



HOKKAIDO UNIVERSITY

Title	Development of Older Adults' Perceptions on Community-based Connectedness with People Scale : Reliability and validity evaluation
Author(s)	Kikuchi, Mami; Ikeda, Atsuko; Hirano, Michiyo
Citation	Japan journal of nursing science : JJNS, 21(2), e12583 https://doi.org/10.1111/jjns.12583
Issue Date	2024-01-12
Doc URL	https://hdl.handle.net/2115/93907
Rights	This is the peer reviewed version of the following article: Development of Older Adults' Perceptions on Community-based Connectedness with People Scale: Reliability and validity evaluation. Japan journal of nursing science. 21(2) e12583 2024, which has been published in final form at https://doi.org/10.1111/jjns.12583 . This article may be used for non-commercial purposes in accordance with Wiley Terms and Conditions for Use of Self-Archived Versions. This article may not be enhanced, enriched or otherwise transformed into a derivative work, without express permission from Wiley or by statutory rights under applicable legislation. Copyright notices must not be removed, obscured or modified. The article must be linked to Wiley's version of record on Wiley Online Library and any embedding, framing or otherwise making available the article or pages thereof by third parties from platforms, services and websites other than Wiley Online Library must be prohibited.
Type	journal article
File Information	ull text.pdf,



**Development of Older Adults' Perceptions on Community-based Connectedness with
People Scale: Reliability and Validity Evaluation**

Running title: DEVELOPMENT OF CONNECTEDNESS SCALE

Mami Kikuchi¹, Atsuko Ikeda², and Michiyo Hirano²

¹Graduate School of Health Sciences, Hokkaido University, Sapporo, Hokkaido, Japan

²Faculty of Health Sciences, Hokkaido University, Sapporo, Hokkaido, Japan

Author Note

Correspondence concerning this article should be addressed to Michiyo Hirano, Faculty of Health Sciences, Hokkaido University, N12-W5, Kita-ku, Sapporo 060-0812, Japan.

Telephone: +81-11-706-3377; E-mail: mihirano@med.hokudai.ac.jp.

Development of Older Adults' Perceptions of Community-based Connectedness with

People Scale: Reliability and Validity Evaluation

Abstract

Aim: We developed a self-assessment scale—*Older Adults' Perceptions of Community-based Connectedness with People*—to assess older adults' comprehensive perceptions of their connectedness with others in the community. A specific aim of this study is to evaluate the reliability and validity of this scale.

Methods: Participants consisted of 1000 men and women aged 65 years or older, living in Sapporo, Hokkaido, Japan. Factorial validity was assessed using exploratory and confirmatory factor analysis, while concurrent validity was assessed using correlation analysis. Reliability was confirmed by Cronbach's α coefficient using the internal consistency method, and the stability coefficient was confirmed using the test–retest method.

Results: Responses were received from 380 participants, and 358 participants who responded to all items were included in the analysis. The developed scale comprised 22 items with three factors: “Perception of Inclusion” ($\alpha = .947$), “Perception of Reciprocity through Reception” ($\alpha = .937$), and “Perception of Reciprocity through Provision” ($\alpha = .910$). Correlation analyses indicated that concurrent scales were positively correlated with *Ikigai* and negatively correlated with loneliness on the total scale. The model fit was CFI = .933, GFI = .854, AGFI = .818, and RMSEA = .081. The stability coefficient of the total scale scores was .875 (95%

CI: .830–.908).

Conclusions: The developed scale had adequate reliability and validity. The perceptions of connectedness measured using this scale can be used by public health and nursing care professionals to prevent loneliness and isolation among older adults living in the community.

Keywords: aged, community, connectedness, nursing care, psychological well-being, scale development

Introduction

Loneliness and isolation are important social determinants of health among older adults (World Health Organization [WHO], 2021). Loneliness is described as a subjective feeling of distress resulting from a discrepancy between desired and actual social connections. Isolation is described as an objective state of having a narrow network of kinship and non-kinship relationships, and infrequent interactions with others (WHO, 2021). Loneliness and isolation are widespread, with the WHO (2021) reporting that 30% of older adults in Western countries are lonely and 10%–40% are isolated. Japan’s first national survey on loneliness and isolation found that approximately 5% of those aged 60 years or older were always lonely and more than 30% were sometimes lonely (Cabinet Secretariat, 2023). About 10% of participants were isolated, meaning that they had “no face-to-face conversations with non-resident family members or friends” (Cabinet Secretariat, 2023). Loneliness and isolation are associated with health conditions such as mortality, depression, and suicide and are therefore priorities for public health and nursing care for older adults (WHO, 2021).

Connectedness has become a key concept in interventions addressing loneliness and isolation among older adults (O’Rourke et al., 2018). Connectedness is essential for the health and well-being of all generations (WHO, 2021). Especially among older adults, it is associated with the maintenance of multiple aspects of health, including physical health (Ten

Bruggencate et al., 2018) and mental health (Collins et al., 2017). Connectedness contributes to the achievement of healthy aging (Nguyen et al., 2019) and is a concept that nursing care professionals should focus on as a useful health indicator for a comprehensive assessment of the health and life of older adults.

Considering connectedness among people in the community is also crucial against the backdrop of an aging population and an increase in single-person households (Ministry of Health, Labour and Welfare, 2016). Ten Bruggencate et al. (2018) emphasize that peripheral relationships, as distinct from close relationships such as those with family members, have an impact on the health and connectedness of older adults. Further, for older adults, relationships with people in the community are an important community resource (Schwirian & Schwirian, 1993) that lead to continued independent living (Chen et al., 2020). Therefore, public health professionals should consider *community-based connectedness with people* in their understanding of older adults' connectedness to the presence of community members.

Previous studies have not discussed connectedness based on a consistent definition. Most studies have dominated quantitative assessments that treat connectedness as network size, as represented by the existence or number of close contacts (Mehrabian et al., 2021). However, studies that have attempted qualitative assessments have limited the measurement of relevant constructs, such as social support and loneliness (Holt-Lunstad, 2018). Previous research has yet to establish a comprehensive method for measuring subjective perceptions of

connectedness among older adults.

Therefore, we developed a draft scale—*Older Adults' Perceptions of Community-based Connectedness with People* (the PECOCO)—consisting of 22 items with three factors. Initially, a pilot study was conducted with 800 Japanese men and women aged 65 years or older to construct a draft scale (Kikuchi et al., 2023a). Based on Kikuchi & Hirano (2023, p. 8), the definition of *older people's connectedness with people in the community* is “the perception of sense of belonging to the community achieved through interactions and feeling of togetherness through interrelationships.” The scale measured older people's subjective perceptions of their connectedness with people in their community. In this manuscript, we evaluated the reliability and validity of the draft scale constructed in the pilot study of older adults living in the community. The scale is expected to contribute to evidence-based loneliness and isolation prevention strategies among nursing care professionals for older adults living in communities.

Methods

Research Design

This study employed a cross-sectional research design.

Participants

This study included 1000 participants aged 65 years or older living in Nishi Ward, Sapporo, Hokkaido, Japan. Sapporo is a large city located in northern Japan, with a

population of almost 2 million people. Within Sapporo, Nishi Ward comprises 11 districts, with a population of approximately 200,000, and an aging rate of 28.4% (as of January 1, 2023). The basic resident registration was used for participant selection—this was to ensure proper extraction based on demographic composition, and to obtain mailing address information. Sapporo City approved the request for inspection and transcription of the basic resident registration copy, and the inspection was conducted in accordance with city ordinances. The personal information obtained was used only to mail out the questionnaires, and was deleted afterwards.

We conducted this study in the Nishi Ward because its older population ratio is the same as that of the city in general. Therefore, the Nishi Ward was considered to be a representative population reflecting the characteristics of the older population of the city.

During the first step of our sampling, we stratified the population of people aged 65 and older residing in all 11 districts of the Nishi Ward based on gender (men/women strata) and age (65-74/75-84+ strata), for each district. Second, we calculated the required number of people that we needed to extract from each stratum based on the population composition of each district. During the third step, we randomly selected the first survey target participant. Finally, for the second and subsequent targets, we systematically extracted one target participant from every 10 people on the list of the basic resident registration ledger.

The sample size was decided by adopting the participant-to-item ratio methodology

used for *a priori* determination. Since the recommended ratio ranges from 2 to 20 participants per item (Hair et al., 1995; Kline, 1979), 20 participants per item were required for this study. Consequently, the required study sample size was calculated to be 440 participants. However, since the study-sampling method could include those who had difficulty responding, and the response rate would be approximately 40–50%, 1000 participants were considered necessary.

Data Collection

Data were collected from March to June 2023. Participants were mailed the questionnaire to their homes and were asked to return it to the university in a self-addressed envelope after answering the questions. This study was conducted using a test–retest method, to validate the reliability of the scale. Participants were asked whether they were willing to cooperate in a retest during the first survey; those who agreed to cooperate were mailed the questionnaire and asked to respond one month later as the second survey as the re-test.

Survey Items

The questionnaire consisted of questions regarding demographic characteristics, the draft scale of the PECOCO, and scales for confirming concurrent validity (on purpose in life and loneliness).

Demographic Characteristics

Demographic characteristics included age, sex, marital status, family structure, educational background, residential history, employment status, economic status, and level of

care needed. The level of care needed (Ministry of Health, Labour and Welfare, 2016) is used in Japan's long-term care insurance system to indicate the degree of long-term care needs, and is determined at three levels: "not applicable," "required support certification," and "long-term care certification."

PECOCO Draft Scale

The PECOCO draft scale comprises 22 items developed by the researchers (Kikuchi et al., 2023a). We developed the items as a pilot study to ensure content and surface validity, and surveyed 800 community-dwelling older adults. Consequently, 22 items were constructed ($\alpha = .967$), consisting of three factors: Factor 1 "Perception of Inclusion" ($\alpha = .941$); Factor 2 "Perception of Reciprocity through Provision" ($\alpha = .915$); and Factor 3 "Perception of Reciprocity through Reception" ($\alpha = .928$). This scale is evaluated on a six-point Likert scale ranging from 1 (*absolutely disagree*) to 6 (*strongly agree*). Higher scores indicate a higher perception of connectedness (range: 22–132).

Scales for Confirming Concurrent Validity

The concurrent scales consisted of *Ikigai* (the Japanese concept of purpose in life) and loneliness. We investigated *older adults' connectedness with people in the community* using Walker and Avant's (2018) conceptual analysis method. Consequently, three themes were extracted, which indicated "creating a sense of meaning in life through coexistence (Kikuchi & Hirano, 2023)." Consequently, *Ikigai* was a phenomenon recognized as a

consequence of perceived connectedness and was hypothesized to have a significant positive correlation. Additionally, two themes were extracted as antecedents, which indicated “individual characteristics including the mental and physical state leading to leading to interaction.” This included mental health states such as experiences of loneliness (Kikuchi & Hirano, 2023). Thus, loneliness was a phenomenon that predicted the occurrence of perceived connectedness, and was hypothesized to have a significant negative correlation with connectedness two concurrent scales were selected based on concept analysis.

Ikigai was measured using the Ikigai-9 (Imai et al., 2012), a 9-item scale of *Ikigai* awareness. This scale uses a five-point Likert-type scale ranging from 1 (*hardly applicable*) to 5 (*very applicable*). Higher scores indicate a higher sense of purpose in life (score range: 9–45).

Loneliness was measured using the Japanese version of the Three-Item Loneliness Scale (Igarashi, 2019). It uses a three-point Likert-type scale ranging from 1 (*rarely*) to 3 (*often*). Higher scores indicate higher loneliness (score range: 3–9). Both scales were tested for reliability and validity. Cronbach’s α s were Ikigai = 0.87 (Imai et al., 2012) and Loneliness = 0.81 (Igarashi, 2019).

Data Analysis

Data analyses were performed using IBM SPSS Statistics (version 29.0 J; IBM SPSS Inc., Chicago, IL, USA) and IBM SPSS Amos (version 26.0 J; IBM SPSS Inc.)

software. A two-tailed significance level of 5% (two-sided) was set.

Item Analysis

We performed simple tabulation to ensure that the items were appropriate and internally consistent. The analysis (and exclusion criteria) consisted of four components: 1) ceiling effect (mean +1 SD > 6 points), 2) floor effect (mean -1 SD < 1 point), 3) good–poor analysis (no significant difference between the high-scoring [good] and low-scoring [poor] groups), and 4) item–total correlation analysis (correlation coefficient $r < 0.3$).

Validity and Reliability

For validity, a confirmatory factor analysis (CFA) was conducted to test construct validity after item analysis. A CFA was performed on the factor models extracted from an exploratory factor analysis (EFA), which was already conducted in the pilot study. The validity of the factor structure was verified using goodness-of-fit indices (goodness-of-fit index, $GFI \geq 0.9$; adjusted GFI, $AGFI \geq 0.9$; comparative fit index, $CFI \geq 0.9$; root–mean–square error of approximation, $RMSEA \leq 0.05$ (Bentler, 1990). For cases in which the obtained model fit was poor, Rossier et al. (2012) suggested adding successive passes starting from the combination with the highest numerical value, with a modification index of over 20 or over 10 as a guide. With this as a reference, we used a modification index of 20 or more as a guideline and add paths in the order of the highest numerical value. Further, to verify concurrent validity, the correlation coefficients between the overall scale and subscales were

calculated using concurrent scales; that is, *Ikigai* and loneliness.

Internal consistency was measured to assess reliability. Cronbach's α coefficient was used for the evaluation. Additionally, a test–retest method was used to verify stability and reliability. The coefficient of stability was evaluated by calculating intraclass correlation coefficients (ICC) using Spearman's rank correlation analysis of the first and second scale scores for the same participant.

Ethical Considerations

This study was conducted in accordance with the principles of the Declaration of Helsinki. It was approved by the Ethics Review Committee of Faculty of Health Sciences, Hokkaido University (no. 22–74; January 31, 2023). Participants were informed of the guarantees of anonymity, confidentiality of data, and free participation in this study. Informed consent was obtained from all the participants. The return of a completed questionnaire was considered as a consent to participate in this study.

Results

One-thousand questionnaires were sent, four of which were returned because participants did not reside at the addresses reported on the resident cards. A total of 380 questionnaires were collected (response rate: 38.0%), and responses with missing items in the PECOCO draft were excluded. Ultimately, 358 valid responses were received (effective return rate: 35.8%).

Demographic Characteristics (Table 1)

Participants' mean age was 72.3 years, with 187 women (52.2%) and 171 men (47.8%). The largest number of participants for each item was 271 (75.7%) married in marital status, 193 (53.9%) living with a spouse, and 72 (20.1%) 31 to 40 years or more in residential history. Regarding health status, the largest number of respondents 341 (95.3%) were not certified as requiring long-term care.

Item Analysis

The average total scale score for the 22 items was 81.0 ± 16.5 points, and the total score range was 33 to 170 points (score range: 22–132 points). Regarding the ceiling effect, floor effect, good–poor analysis, and item–total correlation analysis, none of the items met the exclusion criteria. Thus, all 22 items were retained.

Reliability and Validity

The validity of the PECOCO was evaluated a CFA and correlation analysis with concurrent scales. A CFA was conducted, and the initial fitted model was as follows: CFI = .907, GFI = .812, AGFI = .770, RMSEA = .095. The GFI, AGFI, and RMSEA were below the recommended values in the first fitted model (Bentler, 1990); therefore, based on the modification index, four additional paths with a modification index of over 20 and in numerical order of magnitude were added, resulting in the following fitted model (Figure 1): CFI = .933, GFI = .854, AGFI = .818, RMSEA = .081.

Analysis of concurrent validity of the PECOCO was conducted (Table 2).

Associations with concurrent scales were positively correlated with *Ikigai* and negatively correlated with loneliness on the total scale ($r = .524, p < .001$; $r = -.183, p = .001$).

The reliability of the PECOCO was evaluated (Table 3). Cronbach's α coefficients were 0.967 for the entire scale, and 0.947, 0.937, and 0.910 for Factors 1–3, respectively.

Stability was evaluated using the test–retest method. A total of 193 respondents (50.8%) agreed to participate. Of these, 169 were collected and participants with missing data were excluded. Finally, 163 valid responses were received (valid response rate for the retest was 84.5%). The ICCs for each subscale were .852, .820, and .864 for Factors 1–3, respectively; the ICC for the total score was .875 (95% CI: .830–.908).

Discussion

This study confirmed the reliability and validity of the PECOCO. The factorial and concurrent validity tests indicate that this scale is effective for providing a detailed understanding of older adults' subjective perceptions of connectedness. Regarding factorial validity, a three-factor scale structure was confirmed using EFA. The first factor, "Perception of Inclusion," was that older adults themselves feel part of the community through interaction. Factor 1 included positive perceptions of being part of the community, such as "I am glad that I am part of the community members" or "I am accepted by the community members." This includes not only a sense of belonging, which Register and Herman (2010)

described as a similar concept of connectedness, but also positive feelings toward people in the community, suggesting that this scale might include a broad sense of inclusiveness, as perceived by older adults. Factors 2 and 3 were based on reciprocity and captured the conflicting phenomena of provision (Factor 2) and reception (Factor 3). Reciprocity is a need for older adults (Ten Bruggencate et al., 2018) and provides a sense of connection with others (Register & Scharer, 2010). The PECOCO describes the perception of connectedness from the paired perspectives of provision and reception.

In the CFA, the GFI and AGFI were slightly lower and RMSEA was considerably lower than the recommended value. GFI increases with sample size (Gerbing & Anderson, 1992). The required sample size was defined as 440 cases, based on an *a priori* validation using the participant-to-item ratio. However, the data from only 358 participants were analyzed, which did not reach the assumed sample size. Therefore, the results could have depended on the small sample size. Although the RMSEA was below the recommended value, some have set an $RMSEA \leq 0.08$ as an acceptable value (Browne & Cudeck, 1992). This study showed $RMSEA = 0.081$; thus, it was within a reasonable range. Considering the acceptability of the recommended values, the modified model presented in this study meets certain criteria.

Concurrent validity of the PECOCO was significantly, positively correlated with *Ikigai* and negatively correlated with loneliness. Perception of connectedness was moderately

correlated with older adults' *Ikigai* ($r = 0.524$), suggesting that it is a concept indicative of positive psychosocial health status. However, its correlation with loneliness is weak ($r = -.183$). A previous study inferred that the perception of connectedness with others and a moderate sense of loneliness could contribute to subjective well-being among older adults (Kikuchi et al., 2023b). The perception of connectedness measured using this scale shows negative correlates with loneliness, which could reflect a characteristic unique to older adults (Kikuchi et al., 2023b). Based on the above and the results of factorial and concurrent validity, the PECOCO had adequate validity.

Scale reliability was verified by calculating Cronbach's α coefficients. Reliability coefficients were calculated for the overall scale and each subscale individually, and all of which were determined to have sufficient internal consistency of .90 or higher. Consequently, we consider it acceptable to use the entire scale and for each of its subscales independently. For example, in the case of Factors 2 and 3, it would not only allow us to identify the degree of recognition of reciprocity but also to compare the degree that and in what balance each sub-concept is satisfied or deficient in terms of provision and reception.

Additionally, this study employed a test–retest method to confirm stability. The stability coefficient was .875 (95% CI: .830–.908). The average retest interval ranged from one week to one month (Grove et al., 2012). This study, conducted after one month, was considered to have a reasonable implementation interval. In addition, because between .750

and .900 represents good stability (Koo & Li, 2016), the results indicated that the stability of this scale was good. Based on these results, the PECOCO had adequate reliability.

The study used the same three-factor, 22-item structure from those of pilot study we conducted with 800 community-dwelling older adults. The results of distribution of scores did not differ from the pilot study. This study was conducted in different regions and timeframes as compared to the pilot study. Regarding the implementation region, the pilot study was conducted in a central city with a population of 300,000. Contrastingly, this study was conducted in a large city with a population of 2 million, yet the findings remained stable. A strength of the PECOCO could be its applicability to older adults living in the community, regardless of the size of the city. Additionally, the pilot study was conducted from October to December 2022, and the current study was conducted from March to June 2023. The pilot study period corresponds to the end of the 7th wave to the beginning of the 8th wave of the COVID-19 (Japanese Ministry of Health, Labor, and Welfare). The 7th wave in Japan was the period with the largest number of positive cases. It is possible that older adults still had limited opportunities to recognize human connections, although they were somewhat less alert in the intervening period before the next wave of the disease. However, this study was conducted more than one month after the 8th wave, a period during which the number of positive cases was at a low. It is conceivable that among older adults, interactions with others could have gradually recovered, making it relatively easier for them to recognize the linkage.

However, the fact that the two surveys showed the same results despite these differences in the circumstances of the pandemic suggests that the connections captured by this scale rely on individual perceptions rather than circumstances, which could be relatively unaffected by external factors.

This study evaluated the reliability and validity of the PECOCO. We propose two suggestions for the practical use of this scale in nursing care to prevent loneliness and isolation. The first is its contribution to older adults. The 22-item PECOCO can function as a simple checklist for measuring connectedness that can be used by older adults. This is expected to help older adults who have been considered high-risk according to conventional objective indicators because of their physical function, recognize their own strengths, and strengthen their sense of affirmation and confidence in continuing to live in the community, thereby promoting health.

Second, the scale can be useful for professionals involved in the nursing care of older adults in the community. Owing to its reliability and validity, the PECOCO could help in the early detection of older adults with a low perception of connectedness, leading to preventive interventions against loneliness and isolation. Additionally, it can contribute to the analysis of trends regarding the connectedness of a region's older population. This could provide a direction for individual support as well as a basis for community-wide efforts to empower connectedness, which may prevent both loneliness and isolation simultaneously.

Limitations

This study could be useful in providing older adults and the nursing care professionals who support them with a more detailed understanding of their perceptions of community-based connectedness and a basis for considering appropriate intervention methods. However, this study has some limitations. First, because this study was conducted using a mail survey, the response rate was 38.0%, and participants were limited to those who could respond. Thus, it is possible that the physical and cognitive characteristics that make it difficult for them to respond to or return the survey on their own may not have been reflected. Second, further studies in different regions or with different participants are required to improve the practicability and versatility of the PECOCO. Both the pilot study and the current survey were conducted in the same prefecture in Japan, although each was conducted in a different region. Further studies in various fields, both domestic and international, are expected to provide successive verification of the validity of the PECOCO.

Conclusions

The developed 22-item PECOCO was a reliable and valid scale. The scale was versatile and useful for public health and nursing care activities in the community. This scale allows for the measurement of older adults' subjective perceptions of connectedness, suggesting that it could help prevent loneliness and isolation by focusing on older adults' perspectives on inclusion and reciprocity with people in the community.

Acknowledgments

This work was supported by JST SPRING (grant number JPMJSP2119) and the SOMPO Welfare Foundation Gerontology Research Grant 2022.

Disclosure statement

The authors declare no conflicts of interest.

Author Contributions

Mami Kikuchi contributed to the conception of this study; Mami Kikuchi, Atsuko Ikeda, and Michiyo Hirano contributed to the design, statistical analysis, and methodology; Mami Kikuchi collected the data and drafted the manuscript; Atsuko Ikeda and Michiyo Hirano critically reviewed and edited the manuscript; Michiyo Hirano supervised the entire research process. All the authors have read and approved the final manuscript.

References

- Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, 107(2), 238–246. <https://doi.org/10.1037/0033-2909.107.2.238>.
- Browne, M. W., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological Methods & Research*, 21(2), 230–258. <https://doi.org/10.1177/0049124192021002005>.
- Cabinet Secretariat. (2023). The Office for Policy on Loneliness and Isolation. Available from URL: <https://www.notalone-cas.go.jp/english/>
- Chen, L., Ye, M., & Kahana, E. (2020). A self-reliant umbrella: Defining successful aging among the old-old (80+) in Shanghai. *Journal of Applied Gerontology*, 39(3), 242–249. <https://doi.org/10.1177/0733464819842500>.
- Collins, J., Ward, B. M., Snow, P., Kippen, S., & Judd, F. (2017). Compositional, contextual, and collective community factors in mental health and well-being in Australian rural communities. *Qualitative Health Research*, 27(5), 677–687. <https://doi.org/10.1177/1049732315625195>.
- Gerbing, D. W., & Anderson, J. C. (1992). Monte Carlo evaluations of goodness of fit indices for structural equation models. *Sociological Methods & Research*, 21(2), 132–160. <https://doi.org/10.1177/0049124192021002002>.
- Grove, S. K., Burns, N., & Gray, J. (2012). *The practice of nursing research: Appraisal, synthesis, and generation of evidence* (seventh edn.). Elsevier/Saunders. PMID:

26981669. <https://doi.org/10.7748/ns2013.04.27.31.30.b1488>.

Hair, J. E., Anderson, R. E., Tatham, R. L., & Black, W. C. (1995). *Multivariate data analysis: With readings* (p. 757). Prentice -Hall.

Holt-Lunstad, J. (2018). Why social relationships are important for physical health: A systems approach to understanding and modifying risk and protection. *Annual Review of Psychology*, 69, 437–458. <https://doi.org/10.1146/annurev-psych-122216-011902>.

Igarashi, T. (2019). Development of the Japanese version of the three-item loneliness scale. *BMC Psychology*, 7(1), 20. <https://doi.org/10.1186/s40359-019-0285-0>.

Imai, T., Osada, H., & Nichimura, Y. (2012). The reliability and validity of a new scale for measuring the concept of ikigai (Ikigai-9). *Japanese Journal of Public Health*, 59(7), 433–439. https://doi.org/10.11236/jph.59.7_433. (in Japanese).

Kikuchi, M., & Hirano, M. (2023). Older people's connectedness with people in the community in contemporary contexts: A concept analysis. *Japan Journal of Nursing Science*, e12560. <https://doi.org/10.1111/jjns.12560>.

Kikuchi, M., Ikeda, A., & Hirano, M. (2023a). Construction of draft scale of perception of community-based connectedness with people for older adults [Paper presentation]. *The 26th Japan Academy of Community Health Nursing*. <https://jachn26.yupia.net/> (in Japanese).

Kikuchi, M., Onishi, R., Takashima, R., Saeki, K., & Hirano, M. (2023b). Effects of a “social

- activity program that encourages interaction” on rural older people’s psychosocial health: Mixed-methods research. *International Journal of Older People Nursing*, 18(3), e12534. <https://doi.org/10.1111/opn.12534>.
- Kline, P. (1979). *Psychometrics and psychology* (p. 381). Academic Press.
- Koo, T. K., & Li, M. Y. (2016). A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *Journal of Chiropractic Medicine*, 15(2), 155–163. <https://doi.org/10.1016/j.jcm.2016.02.012>.
- Mehrabi, F., & Béland, F. (2021). Frailty as a moderator of the relationship between social isolation and health outcomes in community-dwelling older adults. *International Journal of Environmental Research and Public Health*, 18(4), 1675. <https://doi.org/10.3390/ijerph18041675>.
- Ministry of Health, Labour and Welfare. (2016). Long-term care insurance system of Japan. https://www.mhlw.go.jp/english/policy/care-welfare/care-welfare-elderly/dl/ltcisj_e.pdf.
- Nguyen, H., Lee, J. A., Sorkin, D. H., & Gibbs, L. (2019). ‘Living happily despite having an illness’: Perceptions of healthy aging among Korean American, Vietnamese American, and Latino older adults. *Applied Nursing Research*, 48, 30–36. <https://doi.org/10.1016/j.apnr.2019.04.002>.
- O’Rourke, H. M., Collins, L., & Sidani, S. (2018). Interventions to address social connectedness and loneliness for older adults: A scoping review. *BMC Geriatrics*, 18(1),

214. <https://doi.org/10.1186/s12877-018-0897-x>.

Register, M. E., & Herman, J. (2010). Quality of life revisited: The concept of connectedness in older adults. *Advances in Nursing Science*, 33(1), 53–63.

<https://doi.org/10.1097/ANS.0b013e3181c9e1aa>.

Register, M. E., & Scharer, K. M. (2010). Connectedness in community-dwelling older adults. *Western Journal of Nursing Research*, 32(4), 462–479.

<https://doi.org/10.1177/0193945909355997>.

Rossier, J., Zecca, G., Stauffer, S. D., Maggiori, C., & Dauwalder, J. P. (2012). Career adaptabilities scale in a French-speaking Swiss sample: Psychometric properties and relationships to personality and work engagement. *Journal of Vocational Behavior*, 80(3), 734–743. <https://doi.org/10.1016/j.jvb.2012.01.004>.

Schwirian, K. P., & Schwirian, P. M. (1993). Neighboring, residential satisfaction, and psychological well-being in urban elders. *Journal of Community Psychology*, 21(4), 285–299. [https://doi.org/10.1002/1520-6629\(199310\)21:4<285::AID-JCOP2290210405>3.0.CO;2-Y](https://doi.org/10.1002/1520-6629(199310)21:4<285::AID-JCOP2290210405>3.0.CO;2-Y).

ten Bruggencate, T. T., Luijkx, K. G., & Sturm, J. (2018). Social needs of older people: A systematic literature review. *Ageing & Society*, 38(9), 1745–1770.

<https://doi.org/10.1017/S0144686X17000150>.

van der Velpen, I. F., Melis, R. J. F., Hussainali, R. F., Perry, M., Vernooij-Dassen, M. J. F.,

Ikram, M. A., Luik, A. I., & Vernooij, M. W. (2022). Determinants of social health trajectories during the COVID-19 pandemic in older adults: The Rotterdam Study.

International Psychogeriatrics, 28, 1–15. <https://doi.org/10.1017/S1041610221002891>.

Walker, L., & Avant, K. (2018). *Strategies for theory construction in nursing* (sixth edn.).

Pearson Education.

World Health Organization. (2021). Advocacy brief: Social isolation and loneliness among older people. <https://www.who.int/publications/i/item/9789240030749>.

Table 1. Participants' demographic characteristics

		(N=358)	
		n	%
Gender	Men	171	47.8
	Women	187	52.2
Age (Mean age: 72.3±4.6 years)	<69 years	112	31.3
	70–74 years	117	32.7
	75–79 years	105	29.3
	≥80–84 years	23	6.4
	N/A	1	0.3
Marital status	Unmarried	14	3.9
	Married	271	75.7
	Bereavement	49	13.7
	Separated	22	6.1
	N/A	2	0.6
Family structure	Living alone	63	17.6
	Living with spouse	193	53.9
	Two or three generation	87	24.3
	Others	14	3.9
	N/A	1	0.3
Educational background	Elementary/Junior high school	16	4.5

	High school	161	45.0
	Vocational school	35	9.8
	Junior/Technical college	42	11.7
	University	97	27.1
	Graduate school	7	2.0
Residential history	<10 years	69	19.3
	11–20 years	65	18.2
	21–30 years	69	19.3
	31–40 years	72	20.1
	41–50 years	59	16.5
	≥51 years	24	6.7
Employment status	No	256	71.5
	Yes	100	27.9
	N/A	2	0.6
Economic status	Very concerned	34	9.5
	Slightly concerned	151	42.2
	Not so concerned	149	41.6
	Not at all concerned	23	6.4
	N/A	1	0.3
Level of care needed	Not applicable	341	95.3
	Required support certification	13	3.6

Table 2. Concurrent validity

(N=358)

Factor	<i>Ikigai</i> (n=345)		Loneliness (n=356)	
	r	<i>p</i>	r	<i>p</i>
Factor 1	.494	<.001	-.230	<.001
Factor 2	.401	<.001	-.093	.079
Factor 3	.539	<.001	-.169	.001
Total score	.524	<.001	-.183	.001

Note: Spearman's rank correlation coefficient

Table 3. Stability reliability

(N=163)

Factor	Test		Retest		Intraclass correlation coefficients		
					95%CI		
	M	SD	M	SD	Intraclass correlation coefficients	Lower	Upper
Factor 1	33.87	8.05	34.87	7.32	0.852	0.799	0.891
Factor 2	21.44	5.03	22.29	5.21	0.820	0.755	0.868
Factor 3	28.64	4.77	29.13	4.89	0.864	0.815	0.900
Total score	83.95	16.21	86.29	16.03	0.875	0.830	0.908

Note: Spearman's rank correlation coefficient

M = mean; SD = standard deviation

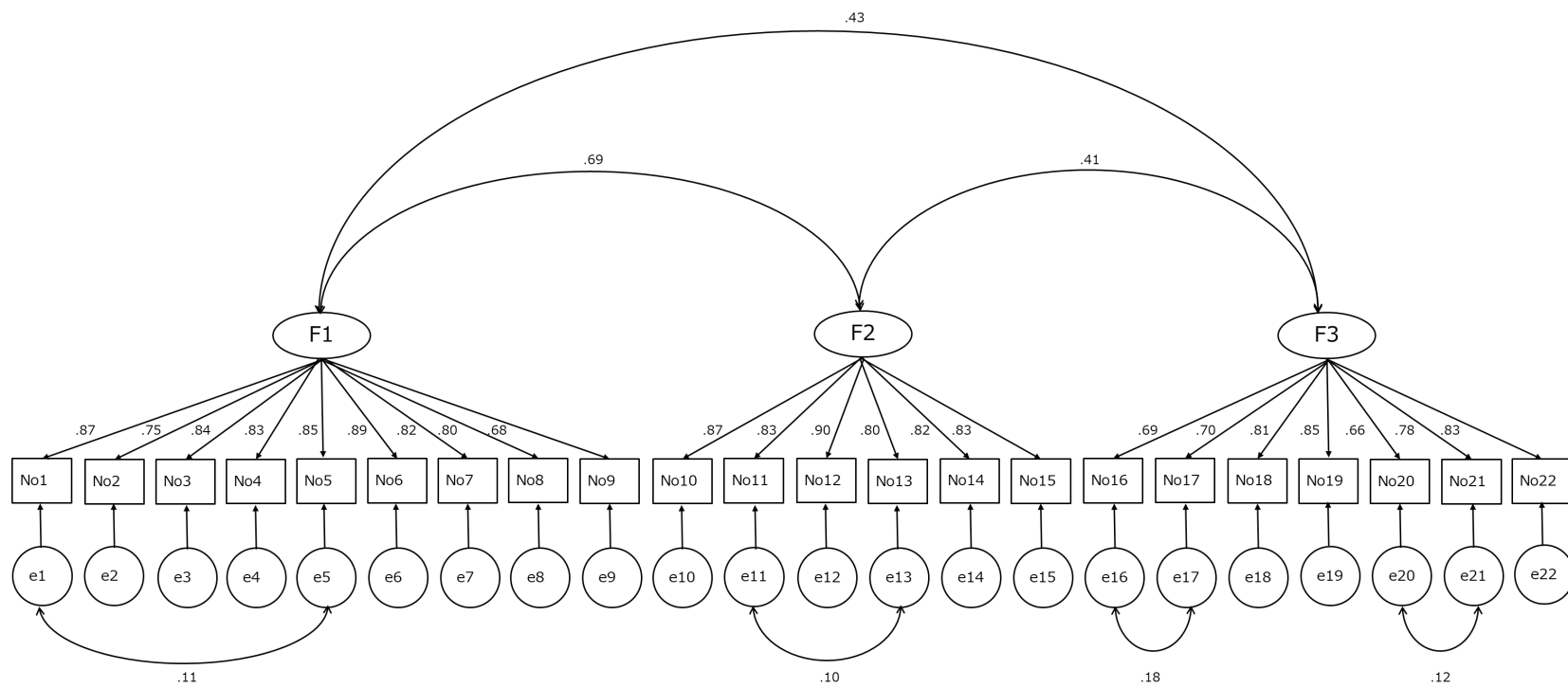


Figure 1. Confirmatory factor analysis