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Abstract

Background and purpose: Possibilities to age in place is increasingly important with the demographic shift towards aging populations. With the Person-Place Fit Measure for Older Adults (PPFM-OA), older adults self-assess how their home and community environments suit their needs. The aim of the study was to evaluate the psychometric properties of the Swedish version of PPFM-OA.

Methods: 460 community-living adults aged 65 and older answered the PPFM-OA. Rasch model was used for analyses.

Results: A reduced 19-item version of PPFM-OA showed sufficient evidence of validity in response processes, internal structure, fairness in testing, and reliability/precision.

Conclusion: The reduced version is recommended to use in Sweden to capture person-place fit, an aspect to consider when communities, healthcare and elder care aim to facilitate aging in place.

Key words: housing; neighborhood; place attachment; age-friendly; aging in place; Rasch

Background

Definitions of aging in place have shifted from focusing on aging solely in one's same home throughout one's life to be more inclusive of the impact of the place or setting where one lives (Scharlach & Diaz Moore, 2016; Weil & Smith 2016; Weil 2023). This idea of place extends beyond the home and includes larger structural and geographic elements. The possibility for aging in place is strongly influenced by the combination of the level of one's home, neighborhood, and the community where the older adult resides (Andrews & Skinner, 2015; Scharlach & Diaz Moore, 2016).

The debate about how living environments can enhance healthy aging has been growing since the World Health Organization (WHO) launched the "Global Age-Friendly Cities: A Guide" (2007, 2014, 2016). This guide identified eight key areas namely, outdoor spaces and buildings, transportation, housing, social participation, respect and social inclusion, civic participation and employment, communication and information, and community support and services (WHO, 2007, 2014, 2016). While WHO's age- friendly concepts have been applied in many cities, researchers question the implementation of this model as driven by policies not older adults (Buffel et al., 2012; Buffel et al., 2019; Greenfield, 2012; Scharlach, 2017; van Hoof et al., 2021) and some researchers ask, age-friendly for whom? (Yeh, 2022).

Research on aging in place highlights the necessity to understand the aging individual's own lived experience and their own definition of successfully aging in place. So, regardless of how aging in place is defined, the ability to live safely and comfortably in one's own home or in the broader community, an age-friendly environment, across functional ability level, is crucial. Yet, a structured method is lacking about how to assess older adults' views of the suitability of their home and neighborhood, attachment to place, and their place-based resources (Weil 2020a; Kan et al., 2020).

In order to assess, monitor and improve living environments adequate measurements are vital. However, reviews of such assessments conclude that there is a lack of instruments that can be used in large-scale, randomized studies (Dellamora et al., 2015; Rudnicka et al., 2020). The assessments that do exist usually focus on easily externally quantifiable features of the built environment. While the older adult's self-rated experience of their home, community, and neighborhood and their own emotional attachment to the living environment can better capture whether, and in which areas, the living environment matches their needs.

The evolution and expansion of aging in place and age-friendly concepts across the continuum of care, increasingly diverse older populations, and the changing meaning of place have created a need to reassess and redesign these models of "fit" (Scharlach & Diaz Moore, 2016; Weil, 2023; Weil & Smith, 2016). It is increasingly important to capture developing key place domains and measure the impact of place in later life across new and emergent areas often overlooked in existing work (Weil 2019; 2020b).

The Person–Place Fit Measure for Older Adults (PPFM-OA) was developed to include a broadening sense of place and place concepts. Using established measurement development procedures, mixed-methods data and testing in multiple steps, the PPFM-OA was published in 2019. It includes several domains to capture the individual´s perception of person-place dynamics namely, primary and basic needs/necessities; neighborhood changes and moving; identity and place attachment; community value; and services and resources (Weil 2020a).

For the current study, the PPFM-OA was translated and culturally adapted to Swedish and the Swedish context with a dual-panel approach (Hagell et al., 2010). In brief, two senior researchers who had lived for an extended time in both Sweden and the US and had experience from working in both countries with similar target groups as this study initially translated the items. The translation was made individually and then discussed until agreed upon. Disagreements, as well as translations that were problematic due to cultural and

contextual differences were discussed with the measure's developer. An academic panel consisting of nine PhD students and junior researchers in the field of housing and aging were invited for presentation of the measure and discussing the translation. Some revisions were made to the translation and then used in Panel 2. Panel 2 consisted of four older adults (age range 74 to 88 years) who represented the population of interest. They had read the Swedish version in advance, were asked to answer the questionnaire via a phone interview, and then provided feedback on the items and the structure of the translated tool in an interview using cognitive interview techniques. After Panel 2, final revisions were made, and three items were excluded due to cultural differences regarding health care and housing options. The excluded items were: My current healthcare suits my needs; There are housing assistance programs in my area for older adults (such as rent control, reduction, or assistance); and The resources for older people in this area are sufficient. See Weil 2020a for a list of all items in the original measure. To assure that the translated version was reliable and valid, especially for older adults with expectedly diverse experiences of person-place dynamics and attachment, psychometric testing was needed.

The aim of the study was to assess the psychometric properties of the Swedish version of the Person-Place Fit Measure for Older Adults (PPFM-OA, Weil 2020a) among older adults living in different types of disadvantaged areas (deprived urban areas and depopulated rural areas) in Sweden. More specifically, the following research questions were formulated. We used the current validity and reliability/precision definitions from the American Psychological Association and the American Educational Research Association (APA/AERA, 2014):

1. How are the rating scales used in the PPFM-OA functioning? (Evidence of validity in relation to response processes)

2. Are the items in the PPFM-OA demonstrating local independence? (Evidence of validity in relation to internal structure)
3. Are the items in PPFM-OA demonstrating acceptable levels of item goodness-of-fit and unidimensionality? (Evidence of validity in relation to internal structure)
4. Are the participants using the PPFM-OA demonstrating acceptable levels of person goodness-of-fit? (Evidence of validity in relation to response processes)
5. How well targeted can the PPFM-OA separate the sample in distinct groups along a continuum? (Evidence of reliability/precision)
6. Do the items in the PPFM-OA demonstrate Differential Item Functioning in relation to Gender, Age and Language? (Evidence of fairness in testing)
7. What is the relationship between the PPFM-OA raw sum score and the Rasch-generated measures of the final version of the PPFM-OA? (Evidence of validity in relation to internal structure)

Methods

Study Context

Translation and testing of the PPFM-OA was applied in the project "Older adults living in disadvantaged neighborhoods: A mixed-methods study of homes, neighborhood transitions, and wellbeing". The purpose of the project was to investigate how home, and neighborhood influenced community participation, quality of life, identity, and belonging and how older adults living in transitioning urban and rural neighborhoods experienced those person-environment dynamics (Granbom et al., 2022). The project included an in-depth interview study and a survey study and was approved by the Swedish Ethical Review Authority (no. 2020-03468; no. 2021-03588). For the psychometric evaluation, data were retrieved from the phone-based survey study with adults 65 years of age or older who had lived in urban areas with low socioeconomic status or depopulated rural areas in the south of

Sweden for five years or more. The urban areas were selected from a list of "socially vulnerable neighborhoods" from the Swedish Police and the rural areas were selected based upon level of rurality and depopulation. Recruitment for the survey started by offering participants from the in-depth interview study to take part in the survey study, and 26 of 41 participants agreed. Then, contact information of residents in the targeted areas was retrieved from the Swedish State Personal Address Register (SPAR) and candidates were randomly selected, aiming for a sample with approximately 50% urban residents and 50% rural residents and with 50% being aged 65-79 and 50% aged 80 or older. Survey data were collected in 2021- 2022 with 462 participants in total. Due to internal missing **on PPFM-OA** the sample for the current study was N = 460.

Sample

The average age in the sample was 76.2 years (SD= 6.7) and 50.7% were women. Of the participants, 52.2% lived in urban areas and 47.8% in rural areas. Of the participants, 13.1% were not born in Sweden. On average, the participants had lived in their current area for 34.4 years (SD 21.3). For detailed sample characteristics, see Table 1.

(Table 1 about here)

Instrument

The PPFM-OA included 41 statements in five domains about the older person´s perception of person-place dynamics namely: primary and basic needs/necessities; neighborhood changes and moving; identity and place attachment; community value; and services and resources (BLINDED FOR REVIEW). Respondents had received a mailed-ahead paper version of the instrument to have in front of them during the telephone interview. The interviews were conducted by trained data collectors. The respondents expressed to what degree they agreed with the statement on a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Statistical Approach

The statistical approach to explore and evaluate the psychometric aspects of the Swedish version of the PPFM-OA was based on a Rasch rating scale model (Bond, 2015). The Rasch model is an item response theory (IRT) model which is suitable to use when scales are based on ordinal rating scale categories. The 41 items and the five scale step categories were analyzed using the Winsteps® Rasch measurement computer program (Version 5.2.3, Portland, Oregon) (Winstep & Facets, accessed 2022). The analysis followed a step-wise iterative process model where the outcomes of each step allow actions to refine the tool for the subsequent steps (Rustöen et al., 2018; Lerdal et al., 2016; Skyttberg et al., 2023).

Rating Scale Functioning (Evidence Based on Response Processes)

First, the overall rating scale functioning of the five-category rating scale was investigated to determine whether (a) the average measures on each item for each category advanced monotonically, and (b) were associated with outfit mean square *(MnSq)* values of less than 2.0 for each of the step calibrations (Bond, 2015). As the same scale steps in the PPFM-OA are used across all 41 items, a Rasch rating scale model for the analysis was appropriate as it assumes that the scale is functioning in a similar way across all items.

Local Independence of Items (Evidence Based on Internal Structure)

In the first part of the second step, the Rasch model's assumption of local independence among the PPFM-OA items was explored by monitoring the correlations between the standardized item score residuals (Yen, 1984; 1993). A criterion of a shared variance between item score residuals not larger than 25% (corresponding to a correlation coefficient similar or larger than 0.5 between them) to support local independence among

items (Linacre, 2009). If the correlation between standardized item residuals exceeded the set criterion, a new so-called “super-item” was created based on the sum score of the correlated items, and then repeated the analytical process until no item residual correlations exceeded the set criterion.

***Item Goodness-of-fit (Evidence Based on Internal Structure*)**

After monitoring local independence among item residuals and creating super-items to minimize the risk of local dependence among items, the fit of the PPFM-OA item responses was then evaluated (Bond, 2015). An item that did not demonstrate acceptable goodness-of-fit to the model (as evidenced by more unexpected response patterns across individual scores than expected) was then subsequently removed, and the psychometric properties of the remaining items were re-analyzed until all remaining PPFM-OA items demonstrated acceptable goodness-of-fit to the Rasch model. Acceptable item goodness-of-fit was defined as *infit MnSq* values between 0.7 and 1.3, which is stricter than the suggested guidelines for surveys (Wright & Linacre, 1994). We also chose to focus on infit statistics in this study as they are considered more informative measure of goodness-of-fit given that they focus on the degree of fit in the most typical observations in the data. Within an iterative process, we initially started with removing items with higher than accepted infit mean square values, as these are considered a higher threat to validity. We then continued to remove items with lower than accepted infit mean square measures, as these are considered redundant.

Unidimensionality (Evidence Based on Internal Structure)

The level of unidimensionality was then evaluated by performing a principal component analysis (PCA) of the residuals, with the set criterion that the first latent dimension should explain at least 50% of total variance, in line with earlier studies (Rustöen

et al., 2018; Lerdal et al., 2016; Skyttberg et al., 2023). The eigenvalue of the secondary dimension (reported as first contrast), with an eigenvalue cut-off higher than 2.0 associated with an explained variance of 5% or higher were also monitored, to signal a lack of convergence in the data.

Person Goodness-of-fit (Evidence Based on Response Processes)

The criterion for evaluating person goodness-of-fit was to reject Infit *MnSq* values of 1.4 logits or higher associated with a *z*-value of 2 or higher, accepting that a maximum of 5% of the sample may by chance fail to demonstrate acceptable goodness-of-fit without threatening evidence of person response validity (Hällgren et al., 2011; Kottorp et al., 2003; Patomella et al., 2006).

Separation Index (Evidence Based on Reliability/Precision)

To determine whether the PPFM-OA scale could distinguish respondents demonstrating different levels of place attachment, the person-separation reliability index was calculated. A criterion that the PPFM-OA scale should be able to distinguish at least two distinct groups (or preferably more groups), which requires a person separation index of at least 1.5 (Fisher, 1992; Mallinson et al., 2004). The internal consistency was also assessed with the Kuder-Richardson Formula 20 (Anselmi et al., 2019). Evidence of any floor or ceiling effects in the PPFM-OA were also monitored, and the targeting of the PPFM-OA statements to the respondents was monitored using the Wright map output from the Winsteps® program (Winstep & Factes, accessed 2022).

Differential Item Functioning (Evidence Based on Fairness in Testing)

A series of Differential Item Functioning (DIF) analyses were then conducted to investigate if subgroups in the sample had significantly different responses on the PPFM-OA items despite equal levels of the underlying trait. DIFs were evaluated across the following subgroups: Gender, Age, and Language. DIF were analyzed within the Winsteps® program using Mantel Chi-Square test for polytomous data using a Bonferroni adjusted *p*-value of less than 0.01 (Hagquist & Andrich, 2017).

Relationships Between PPFM-OA raw sum Scores and PPFM-OA Rasch Generated Measures (Evidence Based on Internal Structure)

Finally, Pearson's correlation coefficients were used to evaluate the relationships between the PPFM-OA raw score sums and the Rasch-generated measures of the final optimal valid version of the PPFM-OA scale.

Results

Overall, the analysis of psychometric properties of the Swedish version of the PPFM-OA revealed evidence of validity in response processes, internal structure, fairness in testing, and reliability/precision for a shortened version of the PPFM-OA including 19 of the original 41 items (46%).

Rating Scale Functioning (Evidence Based on Response Processes)

The average measures for the response categories advanced monotonically with an outfit *MnSq* < 2.0 for all scale steps. As the scale steps met our essential criteria, we did not collapse any scale steps, but proceeded with the analysis.

(Table 2 about here)

Table 2. *Rating scale functioning in the PPFM-OA (N=460)*

Local Independence of Items (Evidence Based on Internal Structure)

Several items in the PPFM-OA demonstrated item residual correlations that exceeded our set criterion. Items #14-#22-#23, #1-#2, and items #8-#9, demonstrated higher than accepted local dependence in the first iteration. We therefore collapsed these items into three "super-items". After creating these three super-items, a new analysis of item residual correlations were performed (with resulted in new super-items created), until no correlations exceeded our set criterion. See Table 3 for more detailed information. This step resulted in a scale with three super-items (#45: #14-#22-#23-#27, #46: #5-#7, and #47: #1-#2-#8-#9), to be monitored in the next step.

(Table 3 about here)

Table 3. *The construction of super-items in the PPFM-OA (n=460)*

Item Goodness-of-fit (Evidence Based on Internal Structure)

In total, 22 items (including some super-items) of the original 41 PPFM-OA items (54%) were excluded due to higher or lower goodness-of-fit statistics than our set criterion. The items are displayed in order of iterative exclusion in Table 4. The final and most optimal version of the PPFM-OA therefore included 19 of the original items, where six items were combined into two super-items (#46: items #5-#7 and #47: items #1-#2-#8-#9).

(Table 4 about here)

Table 4. *Item misfit deletion by iteration in the PPFM-OA (n=460)*

Unidimensionality (Evidence Based on Internal Structure)

The explained variance of the PPFM-OA (19 items) was 88.2% which was above the set criterion of 50%. 1.9% of the unexplained variance was attributed to a single contrasting dimension, with an eigenvalue of 2.35. We therefore concluded that there was empirical evidence of unidimensionality in this final PPFM-OA scale.

Person Goodness-of-fit (Evidence Based on Response Processes)

Ten respondents in our sample (2.2%) were then considered having more variations in their responses than expected according to the Rasch model. This proportion was below our set criterion for person goodness-of-fit. Due to the small sample size (n=10), we decided not to perform any statistical comparisons between the subgroups.

Separation Index (Evidence Based on Reliability/Precision)

The person separation index of the 19 item PPFM-OA scale was 1.60, supporting the assumption that the final tool could differentiate between at least two different levels of the latent trait (person-place fit). No respondents demonstrated maximum or minimum scores on the 19-item PPFM-OA scale. The person reliability score (KR-20) was 0.75. The targeting of the PPFM-OA statements to the respondents is presented in Figure 1.

(Figure 1 about here)

Figure 1. *Wright person-item map for the PPFM-OA (n=460) with the 19 original items demonstrating acceptable goodness-of-fit to the Rasch model. Each "#" is four persons; each "." represents one to three persons. The lower item measure the more likely to agree with (less challenging to agree with); the higher item measure the less likely to agree with the item (more challenging to agree with). Person and Item Mean (M) and Standard Deviation (S) is included.*

Differential Item Functioning (Evidence Based on Fairness in Testing)

One item demonstrating significant DIF in relation to Gender; the reversed item #34 (People are leaving this neighborhood) was relatively more likely to agree with for female participants in comparison to male participants. Item #6 (I want to live in the place I am currently living until I die) and item #36 (I feel alone in my neighborhood) also demonstrated significant DIF in relation to Age; older respondents (above 80 years of age) were relatively more likely to agree with these items as compared to younger respondents (similar or below 80 years of age). There was no item DIF in relation to Language (my native language is Swedish).

Relationships Between PPFM-OA raw sum Scores and PPFM-OA Rasch Generated Measures (Evidence Based on Internal Structure)

Finally, the correlation coefficient between the PPFMOA 19-item sum score and the Rasch-generated unidimensional measures of the PPFMOA optimal 19-item scale was r=.99 ($p<0.01$).

Discussion

The current study presents psychometric properties of a newly created Swedish version of the PPFM-OA – an assessment that captures the older adults' self-rated experience of how well the home, community and neighborhood match the aging individual's resources, wishes and capacity to enable aging in the place they live. For a shortened version of the PPFM-OA, the results show evidence for validity in response processes, internal structure, fairness in testing, and reliability/precision.

The original 41-item version PPFM-OA was found to have several similar item formulations that created problems with local independence in the testing. Only 19 out of 41

items (46%) fit the Rasch model. Notably, all domains of the PPFM-OA were represented with items in the final optimal version of the assessment, which supports a strong unidimensionality of the remaining items. It is worth noticing that these results not necessarily means that items should be removed from the English version of the original measure. The application of the PPFM-OA to a Swedish sample, illustrates that some place concepts worked well in both geographic settings while others were less of a "fit". This finding also shows the importance and value of conducting cognitive interviewing, item revision, and psychometric testing self-reported outcome measures when evaluating its use with different older adult populations (Wright et al., 2021). Although all items may still contribute with valid information to understand person-place fit, in general, each needs to be evaluated and considered for applied use on an individual level within a specific setting. But in order to aggregate information into a single unidimensional measure, these results show that for the Swedish version, some items should not be included in generating such sum score. In the testing, different aspects of validity (test content versus internal structure) did not go hand in hand.

The Swedish 19-item PPFM-OA, with the separation index, shows the measure can distinguish between two groups of person-place fit. This has practical implications, being suitable for detecting differences between older adults experiencing different levels of person-place fit, and to detect changes in a sample over time. This is of particular interest in areas where societal and demographic are prominent, such as different types of disadvantaged areas. Further, measures detecting change over time are crucial also for evaluating public health interventions and interventions to improve independent living at home. However, some limitations should be noted. The well-established Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) is problematic to translate to the Swedish language, and several labels for the steps were discussed during the translation and cultural adaptation. The

translated response scale met essential criteria when testing rating scale functioning. Even though the sample of the current study displayed heterogeneity in terms of age, gender, functional independence, and housing, more research is needed to test the psychometric properties also in samples from a wide area of living conditions. It should be noted that the sample of the current study all resided in areas publicly identified as disadvantaged – either urban areas with low socioeconomic status or depopulated rural areas. PPFM-OA measures the individual experience of the match between the person and the home and neighborhood, person-place fit, and more research is needed to take into account the variability of neighborhood characteristics as well as the individual.

The relationship and assessment of aging and place is an important policy concern in many Western countries, as researchers seek to expand place from the home to the community and societal settings (Andrews & Skinner, 2015; Scharlach & Diaz Moore, 2016). The growing interest for improving cities to be more age-friendly show and its relationships with aging in place (Meeks 2022) emphasize the need for understanding and measuring person-place fit. The Swedish 19-item PPFM-OA, with promising psychometric properties, can be used in different settings and groups in society. By relying on older adults' self-rated responses to place items, it sheds light on the age-friendliness of their communities from their own point of view (Buffel et al., 2012; Buffel et al., 2019; Greenfield, 2012; Scharlach, 2017; van Hoof et al., 2021; Yeh, 2022).

In conclusion, using rigorous psychometric testing, as called for by researchers (Dellamora et al., 2015; Rudnicka et al., 2020), there were many items in the PPFM-OA, that remained in shortened Swedish version. Though the PPFM-OA is being adapted for use in Turkey at Akdeniz University, this study is the first to translate it into another language and conduct full, formal psychometric testing. As elder care and gerontology moves to understand the relationship of person to their home and larger environment the constructs that assess how

well the place one lives suits their needs becomes increasingly important. As this study shows us there are elements of place that might be more overarching and there are items and ways of assessing places that might be more specific. The utility of having a longer form PPFM-OA and a shorter version of the same measure give researchers a wider range of tools to offer for older adults so they can assess their own person place fit. An advantage with using a Rasch model is that you can generate comparable measures between groups from two different contexts, as long as we have a shared generic item pool that includes the items along a continuum that are functioning with similar challenges and acceptable goodness-of-fit for both groups. This can allow international comparisons in relation to person-place fit.

Relevance to Nursing Practice and Research

The PPFM-OA can be used clinically by primary care practitioners and staff in elder care for discussing possibilities and services to age in place with older patients. Equally important it can be used by municipality officials and city planners when assessing the age-friendliness of neighborhoods, detect changes in person-place fit after implementation of neighborhood improvement programs or societal changes causing changing neighborhoods, and to identify modifiable aspects of neighborhoods to intervene on to facilitate aging in place. In clinical and community practice the hierarchy of the PPFM-OA items can serve as a priority guide because the items on the lower end of the continuum are the ones more likely to agree with in general; if such items are perceived as less likely to agree with for an individual or group, they should probably be prioritized in relation to targeted interventions, as they are also more likely to change For example, are community resources scored higher and seen as adequate but neighborhood feeling and value of older adults, rated lower by the older adult, seen as less satisfactory. The PPFM-OA can assess perceived person-place fit across a broad set of domains at the individual and structural levels, include but also adding to for example

Quality of Life assessments.

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Conflict of Interest

The authors have no competing or conflicts of interest.

References

Andrews, G. J., & Skinner, M. W. (2015). Geography of Aging and Older People. In J. D. Wright (Ed.), *International Encyclopedia of the Social & Behavioral Sciences* (Second Edition) (pp. 407–412). Elsevier. https://doi.org/10.1016/B978-0-08-097086-8.72115-5

Anselmi, P., Colledani, D., & Robusto, E. (2019). A Comparison of Classical and Modern Measures of Internal Consistency. *Frontiers in Psychology*, 10, 492664. https://doi.org/10.3389/fpsyg.2019.02714

Bond, T. (2015). *Applying the Rasch Model: Fundamental Measurement in the Human Sciences,* (Third Edition.) Routledge. https://doi.org/10.4324/9781315814698.

Buffel, T., & Phillipson, C. (2019). Ageing in a gentrifying neighbourhood: Experiences of community change in later life. *Sociology (Oxford)*, 53(6): 987-1004. https://doi.org/10.1177/003803851983

Buffel, T., Phillipson, C. & Scharf, T. (2012). Ageing in urban environments: Developing age-friendly cities. *Critical Social Policy*, 32(4): 597-617. https://doi.org/10.1177/0261018311430457

Dellamora, M. C., Zecevic, A. A., Baxter, D., Cramp, A., Fitzsimmons, D., & Kloseck, M. (2015). Review of assessment tools for baseline and follow-up measurement of age-friendliness. *Ageing International,* 40:149-164. https://doi.org/10.1007/s12126-014-9218-7

Fisher, W. (1992). Reliability, separation, strata statistics. *Rasch Meas Trans*. 6:238.

Granbom, M., Jönson, H., & Kottorp, A. (2022). Older adults living in disadvantaged areas: Protocol for a mixed methods baseline study on homes, quality of life, and participation in transitioning neighborhoods. *JMIR Research Protocols*, *11*(10), e41255.

Greenfield, E. (2012). Using ecological frameworks to advance a field of research, practice, and policy on aging-in-place initiatives. *Gerontologist*, 52 (1)1-12. DOI: 10.1093/geront/gnr108

Hagell, P., Hedin, P., Meads, D.M., Nyberg, L., & McKenna, S.P. (2010).Effects of method of translation of patient-reported health outcome questionnaires: a randomized study of the translation of the Rheumatoid Arthritis Quality of Life (RAQoL) Instrument for Sweden. *Value in Health*,13(4) 424-430. DOI: 10.1111/j.1524-4733.2009.00677.x

Hagquist, C., & Andrich, D. (2017). Recent advances in analysis of differential item functioning in health research using the Rasch model. *Health and Quality of Life Outcomes*, 15:1–8. DOI: 10.1186/s12955-017-0755-0

Hällgren, M., Nygård, L., Kottorp, A. (2011). Technology and everyday functioning in people with intellectual disabilities: a Rasch analysis of the Everyday Technology Use Questionnaire (ETUQ). *Journal of Intellectual Disability Research,* 55:610–20. https://doi.org/10.1111/j.1365-2788.2011.01419.x

Kan, H. Y., Forsyth, A., & Molinsky, J. (2020). Measuring the built environment for aging in place: A review of neighborhood audit tools. *Journal of Planning Literature,* 35(2),180-194. https://doi.org/10.1177/0885412220903497

Kottorp, A., Bernspång, B., & Fisher, A.G. (2003). Activities of daily living in persons with intellectual disability: Strengths and limitations in specific motor and process skills. *Australian Occupational Therapy Journal*, 50, 195–204.

Lerdal, A., Kottorp, A., Gay, C., Aouizerat, B.E., Lee, K.A., & Miaskowski, C. (2016). A Rasch Analysis of Assessments of Morning and Evening Fatigue in Oncology Patients Using the Lee Fatigue Scale. *Journal of Pain and Symptom Management*, 51,1002–1012. https://doi.org/10.1016/j.jpainsymman.2015.12.331

Linacre, J. (2009). Local independence and residual covariance: A study of Olympic figure skating ratings. *Journal of Applied Measurements,*10, 157–169.

Mallinson, T., Stelmack, J., &Velozo, C. A (2004). Comparison of the separation ratio and coefficient alpha in the creation of minimum item sets. *Medical Care,* 42 (1) 1-17. DOI: 10.1097/01.mlr.0000103522.78233.c3

Meeks, S. (2022). Age-friendly communities: Introduction to the special issue. *The Gerontologist*, *62*(1), 1-5.

Patomella, A.H., Tham, K., & Kottorp, A. (2006). P-Drive: Assessment of driving performance after stroke. *Journal of Rehabilitation Medicine,* (38), 273–9. DOI: 10.1080/16501970600632594

Psychological Association and the American Educational Research Association. (2014). Joint Committee on Standards for Educational and Psychological Testing of the American Educational Research Association, the American Psychological Association and the National Council on Measurement in Education. *Standards for Educational and Psychological Testing*. Washington DC: American Educational Research Association.

Rudnicka, E., Napierała, P., Podfigurna, A., Męczekalski, B., Smolarczyk, R., & Grymowicz, M. (2020). The World Health Organization (WHO) approach to healthy ageing. *Maturitas, 139,* 6-11. DOI: 10.1016/j.maturitas.2020.05.018

Rustøen, T., Lerdal, A., Gay, C., & Kottorp, A. (2018). Rasch analysis of the Herth Hope Index in cancer patients. *Health and Quality of Life Outcomes*, 16, 1-10. DOI: 10.1186/s12955-018-1025-5

Scharlach, A. (2017). Aging in context: Individual and environmental pathways to aging-friendly communities: The 2015 Matthew A. Pollack Award Lecture, *Gerontologist*, 57(4): 606-618.

Scharlach, A. E., & Diaz Moore, K. (2016). Aging in place. In V. L. Bengston & R. A. Settersten Jr. (Eds.), *Handbook of theories of aging* (3rd ed., pp. 407–425). Springer.

Skyttberg, N., Kottorp, A. & Alenius, L.S. (2023). Sound psychometric properties of a short new screening tool for patient safety climate: applying a Rasch model analysis. *BMC Health Services Research* 23 (742). https://doi.org/10.1186/s12913-023-09768-y

van Hoof, J., Marston, H.R., Kazak, J.K. and Buffel, T. (2021) 'Ten questions concerning age-friendly cities and communities and the built environment', *Building and Environment,* 199: https://doi.org/10.1016/j.buildenv.2021.107922

Winsteps and Facets: Rasch Analysis + Rasch Measurement Software + 1PL IRT. https://www.winsteps.com/index.htm. Accessed 25 Jun 2022.

Weil, J. (2019). Relationship to place for older adults in a New York City neighborhood undergoing gentrification: A discourse analysis. *City & Community, 18*(4): 1267-1286.

Weil, J. (2020a). Developing the person–place fit measure for older adults: Broadening place domains. *The Gerontologist*, *60*(8), e548-e558.

Weil, J. (2020b). Pandemic place: Assessing domains of the person-place fit measure (PPFM-OA) for older adults, *Journal of Aging and Social Policy*, 1-10.

Weil, J. (2023). *Why place matters: Place and place attachment for older adults*. Taylor & Francis.

Weil, J. and Smith, E. (2016). Revaluating aging in place: From traditional definitions to the continuum of care. *Working with Older People*, 20 (4): 223–230.

World Health Organization, WHO. (2014). Age-friendly globe. World Health Organization [online], Available from: https://extranet.who.int/agefriendlyworld/

World Health Organization, WHO. (2016) Global database of age-friendly practices, World Health Organization [online], Available from: https://extranet.who.int/agefriendlyworld/afp

Wright, B.D., & Linacre, J.M. (1994). Reasonable mean -square ft values. *Rasch Measurement Transactions*, 8(2),

Wright, J., Moghaddam, N., & Dawson, D. L. (2021). Cognitive interviewing in patient-reported outcome measures: A systematic review of methodological processes. *Qualitative Psychology,* 8(1), 2–29. https://doi.org/10.1037/qup0000145

Yen, W. (1984). Obtaining maximum likelihood trait estimates from number-correct scores for the three-parameter Logistic Model. *Journal of Education Measurement*, 21, 93–111. https://doi.org/10.1111/j.1745-3984.1984.tb00223.x

Yen, W. M. (1993). Scaling performance assessments: Strategies for managing local item dependence. Journal of Educational Measurement, 30, 187–213. https://doi.org/10.1111/j.1745-3984.1993.tb00423.x

Yeh, J. (2022). Age-friendly for whom? An aperture to the lived experiences of older San Franciscans. *The Gerontologist*, *62*(1), 100-109. https://doi.org/10.1093/geront/gnab119

Tables and Figures

Table 1. *Sample characteristics of the survey participants, N=460*

Characteristics	
Gender, n (%)	
Men	227 (49.3)
Women	233 (50.7)
Age, M (SD)	76.2 (6.7)
Type of area, n (%)	
Urban	240 (52.2)
Rural	220 (47.8)
Income[1], n (%)	
<9 000	22 (4.9)
9 001-13 000	100 (22.2)
13 001-17 000	166 (36.8)
17 001-21 000	88 (19.5)
21 001<	75 (16.6)
Living alone, n (%)	231 (50.2)
Years living in the area, m (SD)	34.4 (21.3)
Type of tenure, n (%)	
Rented	191 (41.55)
Owned	269 (58.5)
Type of dwelling, n (%)	
one-family house	197 (42.8)
apartment	263 (57.2)
Education, n (%)	
Secondary school	137 (29.9)
High school	184 (40.2)
University	137 (29.9)
Not born in Sweden[2], n (%)	60 (13.1)
Self-rated health, Md (q1-q3)	3 (2-4)
Receiving care with BADLs[3], n (%)	24 (5.2)

Note: Due to internal missing n varies from 451 to 460.

[1]In Swedish kronor (SEK). 1 USD = 10 SEK.

[2]Nordic countries = 26, the Balkans = 9, Germany = 7, Poland = 7, Other European countries = 5, the Middle East = 4, Other non-European countries = 2.

[3]BADL = Basic Activities of Daily Living (eating, move around indoors, toileting, clothing, personal hygiene).

Table 2. *Rating scale functioning in the PPFM-OA (n=460)*

	Category Label	Score	Observed count (%)	Observed Average	Outfit Mean Square Measure
PPFM-OA	Strongly disagree	1	1976 (11)	0.21	1.38
	Somewhat disagree	2	1451 (8)	1.93	0.98
	Neither agree nor disagree	3	1995 (11)	2.27	0.59
	Somewhat agree	4	3530 (19)	5.64	0.76
	Strongly agree	5	9807 (52)	9.64	1.02
	Missing data		101 (1)		

Table 3. *The construction of super-items in the PPFM-OA (n=460)*

Item local independence - Iteration 1		
Super-item #42		
#14. I have considered moving to better housing (REV)	#22. I would like to move to a place that better suits my needs (REV)	#23. I have recently considered moving (REV)
Super-item #43		
#1. My community values older people	#2. My community advocates for older adults	
Super-item #44		
#8. I feel accepted in this community	#9. I am heard/listened to in my neighborhood/community	
Item local independence - Iteration 2		
Super-item #45		
Super-item #42	#27. I choose to live in my community	
Super-item #46		
#5. This place means a lot to me	#7. This place is part of who I am/my identity	

Item local independence - Iteration 3		
Super-item #47		
Super-item #43	Super-item #44	

Table 4. *Item misfit deletion by iteration in the PPFM-OA (n=460)*

Iteration	Item	Measure (logits)	Infit MnSq
First iteration	#10	59.59	1.42
	#11	51.54	1.36
	#20	57.07	1.31
	#37	55.83	1.62
	#40	57.43	1.73
	#45	21.28	2.50
Second iteration	#4	58.42	1.43
Third iteration	#16	51.35	1.33
	#17	49.66	1.33
Fourth iteration	#19	49.96	1.36
Fifth iteration	#39	61.28	0.60
	#33	52.65	0.65
	#3	52.18	0.61
	#32	46.71	0.58
	#12	46.68	0.62
	#30	44.89	0.35
	#29	44.85	0.45
	#24	44.14	0.61
Sixth iteration	#13	47.18	0.56


MEASURE Person - MAP - Item
<more>|<less likely to agree with>
90
80
70
60
50
40
30
25. There is affordable housing for older adults in my community
*38. We need more options for older adults, such as programs, transportation, case management, etc., in my community
*26. It's too expensive for older adults to live well in my community
*34. People are leaving this neighborhood
15. My community has accessibility options (e.g. sidewalks with sloped curbs, ramps, etc.) 7. This place is part of who I am/my identity
*28. Living in my community is a challenge 18. I am in good health 2. My community advocates for older adults 5. This place means a lot to me
1. My community values older people 31. I feel safe in my community at night
*35. The neighborhood feeling is gone 21. The environment (such as architecture, natural beauty, climate, parks) keeps me here 6.I want to live in the place I am currently…
9. I am heard/listened to in my neighborhood/community
*36. I feel alone in my neighborhood
8. I feel accepted in this community
41. I have enough transportation options here
<less>|<more likely to agree with>
EACH "#" IS 4: EACH "." IS 1 TO 3

Figure 1. *Wright person-item map for the PPFM-OA (n=460) with the 19 original items demonstrating acceptable goodness-of-fit to the Rasch model. Each "#" is four persons; each "." represents one to three persons. The lower item measure the more likely to agree with (less challenging to agree with); the higher item measure the less likely to agree with the item (more challenging to agree with). Person and Item Mean (M) and Standard Deviation (S) is included. Items marked with *are reversed.*