

Elderly's Homesickness: Development of Elderly Homesickness Questionnaire

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Introduction: Homesickness is a result of migration, and is related to adjustment difficulties and health problems, as well as clinical disorders. The aim of this study was to measure and explore the homesickness of Chinese elderly.

Methods: A total of 355 non-local Chinese elderly in Shenzhen were recruited to measure demographic information and homesickness, and tested for reliability and validity. Patterns and influences of homesickness among Chinese elderly were explored through latent profile analysis and One-way ANOVA on the basis of EHQ.

Results: A three-factor structure was verified in the 19-item elderly homesickness questionnaire (EHQ), namely "positive contact", "refusal to separate" and "homesickness behavior". The EHQ reports high validity and reliability. Chinese elderly had a high degree of homesickness, and homesickness among Chinese elderly varied significantly across variables such as age, occupation, and education level. Four homesickness patterns were found in Chinese elderly, named low homesick group, moderate homesick group, middle-high homesick group, and high homesick group. Coming from rural/urban areas and living with grandchildren are factors that affect classification.

Conclusion: The present study reveals the high validity and reliability of the EHQ among Chinese elderly. The Chinese elderly reported high levels of homesickness, which varied significantly across levels of demographic factors. Four patterns of homesickness were found among the Chinese elderly, coming from rural/urban areas and living with grandchildren are the factors that affect classification. There may be a masking of the male contribution to the main effect due to the larger female sample.

Keywords: homesickness, elderly, questionnaire development

Introduction

The number of floating aged populations is gradually increasing under the multiple influences of population mobility and population aging. This has resulted in homesickness becoming a common social and psychological issue among the elderly. Homesickness is a result of migration,¹ and is related to adjustment difficulties and health problems, as well as clinical disorders.² For elderly people, the homesickness for the homeland is one of the most manifest problems after relocation, particularly during their period of acculturation.³ Homesickness affects people who are far from their place of residence and sail in unfamiliar sociocultural and physical environments.⁴ Homesickness affects individuals in multiple aspects, including physical (eg, gastrointestinal upset, sleep disturbances and headaches), cognitive (eg, negative thoughts and distraction), behavioral (eg, apathy, burnout and adjusting difficulties) and mental problems (eg, depression, anxiety, and loneliness).⁵⁻⁹

There is not a generally acknowledged concept of homesickness in previous research. Fisher et al defined homesickness as the cognitive-emotional-motivational distress created by leaving home, characterized by preoccupation with home and accompanied by grief-like symptoms.¹⁰ Watt and Badger emphasized the role of belonging and proposed that homesickness evoked separation from the old location, and the need to belong arose when people arrived at a new location.¹¹ Stroebe described homesickness as fundamentally a separation phenomenon similar to a "mini-grief", involving different stressors from a new place.¹² The emphasis on homesickness varied in different research, some

focused on the separation of the home,¹³ while some focused on new environment-related factors.^{12,14} On the spatial scale of the “home”, some research has focused on the micro household and family,¹⁵ while others have focused on the wider hometown.¹⁶ Overall, most of the studies have mentioned several common points: separation, attachment, and desire to return.^{7,12,17,18}

One of the newest theoretical frameworks to explain homesickness is a dual-process model of homesickness (DPM-HS).¹² The DPM-HS claimed that homesickness is a bereavement-like experience focused on home. Homesickness is related to two types of factors. One type is the loss-oriented home-related factor, which refers to the experience of an individual losing their attachment figures after separating from their hometown, including the uncontrollable longing for their hometown and a desire to be close to their families. The other type is a recovery-oriented new place-related factor, which refers to physical and mental adjustment in uncertain situations and adaptation to the environment.^{2,14} When coping with homesickness, these two factors form a dynamic oscillation process, thereby influencing each other. Although the new place factors have a great impact on the level of homesickness, separation from hometown is the actual core of homesickness. The problems caused by new places are not necessarily the result of individuals leaving their hometowns.

The concept of homesickness has significant cultural characteristics, but the literature on homesickness is mostly Western-centric and more prominently considers the experiences of Western expatriates. Since the millennium, the main body of homesickness has become more extensive. It represents not only the patriotic sentiment of overseas Chinese but also a more general notion of homesickness among inhabitants.¹⁹ Chinese people live in a “pattern of difference sequence”, and they mainly estimate their relationship with the outside world by the distance between the external object and themselves. Geographical factor is one of the criteria, because blood relationship determines the land where people grow up, and geographical proximity can be a reflection of blood intimacy.²⁰ Chinese people have a sense of roots in their hometown, and they still retain traditional values and local complex deeply. Chinese homesickness is actually an emotional attachment to the local culture and an identification with traditional Chinese culture. Thus, homesickness has a unique connotation in the context of Chinese culture, it contains both positive and negative components while homesickness is generally considered a negative phenomenon in the Western world.²¹

The special local sentiments of the Chinese people can be explained by place attachment theory, which explains the relationship between people and places. Place attachment refers to the emotional connection between people and their meaningful places.²² Individuals are not only directly attached to the physical features of a place, but are attached to the meaning represented by those features.²³ The development of an individual’s place attachment closely relates to their parent-child attachment. For children, an attachment figure can provide a sense of security and act as a safe haven. When children interact well with their environment, they experience a range of positive emotions and their place attachment gradually develops. The place attachment that individuals develop in childhood is an important foundation for emotional connection with places in adulthood.²⁴ Home is one of the primary environments in which people develop during childhood.

The most common measures of homesickness focus on the component of homesickness, such as the Homesickness Questionnaire,⁷ the Homesickness and Contentment Scale,²⁵ and the Utrecht Homesickness Scale.¹⁵ However, current measures of homesickness have some limitations in the Chinese elderly population. Studies measuring the homesickness of elderly mainly use single-item measures or Homesickness Questionnaires,^{26,27} but do not consider whether the homesickness components of elderly are different from those of younger generations. For example, Chinese elderly often move with their families, which means they have fewer attachment figures in their hometowns.²⁸ Additionally, Chinese people have a strong sense of homeland sentiments, while existing homesickness measurements focus more on the micro-environment (family, friends, etc.) to which individuals are attached and less on the macro-environment. In general, homesickness has a special meaning in Chinese culture, and this “uniqueness” needs to be further discovered in research. Most of the current homesickness measurement were developed 20 years ago, during this time, the leap forward in communication and transportation technology has allowed some of the factors contributing to homesickness to be resolved, and the manifestations of homesickness may have changed as a result. Therefore, it is necessary to develop appropriate measures of homesickness in the Chinese cultural context when studying the homesickness of the Chinese elderly today.

Referring to previous concepts and theories of homesickness, we define homesickness as a psychological state caused by separation from the hometown and beloved people, characterized by a tendency to feel close to the hometown. When experiencing homesickness, individuals experience cognitive, emotional and behavioral processes simultaneously.

The current study has two purposes. First, a questionnaire was developed to measure the homesickness of Chinese elderly and tested for reliability and validity. Second, based on the EHQ, we explore the homesickness patterns of the elderly in China. This study provides a new measurement and preliminary exploration into the homesickness of the Chinese elderly.

Method

Development of Elderly Homesickness Questionnaire

Item Development

The initial pool was based on the DPM-HS model and place attachment theory. Some of the items were referred from prior homesickness and attachment-related measurements.^{7,15,25,29,30} Moreover, after interviewing some seniors about their understanding of homesickness, we composed some items to be compatible with Chinese culture. In general, items are adapted from three themes: cognitive, emotional and behavioral. The cognitive theme involved the attitude towards the hometown and the understanding of the relationship between individuals and their origins. The emotional theme involved the extent of respondents' attachment to their hometown and their own people, the pleasure of being close to home, and the sense of loss caused by leaving. Behavioral theme refers to an individual's tendency and specific behavior to maintain an emotional connection to their hometown. When developing the item, we used a generic description for the statement to ensure that it could be used by older people from different backgrounds. We invited 1 professor, 2 lecturers, and 8 students pursuing Ph.D. and MA degrees in psychology to evaluate and revise these items. On this basis, 15 elderly people aged between 50 and 70 were also invited to provide suggestions on the presentation and statement. After consulting experts and peer discussions, a 29-item pool for EHQ was formed (see [Supplementary Table 1](#)). The EHQ asks respondents to rate how they agree with each item using a 5-point scale (1 = strongly disagree; 5 = strongly agree).

Participants

The appropriate sample size is 5 to 10 times the number of items, and the number of items with more than 4 times the number of factors.³¹ Considering split samples for EFA and CFA, the total sample size requires more than 10 to 20 times the number of items.

In gerontological and medical research, the age criterion for the elderly is often set at 50.^{32,33} In general, individuals are classified as "older" at the age of 50.^{34,35} In the Chinese retirement system, 50 is the earliest retirement age,³⁶ and the probability of China people being grandparents at the age of 55 is over 80%.³⁷ Individuals experience two important life transitions during their early 50th: retirement and entering the role of grandparent, which symbolizes their entry into "old age". During this period, lifestyle changes also make them more prone to migrate. Therefore, the elderly participants included in this study were aged 50 years and above.

We recruited non-local elderly over the age of 50 with adequate cognitive level to complete the survey in Shenzhen, China. During the survey, participants completed a paper questionnaire. For the illiterate, trained experimenters read out each item and completed questionnaires according to participants' answers. In order to avoid causing psychological distress to the elderly, experimenters utilized neutral language in their communication. If a participant experienced psychological distress during the survey, the experimenter would suspend the study to provide comfort and determine whether to continue based on the participant's wishes. The current study recruited 387 elderly from various communities in China's Guangdong province. After excluding invalid (> 3 SD) and missing values, 355 samples were reserved, and the rate of valid questionnaires was 91.730%. The participants had a mean age of 66.685 years ($SD = 6.523$ years, range = 54–90 years) and 74.600% were female ($n = 265$). In the current study, participants completed their demographic information and the 29-item pool for EHQ as well as the Single-Item Homesickness Measure (SIHM).³⁸

The full sample was randomly divided into two parts: one part was used for EFA and item reduction while another part was a cross-validation sample for CFA. Participants in EFA ($n = 178$) had a mean age of 66.421 years ($SD = 5.557$ years, range = 54–90 years), and 75.30% ($n = 134$) were female. Participants in CFA ($n = 177$) had a mean age of 67.330 years ($SD = 5.379$ years, range = 57–83 years), and 74.000% ($n = 131$) were female.

Measures

EHQ. A 19-item 5-point scale to measure homesickness. The items range from 1 = *strongly disagree* to 5 = *strongly agree*.

Single Item Homesickness Measure (SIHM) as calibration of *EHQ*. A single item on a 4-point scale ranging from 1 = *not homesick* to 4 = *very homesick*, described as “To what extent are you currently experiencing homesickness?”.³⁸

Procedure and Analysis

In the development of the *EHQ*, we used item analysis and exploratory factor analysis to determine the specific items of the questionnaire, which were then validated for reliability and validity. The internal consistency reliability was demonstrated by calculating Cronbach’s α . The construct validity was verified by CFA, and the criterion-related validity was demonstrated by calculating the correlation coefficient with the validity criterion. In addition, a measurement invariance test was performed to examine the measurement invariance of the questionnaire across groups of different genders and educational levels. The item analysis, EFA, internal consistency reliability, and criterion-related validity were performed using IBM SPSS 21.0, while CFA and measurement invariance tests were performed using M-plus 8.3.

Item analysis. The purpose of item analysis is to examine items from the initial 29-item pool, as the basis for retaining items. Correlations between each item and the total score were calculated as well as the common factor loadings to check for item homogeneity. Items with a correlation between item scores and total score lower than 0.40 and a common factor loading lower than 0.45 were deleted.³⁹ The discrimination degree of items was expressed by the critical ratio (CR). We tested the significance of the difference in each item between the highest 27% and the lowest 27% groups of the total score to decide whether to keep the item.

EFA. The KMO (Kaiser-Meyer-Olkin index) and Bartlett’s test showed the suitability of factor analysis (KMO = 0.918, Bartlett’s test of sphericity was significant, $p < 0.001$). In EFA we used principal axis factoring with oblique rotation to allow for interfactor correlations.

CFA. We evaluated the proposed 3-factor structure of *EHQ* using confirmatory factor analysis. Prior to CFA, the 19 items were tested for normality. Each term has a skewness between -1.841 and 0.622 and a kurtosis between -1.659 and 3.112 . The single-sample Kolmogorov–Smirnov test found significant differences from the normal distribution in each item. Therefore, maximum likelihood parameter estimates with standard errors and a mean-adjusted chi-square test (MLM) were used for confirmatory factor analysis. Several fit indices were considered in CFA, including the chi-squared statistic divided by the degrees of freedom (χ^2/df); the comparative fit index (CFI); Tucker-Lewis index (TLI); the root mean square error of approximation (RMSEA); standardized root mean square residual (SRMR). A well-fitting model should have a $\chi^2/\text{df} < 3.0$, CFI > 0.90 , TLI > 0.90 , RMSEA < 0.08 , SRMR < 0.08 .^{31,40} The Akaike information criterion (AIC) and Bayesian information criterion (BIC) were used to calculate nested models and test whether adjustments of nest models were effective. In the comparison of nested models, lower AIC and BIC values indicate better model fit.

Measurement invariance. Measurement invariance is the degree to which the measurement model of a latent variable is the same across groups involved in the analysis.⁴¹ The current study examined the measurement invariance of *EHQ* across gender and educational attainment. Educational attainment was divided into low (junior high school or below) and high (senior high school or above) levels. Multiple confirmatory factor analysis in the full sample ($N = 355$) was used to compare nested models. Five models were considered with varying model constraints, ranging from relaxed to strict order: unrestricted model (for baseline); model with limited model structure (configural invariance, to test whether the latent variable structure in different groups is the same); model with limited factor loadings (weak invariance, to test whether factor loadings are equal across groups); model with limited intercept (strong invariance, to test whether the intercepts of variables between different groups are equal); and model with limited residuals (strict invariance, to test whether error variance are equal). Chi-squared difference test, RMSEA, CFI and TLI differences were used to evaluate invariance across consecutive models. $\Delta\text{RMSEA} \leq 0.01$, $\Delta\text{CFI} \leq 0.01$, $\Delta\text{TLI} \leq 0.01$ and non-significant Chi-squared difference test were considered evidence of measurement invariance.⁴²

Homesickness of the Chinese Elderly

Participants

On the basis of the full sample, we further eliminated the samples with missing values in the demographic information, and the number of remaining samples after deletion was 342. Demographic statistics information is provided in the [Supplementary Table 2](#).

Measures

In addition to *EHQ*, we also collected *Demographic informations*, including gender, age, occupation, education, marriage, monthly income, migration distance, purpose, length of arrival, coming from rural/urban areas, whether living with a partner, whether living with children, whether living with grandchildren, and whether owning real estate in their hometown.

Procedure and Analysis

To investigate the homesickness of Chinese elderly, we made two explorations. First, one-way ANOVA was used for group comparison of homesickness in IBM SPSS 21.0. Next, we used the tidyLPA and tidyverse packages in R software to perform the latent profile analysis (LPA) of homesickness in elderly.^{43,44} The purpose of the LPA is to explore the categories of homesickness among the elderly. A latent profile model was constructed with the scores of the three factors of homesickness as explicit variables. Using R software, a model of homesick characteristics of elderly was estimated by latent profile analysis. The model testing indicators were AIC, BIC, Entropy index and Bootstrap-based likelihood ratio test (BLRT). Lower AIC and BIC values indicate better model fitness. Entropy ranges statistically from 0 to 1, with higher values indicating better accuracy in group classification. Entropy below 0.60 indicates that more than 20% of the samples were incorrectly classified, while Entropy = 0.80 indicates that the classification accuracy exceeded 90%. The *p*-value of BLRT reaching the significance level indicates that the model with *k* classes is better than the model with *k*-1 classes.⁴⁵ We also used the Chi-square test to investigate factors that affect homesickness patterns.

Results

Development of EHQ

Item Analysis

Except for *hs22*, the correlation coefficients between the remaining items and the total score were higher than 0.40. Thus, *hs22* “I regret leaving my hometown” was deleted.

The independent sample *t*-test shows a significant difference between the highest and lowest 27% of the total scores for 28 items. In this step, all items were retained.

EFA

The initial extraction yielded five factors with eigenvalues greater than 1.0 and cumulatively accounting for 55.243% of the variance. However, after fixing the 5-factor, 4-factor and 3-factor solutions respectively, only the 3-factor solution had three or more terms with factor loadings greater than 0.300. The scree plot also suggested that three-factor solutions would be plausible (see [Supplementary Figure 1](#)). Therefore, the 3-factor solution was determined in EHQ.

Table 1 shows the factor loadings of EHQ. After fixing 3 factors for rotation and extraction, items with low loadings and cross loadings were deleted. When deleting each item, factor analysis was performed again. Finally, 9 items were removed and 19 items were retained in the EHQ. The cumulative variance contribution rate of the three factors was 49.488%. Each factor is named *F1* “positive contact” (6 items), *F2* “refusal to separate” (6 items) and *F3* “homesickness behavior” (7 items). *Positive contact* refers to having a positive attitude toward one’s hometown and actively seeking contact. *Refusal to separate* refers to negative emotions after leaving and a tendency to return to hometown. *Homesickness behavior* refers to some external behaviors about homesickness.

CFA

The fitting of the 3-factor model was near the criterion ($\chi^2/df = 1.807$, CFI = 0.902, TLI = 0.888, RMSEA = 0.068, SRMR = 0.058, AIC = 10,554.229, BIC = 10,744.459). The modified index (MI) value between *hs28* and *hs19* was

Table 1 Factor Loadings of EHQ

Items	Factor		
	F1	F2	F3
hs1 I feel full of power when thinking about hometown	0.711		
hs6 I feel warming when thinking about hometown	0.642		
hs2 I often enjoy local entertainment programs in my hometown	0.585		
hs16 I feel safe in my hometown	0.575		
hs18 I feel the tight connection between myself and my hometown	0.563		
hs4 I often pay attention to the recent situation in my hometown	0.552		
hs19 I often feel lonely after leaving my hometown		0.777	
hs28 I often feel depressed after leaving my hometown		0.754	
hs9 I feel empty after leaving my hometown		0.731	
hs7 Once I return my hometown, I may not want to come here again		0.720	
hs5 I hope to return to my hometown for the rest of my life		0.560	
hs10 I think about what I would do if I returned to my hometown		0.482	
hs24 I miss my family and friends in my hometown			0.778
hs13 I often think of things about my hometown			0.708
hs12 I miss the lively feelings in my hometown			0.675
hs11 I will try to speak my hometown dialect to others if possible			0.631
hs25 I often go to eat local food in my hometown			0.609
hs23 I usually follow the traditional customs of my hometown			0.563
hs29 I will keep some things from my hometown as souvenirs			0.464

Notes: f1: positive contact. f2: refusal to separate. f3: homesickness behavior.

36.652, suggesting that 36.652 chi-square units can be reduced if the residual correlation between these items is considered. Both *hs 28* “I often feel depressed after leaving my hometown” and *hs 19* “I often feel lonely after leaving my hometown” belong to *F2* “refusal to separate”, and they all describe the negative reactions after leaving hometown, so there may be a correlation between the two items. [Figure 1](#) shows the path coefficients for the 3-factor model.

After setting the correlation between the residuals of *hs 19* and *hs 28*, each fitting index was improved ($\chi^2/df = 1.582$, CFI = 0.930, TLI = 0.919, RMSEA = 0.058, SRMR = 0.054, AIC = 10,513.286, BIC = 10,706.686). Lower values of AIC and BIC indicate a better fit of the nested model. The modified model has a good fit, and the model is acceptable [Figure 2](#) shows the path coefficients for the modified 3-factor model.

Measurement Invariance

Measurement invariance test across gender. [Table 2](#) illustrates the measurement invariance test for different gender groups. Model A, model B and model C showed the confirmatory factor analysis results of males and females as well as the full sample respectively. Model B and C had adequate fitting indexes while model A was slightly below. Some absolute fit indexes (such as RMSEA) will have a higher probability of rejecting the model when the sample size is less than 100,⁴⁶ and the sample size of the male group in current study was 90. Thus, further analysis was conducted. The results show that configural invariance, weak invariance, strong invariance and strict invariance for different gender groups was established.

Measurement invariance test across education levels. [Table 3](#) illustrates the measurement invariance test for different groups of educational attainment. Model H and I showed the confirmatory factor analysis results for the low and high educational attainment groups. The three-factor model of homesickness fit well in model I while model H was close to the fitting indexes. The fitting result was acceptable, so we further tested the configural invariance. The results show that configural invariance, weak invariance was established. When verifying the strong invariance (model L), the results show a $\Delta RMSEA < 0.001$, $\Delta CFI = 0.006$, $\Delta TLI = 0.001$ (both < 0.01) while the Chi-squared difference test was significant ($p < 0.01$). In the current study, the score of the items was negatively skewed, which did not satisfy the assumption of a normal distribution. The maximum likelihood estimation tends to have a positive rejection bias when the multivariate

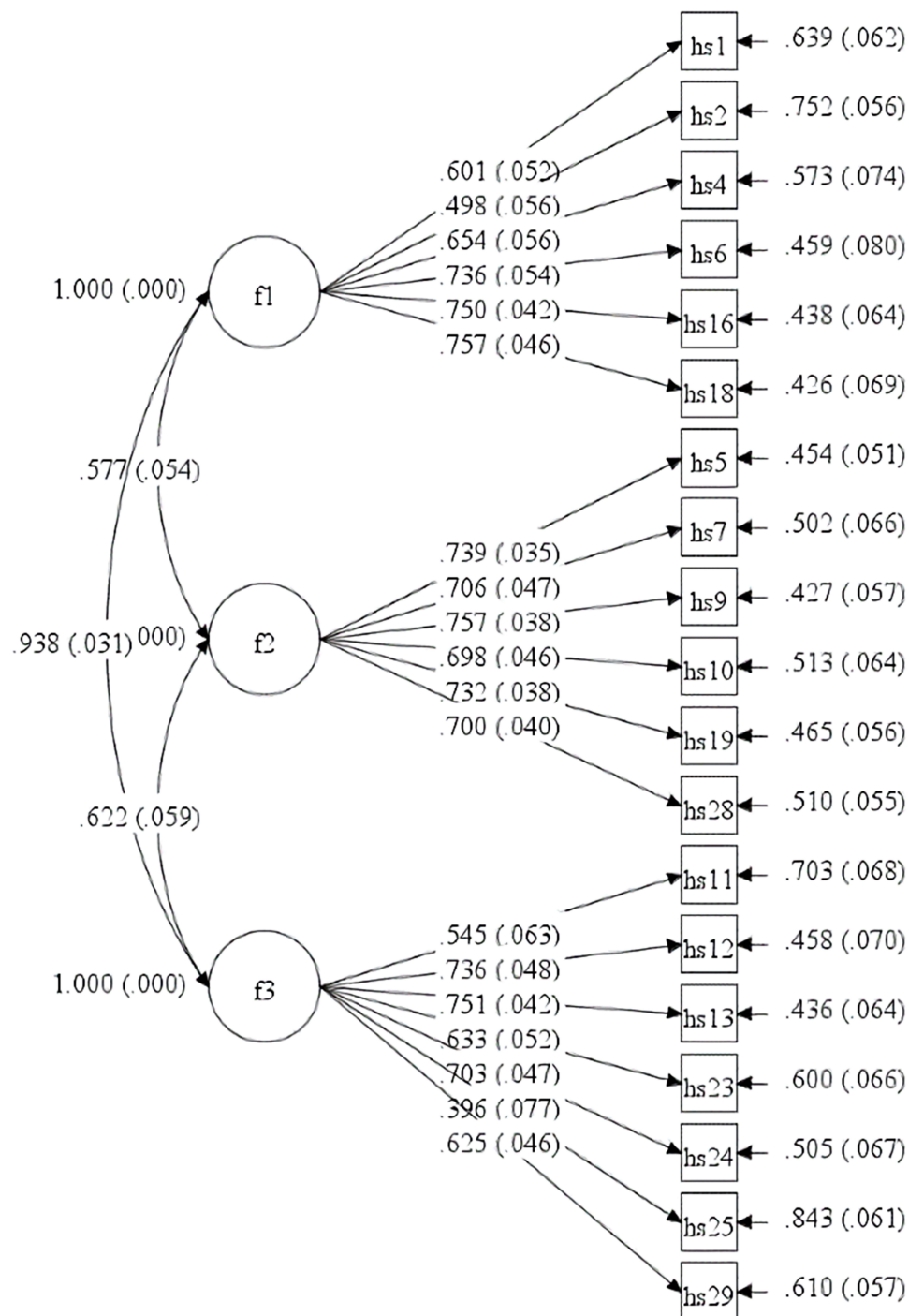


Figure 1 Standardized path coefficient of 3 factors model: f1: positive contact. f2: refusal to separate. f3: homesickness behavior.

normal hypothesis of small sample data is not satisfied.⁴⁷ In addition, the chi-square value is easily affected by the sample size.⁴⁸ When there is a conflict between the chi-square difference test and the Δ CFI results, the latter conclusion should prevail.⁴² Thus, strong invariance was also established.

Reliability and Validity

We used the full sample for reliability and criterion-related validity analysis. Cronbach's α coefficient was calculated to test the internal consistency reliability of the EHQ. Criterion-related validity was assessed by calculating the correlation coefficient of the EHQ and SIHM scores.

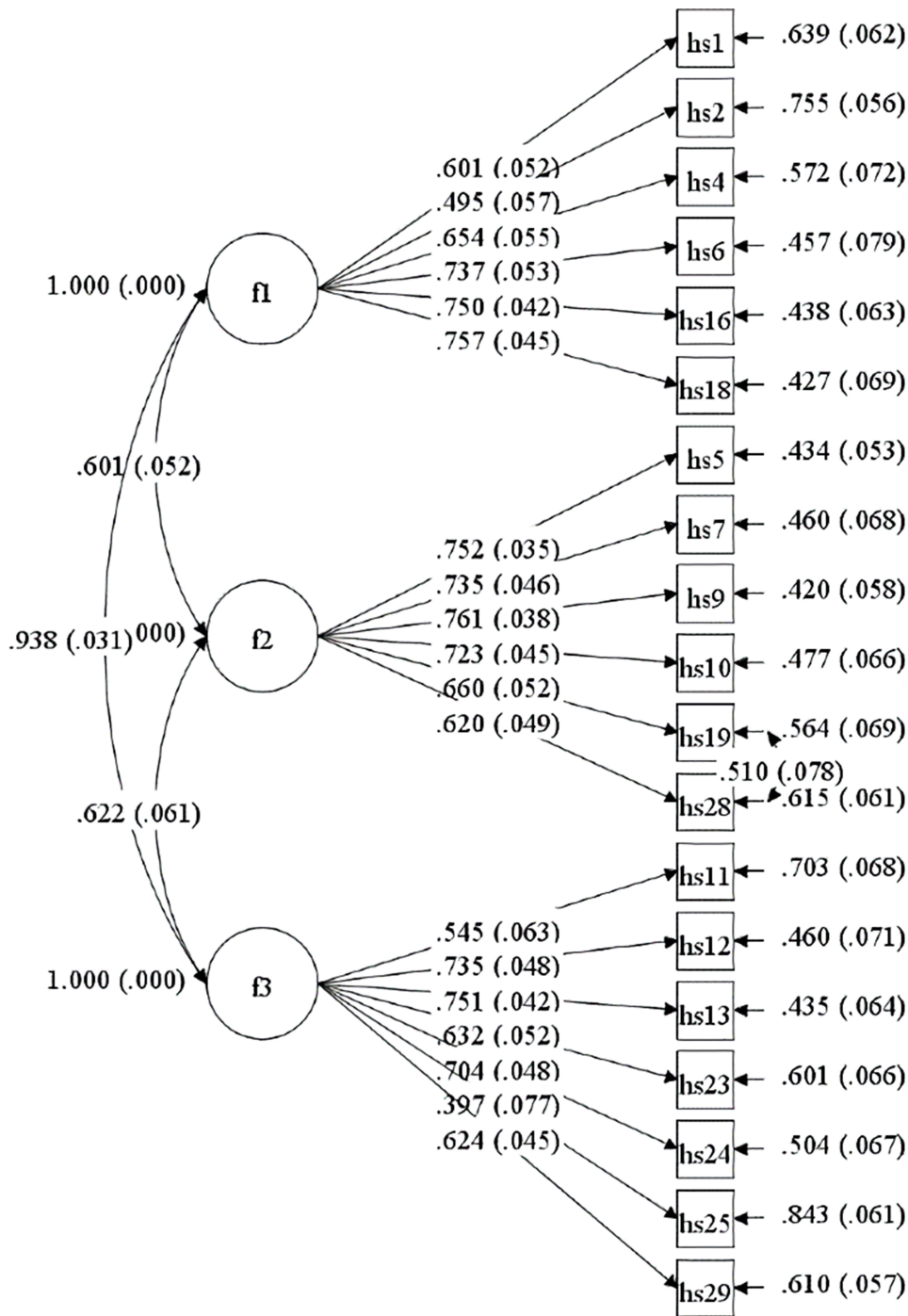


Figure 2 Standardized path coefficient of modified 3 factors model: Correlation between the residuals of hs 19 and hs 28 was set. f1: positive contact. f2: refusal to separate. f3: homesickness behavior.

The EHQ has good internal consistency reliability with a high value of Cronbach’s α among the 3 factors of EHQ ($EHQ_{F1} = 0.829$; $EHQ_{F2} = 0.861$; $EHQ_{F3} = 0.835$), as shown in Table 4. The score of the SIHM was significantly positively correlated with the total score of the EHQ ($r = 0.690, p < 0.01$), and was also significantly positively correlated with the scores of the three factors, as shown in Table 5.

Table 2 The Measurement Invariance Test for Different Gender

Model	$\chi^2_{(s-b)}$	df	RMSEA	RMSEA (90% CI)	CFI	TLI	$\Delta\chi^2_{(s-b)}$	Δdf	p	$\Delta RMSEA$	ΔCFI	ΔTLI
A Male (n = 90)	280.995	148	0.100	[0.082, 0.118]	0.861	0.839						
B Female (n = 265)	310.992	148	0.065	[0.055, 0.075]	0.921	0.909						
C Baseline model (N = 355)	348.094	148	0.062	[0.053, 0.070]	0.932	0.921						
D Configural	591.987	296	0.075	[0.066, 0.084]	0.902	0.887						
E Weak	607.562	312	0.073	[0.065, 0.082]	0.902	0.893	15.575	16	0.483	0.002	0.000	0.006
F Strong	626.631	328	0.072	[0.063, 0.080]	0.901	0.897	19.069	16	0.265	0.001	0.001	0.004
G Strict	639.917	347	0.069	[0.061, 0.078]	0.903	0.905	13.286	19	0.652	0.003	0.002	0.008

Notes: The order of comparison is C→ D→ E→ F→ G.

Table 3 The measurement invariance test for different educational attainment

Model	$\chi^2_{(s-b)}$	df	RMSEA	RMSEA (90% CI)	CFI	TLI	$\Delta\chi^2_{(s-b)}$	Δdf	p	$\Delta RMSEA$	ΔCFI	ΔTLI
H Low (n = 205)	255.237	148	0.059	[0.047, 0.072]	0.927	0.916						
I High (n = 150)	296.251	148	0.082	[0.068, 0.095]	0.900	0.884						
C Baseline model (N = 355)	348.094	148	0.062	[0.053, 0.070]	0.932	0.921						
J Configural	551.488	296	0.070	[0.061, 0.079]	0.913	0.900						
K Weak	566.770	312	0.068	[0.059, 0.077]	0.914	0.905	15.282	16	0.504	0.002	0.001	0.005
L Strong	600.709	328	0.068	[0.060, 0.077]	0.908	0.904	33.939	16	0.005	0.000	0.006	0.001
M Strict	658.138	347	0.071	[0.063, 0.079]	0.895	0.896	58.029	19	0.000	0.003	0.013	0.008

Notes: The order of comparison is C→ J→ K→ L→ M.

Table 4 Criterion-related validity of EHQ

	Cronbach's α
F1 positive contact	0.829
F2 refusal to separate	0.861
F3 homesickness behavior	0.835

Table 5 Reliability Coefficients of EHQ

	SIHM
F1 positive contact	0.509**
F2 refusal to separate	0.644**
F3 homesickness behavior	0.565**
EHQ	0.690**

Notes: **p < 0.01.

Homesickness of the Chinese Elderly Comparisons of Demographic Variables

The coding of each demographic variable, descriptive statistics, and comparison between groups of different demographic variables for homesickness are shown in the [Supplementary Table 2](#) and [Supplementary Table 3](#). The average score of homesickness was 65.97 ($SD = 16.512$). The gender difference in homesickness was not significant. The age difference in homesickness was significant ($F = 5.230, p = 0.006$). A one-way ANCOVA was performed with arrival length as a covariate, and the age difference was still significant ($F = 3.499, p = 0.031$). In addition, the homesickness of

the elderly with different occupations ($F = 10.780, p = 0.001$), educational attainment ($F = 4.747, p = 0.003$), monthly income ($F = 3.788, p = 0.011$), migration distance ($F = 4.448, p = 0.036$), purpose of migration ($F = 5.352, p < 0.001$), length of stay ($F = 11.198, p < 0.001$), from rural or urban ($F = 14.507, p < 0.001$), living with children ($F = 7.467, p = 0.007$), living with grandchildren ($F = 14.260, p < 0.001$), and owning real estate ($F = 9.653, p = 0.002$) were significant. The homesickness of the elderly did not show significant differences in marital status, or whether they lived with a partner.

Categories of Homesickness in Chinese Elderly

The fitting indexes of the latent profile models for different numbers of classes are shown in Table 6. The BLRT values of each model were significant, and the AIC and BIC values decreased monotonically with the increased number of classes. Among all models, the 5-class model reported the lowest AIC and BIC values, but was not much different from the 4-class model. The entropy value of the 5-class model was 0.79 (< 0.8). The 4-class model reported the highest entropy value, and there was not much distinction in the type division between the 4-class and 5-class models. Therefore, according to the model simplicity principle, the 5-class solution was rejected, and the 4-class solution was adopted as the best fit.

As shown in Figure 3, in the 4-class model, the first profile (Class 3) scored low on all 3 factors and was named the low homesick group, accounting for 24.27% of 342 samples. These groups were not highly motivated to contact their hometowns, they did not have a strong reluctance to leave their hometowns, and there was less outward homesickness behavior.

The second profile (Class 2) scored high on positive contact and homesickness behavior factors and a moderate score on refusal to separate factor, named as the moderate homesick group, accounting for 38.59% of 342 samples. These groups were moderately motivated to contact their hometowns, and partial rejection of leaving home and more homesick external behaviors began to emerge.

The third profile (Class 1) scored higher on the two factors of positive contact and homesickness behavior, and moderately scored on the factor of refusal to separate. They were named the middle-high homesick group, accounting for 18.71%. This group is highly motivated to contact their hometowns, partially rejects leaving home, and often displays outward behaviors.

The fourth profile (Class 4) scored high on all 3 factors and was named the high homesick group, accounting for 8.47%. They actively contact their hometowns, are very reluctant to leave their hometowns, and exhibit frequent outward homesickness behaviors.

One-way ANOVA showed that both the three factors and the total EHQ score were significantly different among the 4 classes ($p < 0.05$), as shown in Table 7. Pairwise tests showed that all comparisons were significantly different, except for the insignificant difference when comparing F1 and F3 between Class 1 and 4. Overall, the homesickness scores differ significantly between different classes and Class 4 > Class 1 > Class 2 > Class 3.

A Chi-square test was performed on the four homesickness classes and demographic information, as shown in Table 8. There was a significant difference in coming from rural/urban areas ($\chi^2 = 8.195, p < 0.05$) and whether living with grandchild ($\chi^2 = 11.472, p < 0.01$). The proportions of elderly people from rural areas in the medium-high homesick group (22.3%) and high homesick group (10.6%) were significantly higher than those from cities

Table 6 The Fitting Indices of the Latent Profile Models for Different Numbers of Classes

Classes	AIC	BIC	Entropy	BLRT(p)
1	6778.01	6801.02	1.00	–
2	6405.92	6455.77	0.78	0.01
3	6262.88	6339.57	0.82	0.01
4	6222.75	6326.29	0.83	0.01
5	6179.29	6309.67	0.79	0.01

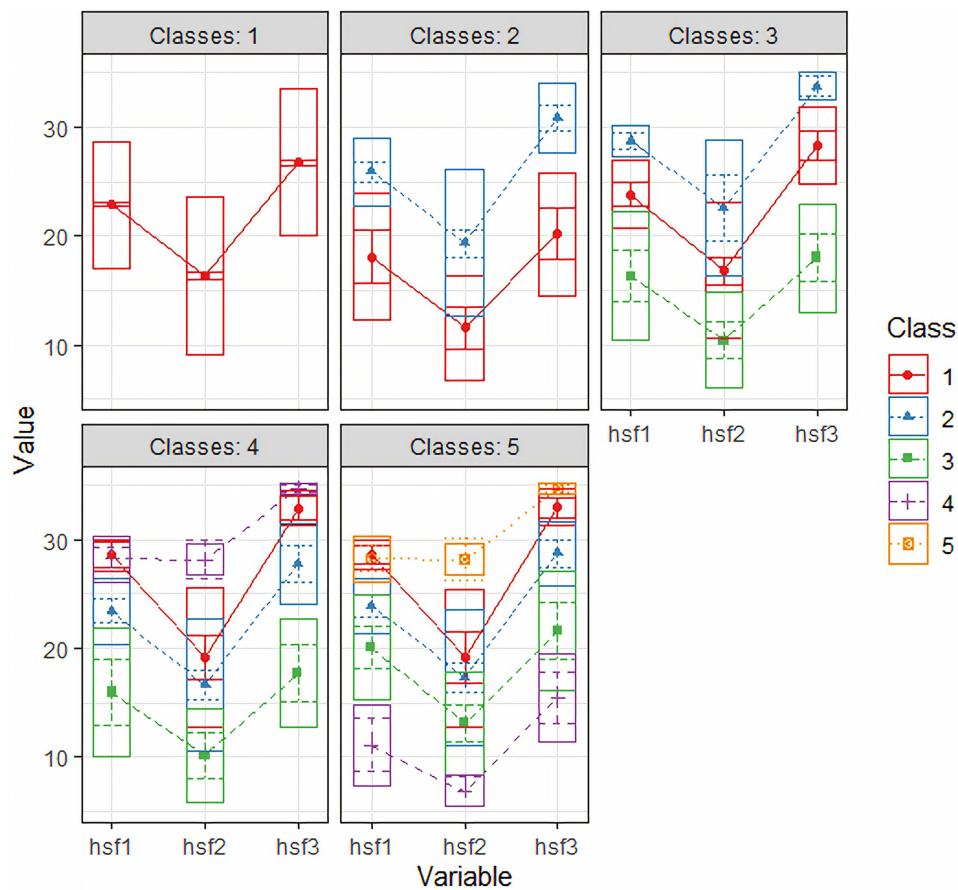


Figure 3 Latent profiles for different numbers of class: The distribution of scores in each group under different class solutions is described from left to right. hsf1: positive contact. hsf2: refusal to separate. hsf3: homesickness behavior.

(14.7% and 6.1% respectively). The proportions of elderly who lived with their grandchild in the medium-high homesick group (23.3%) and high homesick group (12.0%) were significantly higher than those who did not (15.1% and 5.7%).

Table 7 Comparison of Differences in Homesickness Between 4 Homesickness Classes

	Class1 (n = 64)	Class2 (n = 166)	Class3 (n = 83)	Class4 (n = 29)	Total (N = 342)
F1 positive contact	28.59±1.306 ^{bc}	23.30±2.878 ^{acd}	15.72±5.737 ^{abd}	28.24±2.149 ^{bc}	22.87±5.809
F2 refusal to separate	18.73±6.157 ^{bcd}	16.48±6.047 ^{acd}	10.13±4.333 ^{abd}	28.07±1.462 ^{abc}	16.35±7.180
F3 homesickness behavior	32.80±1.615 ^{bc}	27.72±3.459 ^{acd}	17.42±4.753 ^{abd}	34.62±0.494 ^{bc}	26.75±6.744
Homesickness	80.13±6.253 ^{bcd}	67.50±7.299 ^{acd}	43.28±9.577 ^{abd}	90.93±2.520 ^{abc}	65.97±16.512

Notes: M±SD. a: statistically significantly different from Class 1; b: statistically significantly different from Class 2; c: statistically significantly different from Class 3; d: statistically significantly different from Class 4.

Table 8 Chi-Square Test Between 4 Homesickness Classes and Demographic Information

	n	Class1	Class2	Class3	Class4	χ ²	p
Rural	179	40 (22.3%)	85 (47.5%)	35 (19.6%)	19(10.6%)	8.195	0.042
Urban	163	35 (23.3%)	70 (46.7%)	27 (18.0%)	18(12.0%)		
Not living with grandchild	192	29 (15.1%)	96 (50.0%)	56 (29.2%)	11 (5.7%)	11.472	0.009
Living with grandchild	150	35 (23.3%)	70 (46.7%)	27 (18.0%)	18 (12.0%)		

Discussions

In this study, we developed the EHQ through item analysis and EFA. We verified the three-factor structure of the EHQ through CFA and tested its reliability and validity. We further verified the measurement invariance of the EHQ with respect to different genders and educational attainment levels. Finally, we explored the homesickness pattern of Chinese elderly and the factors that influence homesickness based on EHQ.

We conducted item analysis on the initial item pool prior to factor analysis. The hs22 “I regret leaving my hometown” was deleted from item analysis because of a low correlation between item score and total score. During the data collection, most of the elderly told the researchers that they had no regrets about leaving their hometowns. We found that the main purpose of Chinese elderly people leaving their hometowns was usually to take care of their younger generations. Although the elderly have expressed a desire to return to their hometowns, they have decided to stay in their current locations due to a sense of responsibility or lack of ability to live independently. As a result, the average score for this question was also lower.

Three factors were extracted in factor analysis, namely *F1* “positive contact”, *F2* “refusal to separate” and *F3* “homesickness behavior” and the 3-factor model had a good fit in the half-split samples. The factor “positive contact” represented the positive part of homesickness, and was extracted from the items. In some cases, homesickness could be regarded as a motivational factor.⁴⁹ The place attachment theory can provide a possible explanation for this: relocation is associated with the disruption in place attachment due to place-based identities being interrupted, and people tend to be close to home either directly or indirectly, to maintain their place-based identities.^{50,51} When this need for identity is met to some extent, people feel satisfied and exhibit positive emotions. The “place” is a restorative environment that allows individuals to recover from stress, fatigue, and other states, and brings positive psychological experiences.⁵² Individuals gain restorative experience through exposure to a restorative environment and enhance their preference for that environment. Therefore, the “positive contact” was extracted to represent positive expectations for the hometown. However, whether this positive experience affects mental health, or whether the positive and negative content of homesickness offset each other, still requires further empirical research in the future. The factor “refusal to separate” represented the negative part of homesickness, which was also extracted from the items. The DPM-HS model claims that homesickness is related to discomfort in the new environment.^{12,14} The individual rejects the current environment due to dissatisfaction with the new place and prefers to return. On the other hand, this can also be explained as a manifestation of place attachment. The loss of a bond with an attachment place often brings some negative side effects, which are not a natural outcome of relocation.⁵³ Therefore, the “refusal to separate” might be related to the individual’s current situation and was extracted to represent a negative attitude toward leaving. Both cognition and emotion are the mental activities of an individual, so it is acceptable to classify them into the same category. We did not separate the independent cognitive and emotional components of homesickness in the factor analysis. One possible explanation is that there are interactive processes between cognition and emotion, and they are not completely independent.⁵⁴ Homesickness is known as a complex cognitive-motivational-emotional state,⁵⁵ and the cognitive and emotional components of homesickness may be mixed.

We further tested the reliability, validity and measurement invariance of the EHQ. The EHQ has measurement invariance across gender/education levels. This suggests that regardless of gender or educational attainment, elderly people consistently comprehend the contents of the items. Moreover, we subsequently tested the reliability and validity of the EHQ, which demonstrated favorable reliability and validity. It should be noted that further studies with larger samples are needed to verify this result due to the difference in the number of male and female subjects.

We found a high level of homesickness among the Chinese elderly. Consistent with prior studies, homesickness is higher among the elderly with lower education, lower monthly income, and manual labor occupations.^{56,57} Higher educational attainment, income and job complexity are associated with better mental health.^{58,59} In the spatiotemporal dimension, homesickness is higher among the elderly who migrated across provinces and with shorter periods of residence, which is consistent with the prior findings.^{60,61} People who migrate across provinces face more local differences in their new environment, making it more difficult to integrate and identify; second, interprovincial mobility means higher costs and less frequent returns to their hometowns. In addition, we found that elderly people with real estate

in their hometowns are more homesick. Ecological tethering is an aspect of homesickness, which refers to missing the physical aspects of the home, such as lakes, mountains, or cityscapes.^{62,63} As the physical home of the elderly, real estate carries more attachment objects and is more likely to trigger homesickness.

To search for the homesickness characteristics of the Chinese elderly, we explored the patterns of homesickness among the elderly through latent profile analysis. We found a significant difference in homesickness among different types of elderly, in ascending order of low homesick group, moderate homesick group, middle-high homesick group, and high homesick group. Compared to the high homesick group, the middle-high homesick group scored lower on the refusal to separate factor but had little difference from the other two factors, indicating that there is a certain independence among the factors of homesickness. Homesickness can be affected by attachment style, and anxiety about the attached relationship predicts higher homesickness.¹⁵ People with strong dependencies may feel the absence of an attachment figure more acutely. The elderly in this group may be less anxiously attached and therefore show less anxiety after leaving their hometowns. For them, family is an important attachment figure rather than a burden, and they would rather be with their families than return to their hometown alone. Another explanation is that compared with the high homesickness group, the elderly in this group had better adapted to the new place, so they were less dissatisfied with the new place and more willing to stay. This view is also consistent with that of DPM-HS.¹²

An interesting finding in this study is that elderly people from rural areas and those living with grandchildren tend to be categorized among the higher homesickness groups. We also found that the elderly who came to take care of their offspring and live with children were more homesick. During the elderly's migration, they face three kinds of changes simultaneously: physical changes brought about by spatial transition, social changes brought about by leaving the original social network and cultural changes brought about by cultural differences.⁶⁴ Due to the urban-rural difference, the elderly from rural areas have to face higher adaptation pressures when they relocate to the city,⁶⁵ and homesickness is more likely to develop.

It is generally believed that attachment to family members is an important component of homesickness,^{9,15} and the conflicting findings may be due to the characteristics of the floating elderly population: Unlike groups such as students, migrant workers and refugees, Chinese elderly people generally follow their children passively and depend on others,³³ and many of them come for the demand of taking care of the younger generation, rather than their own willingness. On the one hand, the elderly living with their children face changes in family roles,⁶⁶ and on the other hand, they need to take pains to do daily housework. Living with grandchildren creates internal pressures from the family.⁶⁷ The elderly who are accompanied by their families still feel a strong sense of homesickness, which to some extent shows that their homesickness is not only from blood ties but also from the meaning of their hometown itself.

We found that females accounted for the majority of the participants in this study, which did not seem to be an exception. In similar research on floating elderly in China, the sample size of female elderly, especially the younger aged, is typically double to triple that of males.^{33,68–70} Floating older adults are typically a difficult group to reach for surveys,⁷¹ so we utilized community sampling. A common phenomenon in surveys is that males are more difficult to contact and less responsive compared to females.⁷² Whereas female elders are more active in the community and responded more positively and participated more in the sampling. Females often play the role of “diplomats” in the recruiting process who are responsible for contacting the experimenters. It is therefore difficult to avoid gender bias in the sample.⁷² The validity of the questionnaire was validated in different gender groups in the present study, similar studies with a greater proportion of females can still be effective in modeling the emotions of older adult,⁶⁹ which could partially account for the validity of the study. However, because of the higher emotional vulnerability of females, the greater proportion of the female sample may have resulted in higher average scores on emotional scales, leading to the masking of effects in the male group.

This study has the following limitations: First, we verified the reliability and validity of the EHQ only in Chinese elderly, and it still to be confirmed whether the results can be transferred to other populations. Second, female accounted for the majority of the participants in this study, which has already been mentioned above. Third, this study was a cross-sectional study that examined latent categories of homesickness in older adults in a single measure, whereas the fluctuation of homesickness over time in the elderly has not been studied. Additionally, we only collected data in one Chinese province, although Guangdong is the province with the largest floating population in China, which can be

representative. Finally, homesickness is potentially related to many psychological, cultural and regional factors. We have not listed all of the factors in detail, and a more systematic and detailed study of the factors that affect homesickness can be conducted in the future. In the future, the EHQ could be revised for different groups or cultural contexts, and measurement invariance studies could be conducted with questionnaires for different age groups or multinational groups. Future longitudinal studies could also be conducted to examine whether the homesickness categories of the elderly change over time to check the retest reliability of the EHQ.

Conclusion

The present study reveals the high validity and reliability of the EHQ among Chinese elderly. The Chinese elderly reported high levels of homesickness, which varied significantly across levels of demographic factors such as age, occupation, educational attainment, purpose of migration and length of residence. Four patterns of homesickness were found among the Chinese elderly, coming from rural/urban areas and living with grandchildren are the factors that affect classification. The larger proportion of females in the sample did not affect the validity of the questionnaire, but the influence of males may have been weakened in the total effect.

Data Sharing Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethics Approval and Consent to Participate

Ethical approval was obtained from the Ethics Committee of the Medical Department of Shenzhen University (No. PN-2021-019). All participants were informed of their right to withdraw from the study at any time before the start of the survey. They also followed the principle of voluntariness to participate in the survey and were informed in detail that the data collected in this study was only for scientific research and would not disclose personal privacy information. All participants provided informed consent before participation. The study was conducted according to the guidelines of the Declaration of Helsinki.

Consent for Publication

The authors confirm that the details of any images, videos, recordings, etc. can be published, and that the person(s) providing consent have been shown the article contents to be published.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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