and pride for the community, which cannot be measured quantitatively. Because of their attachment to the community, they came to discover local issues and considered what they could do in the community for and with their neighbors. “Awareness of attachment to and coexistence with the community” is an awareness of the connectedness between oneself and others living in the community. This perspective fostered empathy for peers living in the community and contributed to a desire for aging in place.
		Pre: Good → Post: Good n = 2 • Civil welfare officer		
	SS	Pre: 5.53 ± 0.54 Post: 5.29 ± 1.01 <i>p</i> = .271		

*Note.* SS = social support; SARDLS = social activities-related daily life satisfaction; SARDLS \_ learning= satisfaction with learning; SARDLS\_ usefulness= satisfaction with usefulness to others and society; SARDLS\_ health satisfaction with health and physical strength; SARDLS\_ friends= satisfaction with friends; SAPEI: Social Activity Program that Encourages Interaction.

## Figure legends


**Figure 1.** Analytical Framework




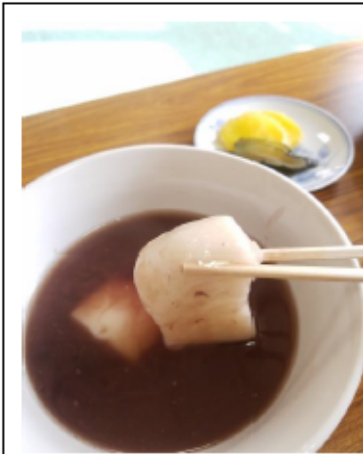
RQ = research question; QUAL = qualitative; QUAN = quantitative

SAPEI: Social Activity Program that Encourages Interaction.

**Figure 2.** District B’s Lifestyle Handbook

	<p><b>Blessings of Nature</b></p> <p>Berry (“Kumaichigo” in Japanese)</p> <p>Delicious eaten as is or made into jam!</p>
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	<p><b>Lunch Table at District B’s Senior Citizen’s Club on October 17th</b></p> <ul style="list-style-type: none"><li>• Pork miso soup</li><li>• Pickles—radish with crimson grapes (“Yamabudou” in Japanese)</li><li>• Rice balls</li></ul> <p>Taste as good as the ones made by professionals!</p>
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	<p><b>Lunch Table at District B’s Senior Citizen’s Club on February 20th</b></p> <ul style="list-style-type: none"><li>• Oshiruko (adzuki beans inside rice cakes)</li><li>• Pickles—radish and cucumber</li></ul> <p>A perfect balance of sweetness and low salt content!</p>
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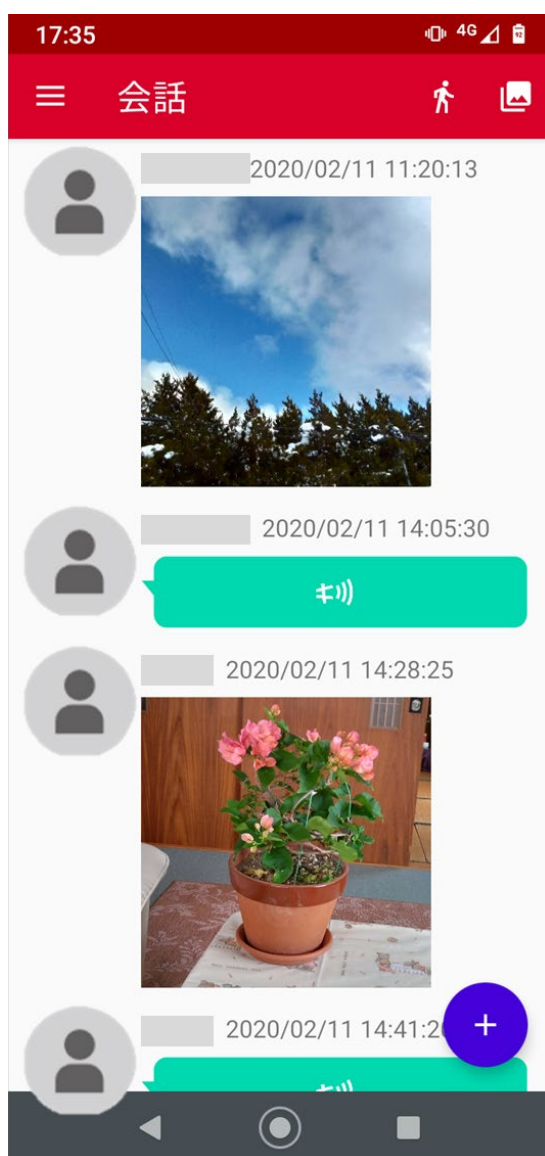
District B’s Lifestyle Handbook is a pamphlet that contains photos taken by participants

(left: photos) and comments made by them (right: comments). The participants created this pamphlet based on their face-to-face group activities and the use of the communication application Kikoeru. Consequently, 156 photos and comments were compiled, covering a total of 40 pages.

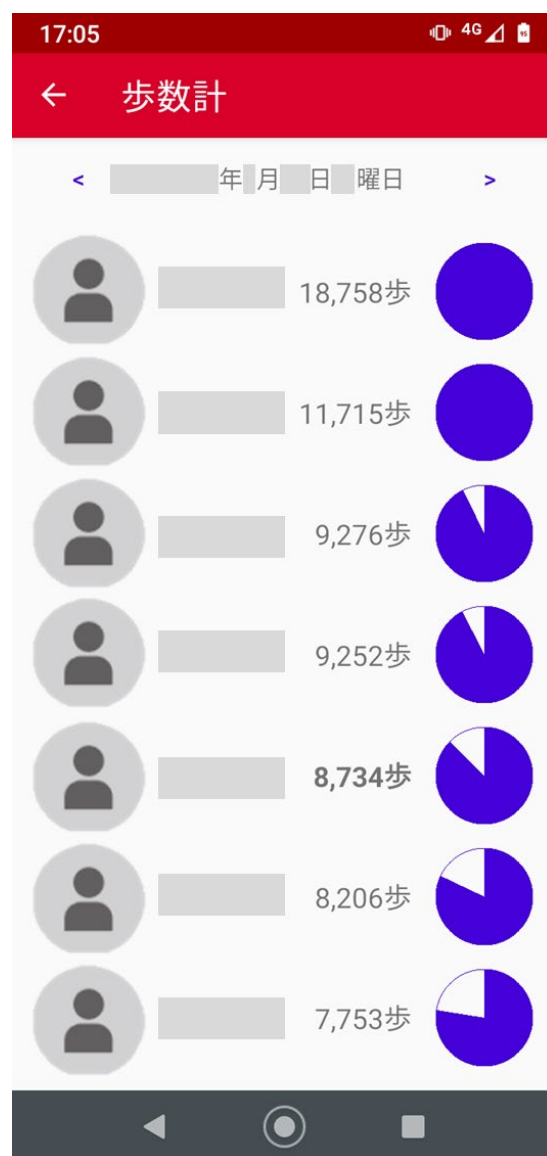


**Figure 3.** Communication application screen

3-1: Chat window



3-2: Pedometer window



The communication application also included activities such as posting about the day's weather, impressive events and landscapes (Figure 3-1), and viewing pedometer rankings (Figure 3-2).

The researcher made participant observations of the online interactions on Kikoeru. The research team paid all the costs related to these smartphones.

Appendix 1. Details of face-to-face group activities

Session	Date	Main contents	Details
1	2019.7.18	<ul style="list-style-type: none"> <li>• Introduction</li> <li>• Local cuisine part 1</li> </ul>	<ul style="list-style-type: none"> <li>• Explanation of how to proceed with face-to-face group activities</li> <li>• Sharing of images of the completed “District B’s Lifestyle Handbook”</li> <li>• Small group discussion on the theme (local cuisine part 1) and overall sharing</li> </ul>
2	2019.9.19	<ul style="list-style-type: none"> <li>• Local cuisine part 2</li> </ul>	<p><b><u>Small group discussion (15 minutes)</u></b></p> <ul style="list-style-type: none"> <li>• Form four smaller groups of 3–4 members each</li> <li>• The leader joins each group and facilitates the discussion</li> <li>• The leader summarizes the group’s opinions referring to the KJ method</li> </ul> <p><b><u>Sharing with all members (15 minutes)</u></b></p> <ul style="list-style-type: none"> <li>• The leader summarizes the content of each group’s discussion and presents it to all members</li> </ul> <p>*During the program, the first, second, third, and last authors joined each group and recorded in writing the group discussions and the content shared.</p>
3	2019.10.17	<ul style="list-style-type: none"> <li>• Local crime prevention, disaster prevention, and problem-solving part 1</li> </ul>	
4	2019.11.14	<ul style="list-style-type: none"> <li>• Local crime prevention, disaster prevention, and problem-solving part 2</li> </ul>	
5	2019.12.12	<ul style="list-style-type: none"> <li>• Local nature and tourism</li> </ul>	
6	2020.2.10	<ul style="list-style-type: none"> <li>• Local history and tradition part 1</li> </ul>	
7	2020.7.16	<ul style="list-style-type: none"> <li>• Local history and tradition part 2</li> </ul>	
8	2020.9.17	<ul style="list-style-type: none"> <li>• Summary of the entire program</li> </ul>	<ul style="list-style-type: none"> <li>• Share a draft of the Handbook</li> <li>• Share how to utilize the Handbook</li> </ul>

## Appendix 2. Theme and subtheme

<b>Theme</b>	<b>Subtheme</b>
Stimulation brought about by relationships with peers	Indulging in brain activity with peers
Realization as to where they feel they belong	Recognition of oneself as being accepted by other members
	Discovery of what they can do for other members
	Feelings of liveliness on meeting other members
Rethinking of oneself in the community	Discovery of new and simple things in daily life
	Nostalgia about the past in connection with changes in their surroundings
	Recollection of what they discussed in the SAPEI in their daily lives
	Reflection of what they talked about in the SAPEI in their interactions with loved ones
Awareness of attachment to and coexistence with the community	Re-recognizing the desire to contribute to the community
	Focusing on the unknown charms of the community
	Becoming aware of and feeling proud of the region
	Realization of the responsibility to pass on local traditions
	Considering local issues as their own issues

SAPEI: Social Activity Program that Encourages Interaction.

**Effects of a “Social Activity Program that Encourages Interaction” on rural older people’s psychosocial health: Mixed-methods research**

**Running title:** Effects of a Social Activity Program

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**Statement of Contribution**

MK, RO, RT, KS, and MH contributed to the conception and idea of the paper. RO, RT, KS, and MH contributed to the study design. RO, RT, MH, and MK contributed to the data acquisition. MK and MH contributed to the analysis. MK, MH, RO, RT, and KS interpretation of data for the work. All authors contributed to drafting the work and approved of the version to be submitted.

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### **Conflicts of interest**

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