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Age friendliness of living environments from the older person's viewpoint: development of the age-friendly environment assessment tool

Ian W. Garner[a], and Carol A. Holland[b]

[a]Aston Research Centre for Healthy Ageing, Aston University, Birmingham, B4 7ET, UK, garneri@aston.ac.uk

[b]Centre for Ageing Research, Division of Health Research, Lancaster University, Lancaster, LA1 4YG, UK, c.a.holland@lancaster.ac.uk

Corresponding Author: Ian Garner

E-mail Address: garneri@aston.ac.uk

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Abstract

Background

According to the World Health Organisation, the role of the environment for older adults is to maintain and facilitate independence, and promote quality of life. However, measures that examine the environment in terms of its potential impact on older people are either oriented towards specific aspects of the environment, specifically designed for community-level assessment rather than individually-oriented, or are unwieldy for everyday use.

Objectives

This paper describes the development and validation of the Age-Friendly Environment Assessment Tool (AFEAT), assessing whether individual function and frailty impact on perceptions of environmental age-friendliness. The extent to which such perceptions may moderate impacts of frailty on outcomes such as need for care support, quality of life and loneliness is examined.

Methods

A total of 132 participants aged 58 to 96 were recruited from retirement villages and local communities in the Midlands of the UK. Participants completed the AFEAT and a series of measures designed to assess frailty and assessments of quality of life, loneliness, and perceptions of functional limitations.

Results

Internal reliability assessment indicated that the AFEAT possesses a Cronbach's Alpha score of .745. The AFEAT significantly predicted quality of life and, loneliness, accounting for 17.1% and 5.8% of variance respectively, indicating high concurrent and predictive validity. Furthermore, the AFEAT moderated the predictive strength of frailty in predicting the amount of formal care an individual receives, but not quality of life or loneliness.

Discussion

The AFEAT is a valid and reliable tool and analyses highlight the need for an individual-oriented age-friendly environment tool.

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Introduction

Research to extend independence and healthy life years within the context of longer lifespans is crucial to enable sustainable health and social services to meet the needs of a growing population of older adults. Need for services increases as robustness deteriorates and frailty progresses [1,2], but for many frail older adults these resources are insufficient to meet their needs, limiting their ability to age in their homes [3,4]. This is particularly so when the person fit with their environment is poor, requiring more resources to support them. A lack of resources and poor environment suitability can inhibit activity [5], which in turn stimulates frailty progression [6]. For example, a lack of easily accessible parks or walking areas is associated with reduced physical activity [7]; or a lack of opportunities for socialising is likely to increase feelings of loneliness and social isolation, which is a risk factor for cognitive decline [8]. However, if the person fit to the communal environment is good, this can facilitate exercise and activity [5]. Additionally, if the home environment is tailored to meet the occupant's needs, such as installing a walk-in shower when needed, the need for formal care reduces and independence can be maintained despite deterioration of capabilities, with a significant positive influence on quality of life [9,10].

Supporting this premise, research has shown that a stimulating and socially and physically accessible environment can improve quality of life [11], increase physical activity [11,12] and help facilitate independence and fulfilment [10]. Poor quality of life, limited physical activity and loneliness are all known risk factors for frailty progression and serious cognitive decline in older age [13], both predictors of vulnerability to adverse events such as hospitalisation and institution admittance [14].

However, research into age-friendly environments often focuses on communal design and resource availability, but presence does not determine accessibility and resource effectiveness. For instance, Potter *et al* [15] examined the availability and accessibility of pleasant outdoor spaces in care homes and discovered that the absence of accessibility when such resources are available is associated with greater feelings of depression. The authors concluded that to reduce depression in this cohort, accessibility to the resources required improving.

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Extending this communally, local services are more readily available to individuals who drive compared to those dependant on public transport or have mobility impairments. Therefore, to maximise the benefits of the environment for individuals living within the community we must consider individual capabilities, wants and needs, and find ways of adapting and designing environments, and supporting people to new ways of interacting with the environment, to fulfil their needs. That is, we need methods by which the environment can be considered from the perspective of the individual, both theoretically and practically, through individual-oriented environmental assessment. Potential opportunities to improve independence and engagement inside and outside the home, and therefore impact risk factors for reduced quality of life and need for care, may then be identified through examining the impact of the environment in older adulthood using a more person-centred, or individual approach.

Unfortunately, measures assessing the environment from this perspective remain elusive. This is unsurprising given the focus on the environment as a communal construct, which is reflected in current environmental assessment tools [3,16,17] There are tools that focus on the individual, but they only examine individual perspectives in relation to a specific attribute of the environment, e.g. the Neighbourhood Environment Walkability Scale (NEWS) tool [18], as opposed to the encompassing assessment required to examine age-friendliness of the environment as defined by the WHO [10]. The tool closest to meeting the criteria outlined is the Age-Friendly Survey (AFS) [19] which assesses seven of the eight WHO age-friendly environment domains from the individual perspective. However, this is a 54-item assessment, giving limited suitability with regards to respondent burden and time efficiency when used in conjunction with other assessments, for example, of health, frailty or need for care. Additionally, the use of a limited scoring system, whilst being user-friendly, restricts the ability of the tool to assess progressive change in perceptions of the environment over time.

The NEWS and AFS tools demonstrate that considering participants' perceptions as a proxy assessment of their environments presents a viable method for reviewing the environment on an individual basis, but also display limitations that require addressing, highlighting the need for an assessment tool that examines the age-friendliness of the environment on an individual basis and allow for the assessment of progressive change in perception over time. In reviewing the available tools and their respective limitations we propose a tool in which

fewer, but broader, items are utilised to assess perceptions of age-friendliness of the environments with a likert scale response system to produce a greater scope for assessing change. Therefore the Age-Friendly Environment Assessment Tool (AFEAT) was developed.

Development of the Age-Friendly Environment Assessment Tool (AFEAT)

Plouffe, Kalache and Voelker [20] reviewed the application of the WHO's [10] age-friendly environment domains in a range of locations, and concluded that the eight dimensions are representative of age-friendly environments. These dimensions are described in Table 1. Therefore, in a similar manner to the AFS [19] the AFEAT was developed using the checklist as its foundation.

The purpose of the AFEAT (see Appendix A) is to gauge individuals' perspectives of their home and local communities, the resources within the environment, and how well suited it is to meet their daily needs. It is a 10-item measure that utilises a 5-point likert response system ranging from strongly disagree (1) to strongly agree (5).

The purposes of this study were to validate the AFEAT and ensure it matches the WHO [10] definition of age-friendly environments, and to determine the usefulness of the tool by examining whether individual frailty and functional limitations influence older people's perceptions of their environment as age-friendly or not. The study will then examine the benefits of high perceptions of environmental age-friendliness, irrespective of actual capabilities, in terms of wellbeing and support need outcomes. In summary, aims are to:

1. Assess internal reliability, and predictive and construct validity of the AFEAT.
2. Examine the impact of objectively assessed individual frailty and self-perceived functional limitations on perceptions of environmental age-friendliness.
3. Assess the impact of perceptions of environmental age-friendliness, controlling for frailty, on outcomes such as quality of life (QoL) and loneliness.
4. Assess the impact of the AFEAT on the extent to which frailty predicts outcomes of QoL and loneliness and care support needs.

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Table 1: *Conversion of the WHO Age-Friendly Checklist Components into the AFEAT.*

WHO Checklist Component	Representation in AFEAT
Outdoor spaces and buildings Community features that assess the pleasantness and availability of resources that facilitate safety and physical activity.	I am able to access local services such as shops, restaurants, maintenance services, or GP clinics without any issue. I live in close proximity to local services such as shops, restaurants, maintenance services, and GP clinics.
Transportation The ease-of-access and use, availability and reach of public transport across a local community, including specialised provision. Good quality infrastructure for older drivers.	I am able to travel around the local area/community without problems.
Housing Houses meet the needs of, and are available to, frail older adults, and any necessary modifications are available and affordable.	My housing is safe, clean and well-maintained.
Social Participation Information is available to community residents about local events and venues; the events are affordable, suitable and easy to reach for residents including those who want to attend on their own.	There are plenty of places to meet up with friends and family, as well as engage in community activities. I feel I am a valuable part of my local community.
Respect and Social Inclusion A review of how well older adults are respected, engaged with, their opinions heard, and included in community activities. There are intergenerational activities.	There is consistent outreach to include people at risk of social isolation
Civic Partnership and Employment Older adults can engage in flexible volunteer and paid work (including training) without	

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fear of discrimination, and older adults are consulted in community decision making.	I can engage in volunteer or paid work without worrying about any special requirements I may have.
Communication and Information Community information is wide-reaching and promoted in accessible formats to older adults, and one-to-one public services to provide information is available.	I have easy access to information regarding the local community and I am able to give my opinion on community-based decision making.
Community and Health Services The availability and accessibility of health and social care and facilities about which there is clear information. Specific provision such as care homes and burial sites are accessible. Emergency planning takes into account capacities of older people.	I have easy access to information and services regarding my health.

Method

Participants

A total of 132 participants (57 men, 75 women) aged 58-96 years were recruited from local communities, and 13 ExtraCare[(1)] retirement villages across the UK Midlands as part of a larger study [11,22]. Recruitment posters were placed within retirement villages and University of the Third Age venues, and information was sent to members of a university research panel. Individuals were invited to contact researchers if interested in taking part in the study.

Ethics

Participants received an information sheet outlining the study, their rights of withdrawal and anonymity as participants. A judgement of capacity to give informed consent was made under

[(1)]Extra Care housing aims to meet the physical, cognitive, and social needs of older adults to sustain independence in their own accommodation [21]. The locations in this study are run by the ExtraCare Charitable Trust, which provides additional services such as a 'well-being' advisor (a nurse) for health assessment and support.

the Mental Capacity Act [23]. Information in which participants could be identified is kept in password protected format and raw data locked away separately. Ethics procedures align with British Psychological Society guidelines. The study was given a favourable opinion from the Aston University ethics committee (Ethics application #565).

Procedure

Data was collected as part of a larger longitudinal study [11,22]. Participant's physical, cognitive, and psychological well-being was assessed to calculate a frailty profile score. The functional limitations profile (FLP), loneliness and QoL assessments were also completed. The AFEAT was added to data collection at the current wave. In several instances, participants chose not to complete specific assessments, resulting in small variability in number of participants completing the QoL, FLP and loneliness measures.

Measures

Participants completed:

- A 52-item physical and psychological accumulation of deficits frailty index based on existing frailty indices [24,25]; scores over 0.25 indicate a frail state (scores range 0 to 1).
- the Control, Autonomy, Self-Realization & Pleasure 12-item (CASP12) measure of quality of life [26]; higher scores indicate better quality of life; (ranging from 12 to 48).
- the FLP which assesses perception of impact of health on function [27], with greater perceptions of limitations reflected by higher scores (ranging from 0 to 883),
- a four item assessment of loneliness using the Brief UCLA scale [21], higher scores indicate lower feelings of loneliness (range from 0-12).

- The AFEAT, where higher scores (ranging 10-50) indicate greater perceived age-friendliness of the environment.

Participants were also asked how many, if any, hours of formal care they received on a weekly basis. Of the 132 participants who took part in the study, 14 received formal care.

Results

Descriptive Statistics

The means, standard deviations, range, median, and interquartile range of the measures are displayed in Table 2.

Table 2: *A Table Displaying the Mean, Standard Deviation, Range, Median, and Interquartile (IQ) Range for AFEAT, Frailty, CASP12, FLP, Loneliness, and Formal Care.*

	n	**Mean**	**Standard Deviation**	**Range**	**Median**	**IQ Range**
AFEAT	132	42.20	6.28	21 - 50	44	8
Frailty	131	0.171	0.132	0.010 - 0.628	.129	.127
CASP12	127	37.94	5.44	18 - 48	39	8
FLP	121	130.34	155.68	0 - 691	86	174
Loneliness	130	10.64	1.68	4 - 12	11	2
Formal Care (hours/week)	131	1.84	10.37	0 - 91	0	0

Internal Reliability

The AFEAT Cronbach's Alpha score was 0.745, with an 'alpha if item deleted' range of .705-.740, indicating high internal reliability across all items with low risk of item redundancy [28].

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Convergent Validity

Linear regressions were performed to determine if the AFEAT significantly predicted QoL and loneliness. Consistent with the WHO definition of age-friendly environments [10], the AFEAT significantly predicted quality of life (R^2 = .171, F(1,125) = 25.873, p<.001) and loneliness (R^2 = .058, F(1,127) = 7.799, p=.006), therefore demonstrating convergent validity.

Construct Validity

A Principal Axis Factoring analysis was performed to assess the dimensionality of the AFEAT. As the measure was designed under a single construct, a unidimensional outcome would indicate construct validity.

The scree plot indicated the AFEAT was comprised under a single component structure. From this, the Direct-Oblimin pattern matrix showed that all 10 items loaded onto the single component sufficiently, with a loading power range of .403 to .657 observed.

The Importance of Actual and Perceived Individual Capabilities in Determining Perceptions of Environmental Age-Friendliness

Separate linear regressions determined that both frailty (β = -.370, t(1,129) = -4.526, p<.001) and FLP (β = -.450, t(1,119) = -5.503, p<.001), significantly predicted AFEAT scores.

Perception of functional limitations was the greater predictor of perceptions of environmental age-friendliness. However further analysis confirmed that the majority of FLP variance was attributed to frailty (R^2 = .645, F(1,118) = 214.474, p<.001), and that the measures together accounted for 19.3% of the variance in the AFEAT score.

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The impact of perceptions of environmental age-friendliness, controlling for frailty, on outcomes of quality of life (QoL) and loneliness.

In hierarchical regressions the AFEAT added a significant amount of variance once frailty was accounted for in the prediction of loneliness (β = .261, $t(2,126) = 2.910$, p = .004), and quality of life (β = .189, $t(2,123) = 2.559$, p =.012), accounting for 5.9% and 3.0% of variance respectively.

The moderating effect of the AFEAT on frailty predicting formal care, QoL, and loneliness.

The contribution of the perception of the age-friendliness of the environment, beyond the contribution of actual frailty noted above suggests that the perceptions measured by the AFEAT may moderate the impact of frailty on selected outcomes. A series of Hayes [29] moderation analyses were performed to determine if higher perceptions of environmental age-friendliness can reduce the negative impact of frailty, on outcomes such as amount of formal care received on a weekly basis, loneliness, and quality of life. Results (see Table 3) show an increasing moderating effect of AFEAT scores in relation to the strength of the predictive effect of frailty on formal care as AFEAT score increases. No moderating effect of the AFEAT was observed in relation to frailty predicting loneliness or quality of life.

Table 3: *Moderation Analyses Assessing the Moderating Effect of the AFEAT on Frailty Predicting Formal Care and Loneliness.*

	Effect	Standard Error	*t*	*p*	95% Confidence Interval	
					Lower	Upper
Formal Care						
AFEAT Score: 37.96	26.153	7.025	3.723	<.001	12.250	40.056
AFEAT Score: 44.00	43.563	7.561	5.761	<.001	28.600	58.527
AFEAT Score: 48.00	55.093	9.854	5.591	<.001	35.593	74.593
Loneliness	---	.041	.407	.685	-.064	.097
Quality of Life	---	.130	1.276	.204	-.092	.423

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Discussion

The purpose of this study was to validate the AFEAT, to confirm the extent to which perceived and actual health and functional limitations influence perceptions of environmental age-friendliness, to determine the impact of perceptions of age-friendly environments on quality of life (QoL) and loneliness, controlling for the important predictor of frailty, and to determine whether perceived AFEAT is a useful index in terms of whether it can moderate the impact of frailty on important outcomes such as need for care, quality of life or loneliness.

Validation procedures fulfilled requirements for internal reliability and construct validity and were consistent with the WHO definition of age-friendly environments [10] in that the role of the environment is to help sustain independence (control limitations) and maintain a fulfilling lifestyle: the AFEAT significantly predicted quality of life and loneliness. Findings indicate that the AFEAT a valid and reliable tool.

The importance of individual function, both actual and perceived, in determining perceptions of environmental age-friendliness was highlighted, showing that variance in the relationship between individual limitations and the environment, rather than the environment itself, is critical. This is clear given that many of the participants lived in purpose-built age-friendly communities, but had a wide range of levels of frailty, an advantage of this sample for this study. Perceptions of environmental age-friendliness linked closely to the fit between health/function and effective environmental facilitation of individual capabilities to maximise maintenance of independence, across the full range of robust to frail people within this sample. This is further confirmed by the relationships with loneliness, quality of life and amount of care. Findings suggest that if the environment is age friendly a significant benefit in these variables would be observed irrespective of frailty severity. Indeed, for amount of care received, AFEAT moderated the impact of frailty. However, as only a small amount of participants received care we must be cautious about drawing conclusions based on results.

These findings emphasise the need for an individual-oriented environmental assessment tool, justifying the development of the AFEAT and its use in future research. Findings also imply that the assessment of age friendliness, or application of standards in designing and building homes and environments, needs to shift to a more person-, or end-user focussed approach, right from design phases.

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Limitations

This study did not compare the person-centred perceived age friendliness tool with any other tools, and objective quantitative assessment of each participant's home location was not available. Future research could develop the understanding of person-environment fit by making such comparisons.

Conclusion

The AFEAT is valid and reliable tool and addresses the need to review age-friendliness of environments on an individual-basis. Analyses suggested that maintaining a high perception of environmental age-friendliness can improve quality of life and loneliness in frail older adults, irrespective of individual capabilities, and age friendliness of the environment can moderate the impact of frailty on need for care.

Appendix A

The Age-Friendly Environmental Assessment Tool (AFEAT)

When answering each statement consider how easy/difficult it is to access each resource based on current physical and cognitive capabilities.

1. I am able to access local services such as shops, restaurants, maintenance services, or GP clinics without any issue.

Strongly Disagree Disagree Neither Agree/Disagree Agree Strongly Agree

2. I am able to travel around the local area/community without problems.

Strongly Disagree Disagree Neither Agree/Disagree Agree Strongly Agree

3. I live in close proximity to local services such as shops, restaurants, maintenance services, and GP clinics.

Strongly Disagree Disagree Neither Agree/Disagree Agree Strongly Agree

4. My housing is safe, clean and well-maintained

Strongly Disagree Disagree Neither Agree/Disagree Agree Strongly Agree

5. There are plenty of places to meet up with friends and family, as well as engage in community activities.

Strongly Disagree Disagree Neither Agree/Disagree Agree Strongly Agree

6. There is consistent outreach to include people at risk of social isolation

Strongly Disagree Disagree Neither Agree/Disagree Agree Strongly Agree

7. I feel I am a valuable part of my local community.

Strongly Disagree Disagree Neither Agree/Disagree Agree Strongly Agree

8. I can engage in volunteer or paid work without worrying about any special requirements I may have.

Strongly Disagree Disagree Neither Agree/Disagree Agree Strongly Agree

9. I have easy access to information regarding the local community and I am able to give my opinion on community-based decision making.

Strongly Disagree Disagree Neither Agree/Disagree Agree Strongly Agree

10. I have easy access to information and services regarding my health.

Strongly Disagree Disagree Neither Agree/Disagree Agree Strongly Agree

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