

Validity and Reliability of the Expectations Regarding Aging (ERA-12) Instrument among Middle-Aged Singaporeans

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Abstract

Introduction: The 12-item Expectations Regarding Aging (ERA-12) instrument measures expectations that individuals have about how their health and cognitive function will be when they age. To date, primarily assessed among older adults in Western settings, expectations regarding ageing have been associated with physical activity and healthcare seeking behaviour. It has been suggested that it may be possible to develop interventions that promote positive expectations about ageing. Assessment of expectations regarding ageing among today's middle-aged population would allow for earlier interventions to help give them positive (but realistic) ageing expectations, and age successfully. We assess the reliability and validity of ERA-12 for middle-aged Singaporeans. **Materials and Methods:** A questionnaire that included ERA-12 was administered to 1020 patients aged 41 to 62 years attending 2 SingHealth polyclinics in Singapore. Data from 981 respondents who completed the ERA-12 instrument were analysed. ERA-12's construct validity was determined using Exploratory Factor Analysis (EFA), and through its correlation with depressive symptoms, and self-rated health and education. Internal consistency reliability was assessed using Cronbach's alpha. **Results:** EFA confirmed that the ERA-12 consisted of 3 factors (each with 4 items) – expectations regarding physical health, mental health and cognitive function, together explaining 64% of the variance in ERA-12 total score with high factor loadings (range, 0.6 to 0.8). The ERA-12 total score was positively correlated with self-rated health ($r = 0.13$) and education ($r = 0.19$), and negatively correlated with depressive symptoms ($r = -0.25$). Cronbach's alpha exceeded 0.7 for ERA-12 overall, and for each subscale. **Conclusion:** ERA-12 can be used to evaluate expectations regarding ageing not only among elderly populations in the West, but also among middle-aged Singaporeans.

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Introduction

With increasing life expectancy and low fertility rates, the proportion of the elderly is rapidly increasing in developed nations, Singapore being no exception. The elderly (over 65 years) population in Singapore is expected to grow from 7.2% in 2000 to 18.4% by 2030.¹ As they age, middle-aged Singaporeans will constitute a large proportion of the elderly over the next two decades.

Though it is a common perception that increasing age is associated with a reduction in physical and functional health status, geriatricians and gerontologists have now started to focus on more positive constructs such as positive ageing and successful ageing.² Health outcomes in later life,

among older and middle-aged individuals, are predicted by not only objective health measures, but also subjective measures of health and ageing.³⁻⁷

One such subjective measure is “expectations regarding ageing” (ERA). The concept of ERA has been defined as expecting achievements and maintenance of high levels of physical and mental functioning with ageing, which indicates the expectation of “healthy ageing” for self and others.⁸ Those with more positive/higher expectations about ageing have been reported to have higher levels of physical activity⁷ and place greater importance on seeking healthcare for age-related conditions.⁷ Researchers have suggested that it may be possible to modify (increase realistically)

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expectations regarding ageing among older adults as a way to improve their health.⁷ However, there has been comparatively little focus on assessing ageing expectations among middle-aged adults, who have not yet reached, but will soon enter the “youngest old” age group.

Understanding their expectations regarding ageing should inform policymakers who can develop strategies for future social and health services, help today’s middle-aged generation to attain positive expectations, and age successfully.

Commonly used to assess ageing expectations are the 38-item “Expectation Regarding Aging” instrument (ERA-38),⁸ developed through focus groups discussions and cognitive interviews with older American adults, and the ERA-12, its shorter version.⁹ However these instruments have been developed, validated and chiefly administered among Western populations in general and the US populations in particular.^{7-8,10-12} Further, they have been administered mainly to older adults,^{7,8,10-12} and only recently to middle-aged and younger individuals.⁹ To our knowledge, only 1 study has administered the ERA-12 in an Asian population,¹³ but it had a small sample size ($n = 99$) and again, was limited to older adults. It is therefore of interest to explore ERA-12’s validity and reliability among middle-aged individuals, and to do so in a Southeast Asian population, using a larger sample. A valid and reliable instrument measuring middle-age adults’ expectations regarding ageing would allow researchers from Singapore to explore relationships of expectation regarding ageing with health behaviour, health service use and subsequent health. The objective of the present analyses was therefore to assess the (construct) validity, (internal consistency) reliability and strength of relationship between items of ERA-12 to determine its suitability for use among middle-aged Singaporeans.

Materials and Methods

Sample

Our target population consisted of middle-aged Singaporeans, aged 41 to 62 years (at the time of study, 62 years was the retirement age in Singapore), from the 3 main ethnic groups in Singapore, i.e. Chinese, Malay and Indian (75.6%, 13.6% and 8.7% of the population, respectively).¹⁴ Study participants were selected from middle-aged individuals seeking treatment at 2 large, representative polyclinics, one each from the central and eastern part of the country. About 500 to 600 patients of all age groups seek treatment at these polyclinics each day. We aimed to enrol a sample of 1000 individuals, the sample ratio stratified according to ethnic group: Chinese, Malay and Indian (7:2:1). A total of 2110 patients meeting the inclusion criteria, i.e. age between 41 and 62 years old, able to read and understand English and being citizens

or permanent residents of Singapore, were approached for participation, out of whom 1020 (48.3%) agreed to participate. Non-participants, compared to participants were more likely to be male (49% vs 37%) and in the age group of 41 to 51 years old (51% vs 43%), but similar in terms of ethnic group. Participants were asked to complete the 5-item Geriatric Depression Scale (GDS-5)¹⁵ (maximum score of 5, higher score indicating presence of depressive symptoms,) rate their health (“Would you say that your health is excellent/very good/good/fair/poor/don’t know; scored on a 1-5 scale, with 5 for excellent and 1 for poor) and demographic information in addition to questions on ERA-12. The study was approved by the SingHealth Polyclinic Institutional Review Board.

Questionnaire

After obtaining written informed consent, a self-administered questionnaire in English was administered. Trained nurses conversant in Chinese, Malay, Tamil and English were present for addressing any participant queries. Data were collected over a period of 4 weeks, during August and September 2008. Participants, on average, took 20 minutes to complete the questionnaire.

ERA-12

ERA-12 includes a series of 12 statements describing expectations regarding ageing (Table 1), followed by a 4-point “definitely true/somewhat true/somewhat false/definitely false” response set.¹⁰ It provides a total score, reflecting global expectations regarding ageing (based on all 12 items), and 3 subscale scores [expectations regarding physical health (PH), mental health (MH) and cognitive function (CF)], each based on 4 items. The scores are calculated as per an algorithm,¹⁰ and range from 0 to 100. Lower scores indicate expectations of decline in physical and mental health and cognitive function while higher scores indicate expectations of successful ageing.¹⁰

Of the 1020 participants, 981 (96.2%) completed the ERA-12 instrument. Among them, 1.8% missed marking 1 item and 1.5% missed 2 items. Missing data for an item were substituted by the average of the score of other items in the particular scale (PH, MH or CF) to which the missing item belonged.

Statistical/Psychometric Analysis

The analysis was carried out using SPSS 15 software. We first used exploratory factor analysis, a technique that can be used to group interdependent latent (that cannot be measured directly, i.e. subjective) variables into categories based on similar characteristics or behaviour, to determine the basic structure of the ERA-12. The unknown domains of ERA-12 scores were explored by dividing the characteristics/items into independent sources of variation (factors). Here we

Table 1. Rotated Component Matrix for ERA-12 factors (Exploratory Factor Analysis, with Varimax Rotation Showing Strength of Relationship of Items within the Subscales)

ERA-12 item	Cognitive Function	Physical Health	Mental Health
When people get older, they need to lower their expectations of how healthy they can be.		0.710	
The human body is like a car: when it gets old, it gets worn out.		0.798	
Having more aches and pains is an accepted part of ageing.		0.768	
Every year that people live, their energy levels go down a little more.		0.714	
I expect that as I get older I will spend less time with friends and family.			0.723
Being lonely is just something that happens when people gets old.			0.821
As people get older, they worry more.			0.715
It is normal to be depressed when people get old.			0.690
I expect that as I get older I will become more forgetful.	0.789		
It's an expected part of ageing to have trouble remembering names.	0.802		
Forgetfulness is just a natural occurrence just from growing old.	0.773		
It is impossible to escape the mental slowness that happens with ageing.	0.704		

used the deductive approach by hypothesising the existence of particular dimensions and assessed whether our data fit a factor structure identical to the structure found by other researchers¹⁰ [i.e. how well the measure represented the construct of interest (construct validity)]. For selecting the number of factors, we used the criteria of the factor having an eigen value (which measures the amount of variation accounted for by the factor) greater than 1. Varimax rotation (orthogonal rotation of quadrants) was used to control for certain influences (of items on the subscale) on the result. The rotated factors delineate a distinct cluster of relationships while unrotated factors successively define the most general patterns of relationships in the data.

We further determined convergent and divergent validity for the ERA-12 scale by assessing its correlation with constructs that either theoretically or as shown by the developers of the scale^{8,10} are similar or dissimilar to the construct of expectations regarding ageing. Considering that higher scores on the ERA-12 indicate expectations of successful ageing, we hypothesised ERA-12 total score to be positively correlated with measures of self-rated health

Table 2. Demographic characteristics and ERA-12 scores of study participants (n = 981)

Variables	n (%)*
Gender	
Male	355 (36.4)
Female	619 (63.6)
Age (y)	
41 to 51	426 (43.4)
52 to 62	555 (56.6)
Race	
Chinese	697 (71.0)
Malay	196 (20.0)
Indian	88 (9.0)
Education	
Up to primary	275 (28.1)
More than primary and up to secondary	473 (48.4)
Polytechnic	110 (11.2)
Tertiary	120 (12.3)
Occupation	
None	363 (37.7)
Administrative, Service, Technical	476 (49.8)
Professional	122 (12.7)
ERA-12 Score (Mean ± SD)	
Total ERA	32.6 ± 15.9
Physical Health	23.2 ± 17.5
Mental Health	44.4 ± 21.9
Cognitive Function	30.2 ± 20.2

* May not add to 100% due to missing values

(SRH), and of socio-economic status (SES) – represented by educational status. Conversely, we expected it to have a negative correlation with depressive symptoms, as represented by the GDS-5 score. Further, as females have been reported to be more depressed and have lower self-rated health, we hypothesised lower ageing expectations among females. Based on previous studies, we also hypothesised the score to be negatively correlated with age.

Cronbach's coefficient alpha was determined to assess internal consistency reliability for the overall scale, and individual subscales. Correlation coefficients were also calculated to assess the strength of relationship between items, within and outside each subscale.

Results

Demographics and ERA-12 Scores

Most of the 981 study participants were female (63.6%), aged 52 to 62 years (56.6%), Chinese (71.0%), educated up to secondary level (76.5%) and working (87.1%). The mean ERA-12 subscale scores ranged from 23.2 (PH) to

44.4 (MH), with the overall mean score being 32.6 (Table 2). The distribution of the ERA-12 subscale, and overall scores was skewed, positive for PH, CF and total ERA, and negative for the MH subscale. Skewness and kurtosis scores ranged from -2 to $+2$. Item discrimination indices, indicating mean percentage of times an item in a particular subscale correlated significantly higher with the particular subscale total than with any other subscale total, for items for each subscale ranged from 0.9 to 1.

Construct Validity (Exploratory Factor Analysis), Convergent and Divergent Validity

Factor analysis with varimax rotation of the 12 ERA-12 items revealed that they encompassed three 4-item factors/domains (physical health, mental health, and cognitive function), and 1 global domain (expectations regarding ageing) combining all 12 items. The number of factors indicates the number of substantively meaningful independent patterns of relationships among items. Varimax rotation gave higher factor loadings (>0.7). The PH and MH subscales, in particular, exhibited a stronger relationship (>0.7) between items and the subscales as compared to unrotated analysis (Table 1). Factor loadings tell us the pattern of relationships and the association of each characteristic with each pattern, which are interpretable as correlation coefficients. The scree plot derived from the factor analysis supported the presence of 3 factors with eigen values of more than 1 (not shown). Comprehensiveness and strength of the 3 subscales and the global scale was measured by % of variance. The PH, MH and CF “factors” individually explained 62%, 61% and 68% of the variance in the ERA-12 total score, respectively. Together, the 3 factors explained 64% of the variance.

The total ERA had significant positive correlation with SRH ($r = 0.13$, $P = 0.01$) and education ($r = 0.19$, $P = 0.01$). It had a significant negative correlation with the GDS-5 score ($r = -0.25$, $P = 0.01$), but demonstrated very weak negative correlation with female gender ($r = -0.08$; $P \leq 0.05$), and none with age ($r = 0.02$, $P = 0.45$).

Reliability

Internal consistency reliability estimates (Cronbach’s alpha) for the ERA-12 and its component subscale exceeded 0.7, the recommended score for good reliability.¹⁶ Product moment correlations between factors were 0.40 (physical health and mental health), 0.52 (mental health and cognitive function) and 0.50 (cognitive function and physical health). All correlations were significant at the 1% level, with the strongest correlation between the MH and CF subscales.

Discussion

Our findings suggest that ERA-12 can be used to examine expectations regarding ageing among middle-

aged individuals. When administered to middle-aged Singaporeans, ERA-12 demonstrated an acceptable level of reliability, as indicated by high item discrimination scores and Cronbach’s alpha values. Exploratory factor analysis supported the presence of three 4-item factors, as proposed by the developers of the scale, along with high factor loadings, with the factors able to capture 64% of the variation in the ERA-12 total score. Additionally, the correlations of total ERA-12 score with depressive symptoms (assessed through GDS-5), self-rated health and education were consistent with our hypotheses, and with that reported by the authors of ERA-12.¹⁰

As suggested by its developers, the ERA instrument scores represent the extent to which individuals expect age-associated changes in different health domains, rather than classifying attitudes towards ageing as positive or negative.⁸ However, previous work has not suggested any particular cut-off (for any subscale or the overall scale), above or below which a person can be labelled as having “high” or “low” expectations related to ageing. It is also not known how large a difference in the scale scores, between groups or individuals, need to be to be considered clinically or socially meaningful. These aspects should be explored in future studies.

Most earlier studies have assessed expectations among the elderly, aged 60 years or older, and mainly in the context of Western populations. Hence, since we assessed expectations in a younger population, it is imprudent to conclude that Singaporeans in general have higher or lower expectations related to ageing compared to individuals in other countries. Nevertheless, it would be of interest to assess the relationship between socio-demographic variables and expectations regarding ageing to identify population sub-groups that, comparatively, have higher or lower scores on the ERA-12, overall or in individual subscales. Also interesting would be to ascertain the extent to which ERA-12 scores in middle-aged are predictive of health outcomes in later life, as well as their association with other subjective health or well-being measures.

It will also be of interest to investigate the extent to which ERA-12 correlates with expectations regarding medical care in old age, and to carry out longitudinal studies to understand how the expectations change with age and how such change may affect the relationships with health outcomes. Since Singapore is multi-racial society, it is important to test the psychometric performance of ERA-12 on a large sample within each racial group. ERA-12 should also be administered to assess its associations with physical and mental quality of life.

A limitation of this study is that it was limited to middle-aged public polyclinic attendees. Such individuals, more likely to have a lower socio-economic status and more likely

to suffer from an illness, may not be representative of, but rather have lower expectations related to ageing than the middle-aged Singaporean population in general. On the other hand, the response rate of 48.3%, though acceptable in this type of survey, indicates that we might have excluded severely ill patients from inclusion in our sample. Though nurses conversant in Chinese and Malay were available to answer any respondent questions, the lack of translated versions of the ERA-12 might have excluded individuals not conversant in English. Future studies should include samples that are representative of the general population, and include ERA-12 versions that have been translated, and adapted to the local Singaporean context.

The cross-sectional nature of the study precluded us from determining additional measures of validity such as test retest reliability. Future studies should examine the same.

The present study has several strengths. To our knowledge, it is the first study that has evaluated the reliability and validity of the ERA-12 among middle-aged individuals in a Southeast Asian population. The developers of the scale have in fact stressed the need for assessing the use of the instrument in younger individuals and in geographically diverse populations.^{8,10}

In summary, this is the first time that the shorter and practical ERA-12 has been used in a large sample of middle-aged individuals in Singapore. The results demonstrate acceptable reliability and construct validity in Singaporeans of this age group, and we conclude that ERA-12 can be used for assessing expectations regarding ageing among middle-aged individuals in Singapore.

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