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Research Article

Psychometric Properties of Older Adults' Entomophobia and Arachnophobia Scale (OAEAS): Validating, Cutoff Points, IRT Analysis, and Its Measurement Invariance in Iranian Version

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Objectives: Experiencing the fear of insects or other arthropods is more challenging for older adults than encountering insects themselves. The aim of this study is to measure this feeling in the Older Adults' Entomophobia and Arachnophobia Scale (OAEAS) in the aging community of Iran.
Materials and Methods: In a psychometric study, translation and validation of OAEAS (short version) have been done among a sample of 450 Persian-speaking older participants with mean score of years old 70.2 (SD = 8.3) (female = 61.4% and male = 38.6%). In the midyear of 2021, psychometric features of the OAEAS and its cutoff points for measuring fear of insects or other arthropods were investigated among Iranian older population. Using EFA and CFA, the extracted models, that is, PCA, GLS, and ML and also, test-retest reliability, ROC analysis, and convergent validity were also assessed. The polytomous Rasch model for all items has been prepared alongside extracted marginal maximum likelihood estimation (MMLE) and PCM model.
Results: About 55.9% were married, 34.4% lived alone, and 65.6% did not live alone. Approximately 89.5% of the participants experienced insect bites in childhood, and 60% did not have pets at home. A total of 28.2% of the participants reported fear of flying insects or other arthropods, while 21.8% feared nonflying arthropods. Using EFA and CFA, it was indicated to internal consistency, accuracy, structural reliability, and convergent validity under 2 factors named entomophobia and entomophilia with eigenvalues close to once. The fit indices (mean indices ≥ 0.8) were the best for the 2-factor model with RMSEA = 0.04 ($p \leq 0.01$). In the final analysis of the IRT method, two items (16 and 20) were removed from the OAEAS. The results of ROC analysis showed that the OAEAS has sufficient diagnostic validity to classify different groups.
Discussion: The new version of OAEAS 18-items is a valid and reliable tool for assessing fear of insects or other arthropods in Iranian community-dwelling older adults. The possible uses and limitations of the Iranian version of the scale were also discussed.

Keywords: entomophilia; entomophobia; instrumentation; Persian version; psychometric properties

1. Introduction

With the advancement of healthcare, the older population is increasing [1]. During the geriatric period, individuals experience various physical and mental disorders [2], and failure to prevent these disorders leads to a decline in quality of life [3]. One of these disorders is entomophobia, or fear of insects or other arthropods, which is a type of anxiety disorder and phobia [4] defined as an irrational or intense fear of one or more groups of arthropods. Examples of such species include spiders, ants, cockroaches, bees, centipedes, and other arthropods [5]. Individuals over 65 years old are more afraid of stimuli related to the natural environment, followed by animals, blood, injections, surgeries, and specific situations [6]. Many psychiatric conditions are associated with accelerated biological aging processes [7].

There are various reasons for insect phobia, including temperament, individual's excessive sensitivity to life issues, various obsessions, specific age-related conditions, experience of a traumatic event, injury or sting by insects or other arthropods in childhood, fear of poisoning or suffocation, and related psychological issues [5]. The results of a study by Rivero et al. in 2023 showed that individuals with specific phobia of insects or other arthropods have smaller gray matter volume (GMV) in brain regions such as the orbitofrontal cortex (OFC) and mid-frontal cortex and larger GMV in the putamen, demonstrating increased sensitivity to nonthreatening controls. These brain regions are responsible for avoidance behavior (putamen) and inhibitory control or emotional regulation processes in the prefrontal cortex (PFC), which may indicate greater vulnerability in individuals with phobias to developing maladaptive and emotionally dysregulated conditional responses [8]. These are related to phobic anxiety and generalized anxiety with cardiovascular diseases, ventricular arrhythmias [9], psychiatric disorders, and psychological conditions associated with symptoms such as palpitations, chest pain, and breathing difficulties. Cardiovascular disease is a significant cause of death, especially in the older people [10]. Anxiety disorders are one of the most common mental conditions among individuals over 65 years old [11]. Increased heart rate and excessive stimulation of the sympathetic nervous system may contribute to premature aging or structural changes in the heart, leading to the development of atrial fibrillation or other arrhythmias [9]. Although mental illness ranks eighth among the most common diseases in Iran [6], it has significant social and cultural consequences [12] and affects cognitive function negatively over time [13]. Cognitive decline associated with aging is prevalent and potentially modifiable through cognitive training [2, 13]. When individuals enter the geriatric phase, they become a vulnerable group and require more attention [14]. The 1-year incidence rate for each mental disorder in the older people is 8.65%. Anxiety disorders have the highest prevalence rate of 18.5% across all diagnostic groups. The incidence rate of any mood disorder is 2.97%. The lowest incidence rates are related to agoraphobia or situational phobia (1.37%) and specific phobia (1.30%) [15]. Today, fear and anxiety related to insects and venomous arthropods are considered one of the most important health and medical issues in countries, especially in tropical and subtropical regions like Iran [15, 16]. Warmer temperatures favor the growth and survival of many arthropod species [17].

The prevalence of animal phobias is 1.12% in women and 3.3% in men [11]. Fear and phobia of inanimate objects are more common in older individuals than younger ones, while fear of animals is more prevalent in younger individuals than older ones. Taking into account the simultaneous occurrence of each type of phobia, the average frequency of experiencing one symptom is 6.45% in women and 2.29% in men [11]. The lack of research on phobias may be due to the underestimation of this condition by both patients and physicians, potentially reducing their intention to search for appropriate treatments such as cognitive-behavioral therapy or medication [9]. Since fear of insects or other arthropods disrupts the psychological wellbeing and quality of life in the older participants, research in this area remains insufficient. The Older Adults' Entomophobia and Arachnophobia Scale (OAEAS) questionnaire, derived from the article on entomophobia and arachnophobia [18], is an important tool for assessing the prevalence of entomophobia. It has been designed in Persian by simulating and adapting the Spider Phobia Questionnaire SPQ; Klorman et al., 1974 and the Fear of Spiders Questionnaire [19]. However, the validity and reliability of the insect fear version have not been validated among the older adults in Iran, and the validation process is conducted on 450 Iranian older people.

2. Materials and Methods

The present study is a cross-sectional analytical research focusing on the psychometric evaluation and validation of a tool. The research setting encompasses the older population aged 60 and above in the northeast, south, and southwest regions of Iran. Based on the study by Beaton DE [20], a sample size of 450 older adults was determined using PASS software Version 15, considering a 5% margin of error and a 10% dropout rate. To select this number of participants, the names of eligible older individuals were entered into an Excel software from the comprehensive health system (SiB). Individuals were assigned a code based on the specified entry criteria and were then randomly selected using a random number table. The inclusion criteria for the study comprised being 60 years or older, having the ability to comprehend the concepts to complete the tools, not having cognitive impairment according to the MoCA tool, and willingness to participate in the study. Nonparticipation in the study was considered as an exclusion criterion. For each of the 450 older samples, a demographic questionnaire including age, gender, marital status, education level, chronic diseases, history of insect bites, disgust and anxiety toward specific insects or other arthropods, fear of specific insects or other arthropods, fear of flying or nonflying arthropods, awareness of insects or other arthropods being disease carriers, reasons for insect fear, completion of the 5-item short version of the GAI questionnaire, and completion of the OAEAS questionnaire were conducted.

2.1. Instrumentation: OAEAS. One of the assessment tools for measuring entomophobia is the "Fear of Insects and Spiders Questionnaire" (Older Adults' Entomophobia and Arachnophobia Scale [OAEAS]). This version initially comprised 20 questions. The validity and reliability of this tool have been confirmed in several studies, including the research conducted by Shahriari Nemati, Tabatabaei, and Soltani [18] in the Persian version. The score range for this questionnaire is from 20 to 100. In the initial design, questions 1–4 and 14–20 address fears, while questions 5–9 and 11–13 pertain to phobias. Question 10 assesses the seniors' discomfort (disgust) toward insects or other arthropods. After confirmatory factor analysis and IRT, questions 1–14 were selected for the concept of insect phobia (score range from 14 to 70), and questions 15 and 17–19 were chosen for the concept of coexistence with insects or other arthropods (score range from 4 to 20). Questions 16 and 20 were eliminated from the questionnaire due to their asymmetric distribution in IRT analysis and low factor loading in confirmatory and exploratory factor analysis. A scoring scale was assigned to each question, with some questions scored from 1 to 5 and others scored from 5 to 1, reflecting "strongly agree [1]," "agree [2]," "neutral [3]," "disagree [4]," and "strongly disagree [5]" and vice versa. The overall tool score ranges from 18 to 90. The highest fear score is 90, and the lowest fear score is 18. This tool has not been validated for the older people yet, and in this study, it underwent three methods of psychometric evaluation and standardization. Alongside completing this questionnaire, the participants also completed a demographic questionnaire and the 5-item short version of the GAI anxiety measurement scale as a peer instrument. The questionnaire is designed in two parts. The first part includes demographic information and a few short questions about insects or other arthropods, history of insect bites, disgust, and fear. The second part of the questionnaire consists of 20 five-option questions designed on a Likert scale. This questionnaire demonstrates good internal consistency and can differentiate between individuals with clinical phobia and those without, although the second part of the questionnaire was unsuccessful in measuring the type of disgust and fear toward specific insects or other arthropods, leaving some ambiguous aspects and causing confusion for some participants. To address the limitations of the Fear of Insects and Spiders Questionnaire and achieve a more precise mapping of disgust and fear dimensions, our objective was to create a valid, reliable, and concise questionnaire that measures distress related to insects comprehensively and distinguishes between the fear of different types of insects compared to other animals. For this reason, additional questions were added to the first part of the questionnaire, which measures demographic and health indicators, from question 17 to 27, to cover various insects or other arthropods, types of disgust and phobia, and the reasons for fear of insects or other arthropods.

2.2. Procedure and Data Gathering. First, from November 2022 to January 2023, a questionnaire on insect phobia was completed by 225 older Iranian men and women and entered into SPSS software Version 28. To determine the construct validity in the initial stage, the classical psychometric method of exploratory factor analysis (EFA) was employed using Varimax and Quartimax rotations, as well as the Kaiser–Meyer–Olkin (KMO) test and Bartlett's test of sphericity to identify the questionnaire factors. These assumptions were confirmed in this study.

In the second stage, from March to April 2023, using the confirmatory factor analysis (CFA) method in JAMOVI software Version 2.3.21.0 [21] and principal component analysis (PCA), the structural validity of the questionnaire was assessed on a population of 225 older adults. Model fit indices were examined [22, 23]. In addition, the measurement invariance (MI) index was calculated between men and women as an indicator of good fit of the instrument in different groups [24].

In the third stage, the modern psychometric technique of item response theory (IRT) was employed using the polytomous Rasch model and tables were extracted using marginal maximum likelihood estimation (MMLE) and PCM model [25]. The eRm *R* package in JAMOVI software was utilized for plotting model graphs and preparing a Person-Item Map [26].

In the fourth stage, internal consistency reliability was assessed using McDonald's omega coefficient, Cronbach's alpha, and Pearson correlation. The reliability (equivalence) of the OAEAS tool was also measured in relation to the Short Form of Geriatric Anxiety Inventory (GAI) comprising five items. Furthermore, internal stability of the tool was examined by assessing the within-cluster correlation coefficient (ICC).

The final stage of the questionnaire validation involved determining the cutoff points using receiver operating characteristics (ROCs) analysis and the Youden index (or Youden's *J* statistic). Inferential statistical analysis was conducted to determine the variables or factors affecting entomophobia using one-tailed analysis of variance with the determination of squared omega and epsilon coefficients in IBM-SPSS statistic software with Version 28 (IBM-SPSS, Chicago, IL, USA).

The present study was conducted in accordance with the Helsinki Declaration and STROBE guidelines, and it has obtained ethical approval from the Shiraz University of Medical Sciences Ethics Committee (IR.SUMS.SCHEANUT.REC.1401.009). Written and verbal informed consent forms have been completed by all participants. The significance level for all statistical tests was set at 0.05, and the final data analysis was performed in May 2023.

All instruments were completed through face-to-face native interviews. Completing the questionnaires for each older sample took approximately 50 min. During the interview, a 10-min pause was intended for rest and older adults' reception.

3. Results

3.1. Participants' Description. The older persons (450 participants) had a mean age of 67.7 (SD = 5.29, 61.4% women) and the highest frequent education level was no formal schooling (31.1%). About 55.9% were married. Approximately 71.8% do not lived alone, and 95.5% experienced at least one chronic disease in the past 5 years. The mean score of OAEAS and GAI was 61.7 and 2.76, respectively (OAEAS SD = 16.48 and IQR = 8.25, no difference was found between males and

females in OAEAS measure, $p = 0.015$). About 54.1% were unaware of the pathogenicity of insects or other arthropods, while 61% did not keep any animals, birds, or arthropods at home. In childhood, 89.5% have been bitten by insects or other arthropods with pain, burning, and swelling, and 45.5% said scorpions are the most arthropod that they are afraid of. In addition, 28.2% and 22.7% reported being bitten/stung by mosquitoes and scorpions, respectively. It was also indicated the results of analysis of variance (ANOVA) could clarify the effect of GAI on the total score of OAEAS (20 items). It shows the effect size via Epsilon-squared as 15.8 (omega-squared fixed effect = 0.157, $p < 0.001$).

3.2. Reliability. The OAEAS represented excellent reliability. The Cronbach's alpha was 0.854 along with the McDonald's omega of 0.925 for the entire scale ($p < 0.001$), Fleiss kappa of 0.84, ICC of 0.861, and weighted kappa of 0.81. The comparison was made on the convergent validity of OAEAS and GAI 5-item and the measure of Pearson correlation coefficient was 0.672 ($p < 0.001$). In this paper, the Skewness scores of each item and total scores of OAEAS was between ±1 that is acceptable amount according to Fidell and Tabachnick (2001) as < 2, indicating the normality of distribution for the data. Moreover, the KMO value was 0.833 ($p < 0.001$), which was higher than the recommended threshold of 0.6 (Kaiser, 1974).

Also, Bartlett's test of sphericity was statistically significant (approx. Chi-square = 2178.252, $p < 0.001$). Item communality was calculated for all items. It is a numerical measure that indicates an item's variance has been loaded in the factor model and in the study, the measure more than 0.4 is acceptable cutoff values. Items nos. 15, 16, and 20 have initial measures as 0.200, 0.242, 0.340, and 0.359, respectively, that could not be acceptable. According to Table 1, construct validity of OAEAS was based on EFA utilizing three extracting models including generalized least squares (GLSs), principal component analysis (PCA), and maximum likelihood (ML) with Varimax rotation in all models since only 2 components with factor loading measure more than 0.4 was extracted. The eigenvalue was 67.49, and the total explained variance was 67.5%. The mean scores of factors for the all items and without items nos. 14, 15, 16, and 20 were more than 0.528 (SD = 0.157) and 0.591 (SD = 0.103), respectively (see Table 1).

In the next stage, CFA using JAMOVI software was conducted on 225 older samples to evaluate the two-factor structure presented too. Considering the main goodness of fit indices, the OAEAS factor structure without items nos. 16 and 20 for the obtained model was good and the chi-square was significant ($p < 0.001$), with the relative chi-square of 4.46, TLI = 0.823, CFI = 0.857, and SRMR = 0.051. Furr [24] recommended that the CFA fit indices need to include standardized loadings of ≥ 0.80 [27]

3.3. The MI Across Gender Groups. Table 2 shows that MI for good fit was estimated across gender groups, and its model fit indicators were then extracted in Table 3. The results of the MI analyses represent that goodness of fit was excellent for all MI models, minimal differences between the descriptive fit parameters were observed, and the results of the likelihood ratio tests indicated no significant differences in model fit between MI models. Therefore, an equal fit across all MI models was obtained for the OAEAS version between men and women (see Table 2).

3.4. ROC Curve Analysis and Cutoff Points. Table 3 represents the area under the ROC curve (AUC), the specificity, the sensitivity, as well as the cutoff points for OAEAS 18-items. As shown, the cutoff point of the best differentiates with fear of insects or other arthropods and without it in women and men was 47 and 46, respectively. Youden's J index is used to diagnose the best cutoff point of instruments and assess the biomarker effectiveness [28]. The J close to one indicates the optimal cut-point value. According to Table 3, the estimated cutoff points are applicable [22, 29].

3.5. Polytomous Rasch Model. According to Table 4, a polytomous Rasch model using the partial credit model was used to assess the one-dimensionality and item fits of the OAEAS. The model was fitted using person reliability = 0.880 and MADaQ3 = 0.171 ($p < 0.001$). It should be noted that the mean of absolute values of centered Q-3 statistic (MADaQ3) as an effect size of the model is the overall measure of model-data fit and obtained by Holm adjustment; Ho = the data fit the Rasch model. All items fitted well with their latent construct as the infit and outfit OAEAS were within an acceptable range (0.5–1.5) except item nos. 16 and 20 [30, 31]

Figure 1 illustrates the results related to the intersections in the OAEAS with the four sample items.

As Table 5 indicates, in the final decision, the OAEAS could contain 18 items (without item nos. 16 and 20) with two subdomains, that is, entomophobia (items nos. 1–14) and entomophilia (items nos. 15, 17, 18, and 19). The highest correlation was between the total score of OAEAS and phobia domain (0.97, $p = 0.01$). Also, internal consistency of OAEAS and its two domains was appropriate (≥ 0.75).

4. Discussion

The psychometric properties of the OAEAS version and its cutoff points for measuring entomophobia in the older population in Iran were examined in this study. The assessment demonstrated high internal consistency, accuracy, structural reliability, and convergent validity, with the underlying two-factor structure of the questions being identified and analyzed. The extracted models included PCA, GLS, and ML. The model with a two-factor structure and RMSEA = 0.04 ($p = 0.01$) yielded the best fit indices (mean indices ≥ 0.8). In addition, the polytomous Rasch model, a novel psychometric approach for multiple-choice questionnaires, was employed. This measurement model has potential applications in any field where the goal is to measure a specific attribute or capability through a process in which responses are scored with consecutive integers. For example, it can be utilized for Likert scales, ranking scales,

Table 1: Rotated factor matrix for OAEAS in three extracted models.

Items	ML model Factor		PCA model Factor		GLS model Factor	
	1	2	1	2	1	2
1. I am always scared.	0.566		0.607		0.572	
2. I am always afraid of alive species.	0.572		0.607		0.570	
3. I am usually afraid of arthropods.	0.783		0.800		0.792	
4. If I see an arthropod, I ask someone to kill it.	0.667		0.683		0.652	
5. If I see an arthropod, I think it is attacking me.	0.818		0.827		0.817	
6. If I see an arthropod, I am embarrassed (sweating and heart beating).	0.674		0.716		0.686	
7. I'm afraid of the pain caused by arthropod bite/sting (whether it has a history or not).	0.715		0.740		0.716	
8. If the arthropods are around me, I will escape.	0.751		0.777		0.755	
9. I get nervous when someone says there is an arthropod in this space.	0.662		0.699		0.669	
10. I disgust the arthropods.	0.670		0.692		0.664	
11. Before entering a room, I check it for the being of arthropods or not.	0.623		0.646		0.611	
12. If I come across an arthropod, I will not be able to remove it from my mind for a long time.	0.673		0.697		0.668	
13. I am afraid to enter a room where there is an arthropod.	0.826		0.832		0.826	
14. Fear of arthropods is one of my worst fears.	0.403		0.411		0.401	
15. I can imagine myself caring for arthropods.		**0.313**		**0.317**		**0.308**
16. I can distinguish arthropods from other small animals like them.		**0.228**		**0.313**		**0.300**
17. I have been among arthropods.		0.440		0.705		0.618
18. I have awareness on biology of arthropods.		0.656		0.661		0.549
19. Arthropods play an important role in the ecosystem and are useful.		0.561		0.544		0.415
20. I am very interested in nature protection.		**0.252**		**0.347**		**0.305**

Note: $p > 0.05$.

Table 2: Multigroup CFA results for OAEAS 18 items ($N = 450$).

Model	χ^2	df	p	CFI	GFI	SRMR	RMSEA	ΔCFI	ΔGFI	ΔSRMR	ΔRMSEA	$\Delta\chi^2$	Δdf	Δp
Configural	121.87	424	< 0.001	0.886	0.885	0.04	0.042	—	—	—	—	—	—	—
Thresholds	122.47	434	< 0.001	0.876	0.875	0.04	0.043	0.000	0.001	0.000	−0.004	128.02	421	> 0.99
Loadings	186.32	434	< 0.001	0.876	0.875	0.04	0.042	0.000	0.001	0.001	−0.001	11.14	412	> 0.99

Note: The configural model always serves as a reference. ΔCFI, difference in CFI; Δdf, difference in df; p statistical significance of χ^2; Δp, statistical significance of $\Delta\chi^2$; ΔRMSEA, difference in RMSEA; ΔSRMR, difference in SRMR; ΔGFI, difference in GFI; χ^2, overall scaled chi-square statistic; $\Delta\chi^2$, scaled chi-square difference statistic.

Abbreviations: CFA, confirmatory factor analysis; CFI, comparative fit index, df, degrees of freedom; GFI, goodness-of-fit index, RMSEA, root mean square of approximation, SRMR, standard root mean square residual.

Table 3: The AUC, sensitivity, specificity, and Youden's index for possible cutoff points of OAEAS 18 items.

		Cut-off points	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Youden's J index	AUC	Metric score
All samples		46	95.16	75.42	67.43	86.67	0.648	0.782	1.74
Gender	Male	46	93.33	64.32	75.27	88.12	0.550	0.769	1.55
	Female	47	90.67	61.67	74.73	84.09	0.523	0.769	1.52
Bitten/stung in childhood	Yes	51	84.62	64.33	68.75	71.43	0.546	0.796	1.53
	No	47	84.62	90.12	85.71	56.25	0.562	0.795	1.54
Awareness on arthropods' pathogenicity	Yes	46	90.32	63.16	72.73	85.71	0.544	0.767	1.53
	No	51	84.44	64.41	68.61	71.34	0.556	0.786	1.51

and assessment items that employ higher integer scores to denote increasing levels of competency or success. Furthermore, the measurement invariance technique was employed to assess measurement stability and equivalence based on gender in older men and women. This tool measures the same concept of entomophobia between genders without any differences.

In the final analysis, two questions from the questionnaire (items 16 and 20) were excluded from the list due to their inadequacy and low explanatory power. The results indicated high internal consistency of the OAEAS, which aligns with previous studies, demonstrating acceptable item correlations. A good agreement was found between the results and the original version of the OAEAS for assessing

Table 4: Item statistics from the partial credit polytomous Rasch model for OAEAS.

Items	Measure	S.E. measure	Infit	Outfit
1	−2.106	0.0561	0.871	0.890
2	−2.289	0.0597	1.059	0.931
3	−2.035	0.0550	0.745	0.709
4	−2.173	0.0572	1.075	0.934
5	−1.869	0.0533	0.759	0.679
6	−1.724	0.0526	0.993	0.973
7	−1.510	0.0529	0.943	0.874
8	−1.605	0.0526	0.850	0.783
9	−1.718	0.0526	0.888	0.863
10	−1.630	0.0525	0.892	0.948
11	−1.829	0.0530	0.986	0.964
12	−1.863	0.0532	0.856	0.915
13	−1.909	0.0536	0.746	0.681
14	−2.116	0.0562	0.707	0.759
15	−2.164	0.0571	1.674	2.299
16	**−0.350**	**0.0622**	**0.261**	**0.433**
17	−1.408	0.0537	1.545	1.668
18	−1.602	0.0526	1.051	1.196
19	−0.818	0.0665	1.574	2.750
20	**−0.391**	**0.0874**	**0.481**	**0.364**

Note: Infit = information-weighted mean square statistic, Outfit = outlier-sensitive means square statistic. $p > 0.05$.

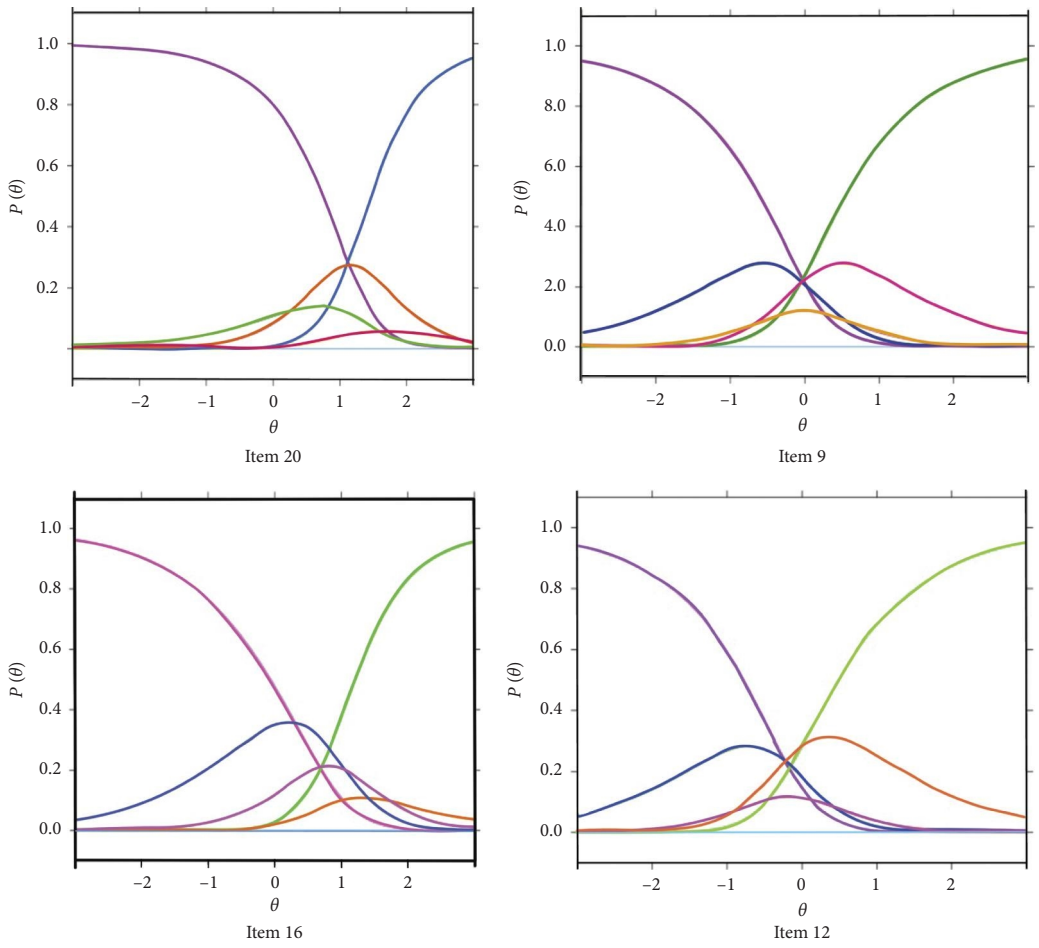

Figure 1: Category probability curves of four fit and unfit sample items 9, 12, 16, and 20 in the OAEAS.

Table 5: Pearson correlation coefficient for OAEAS and its domain.

	1	2	3	Items	Mean	S.E. of mean	SD	IQR	*t*-test[a]	ES	Cronbach's alpha	McDonald's omega
1. OAEAS	1	—	—	18	61.72	1.11	16.48	27.01	3.739[1]	0.517	0.87	0.94
2. OAEAS: Phobia	0.968[2]	—	—	14	47.19	1.07	15.95	26.25	4.058[1]	0.561	0.89	0.95
3. OAEAS: Philia	0.204[2]	−0.131[1]	—	4	11.10	0.08	3.32	5	1.119[1]	0.155	0.63	0.61
4. GAI	0.372[2]	0.351[2]	0.097[1]	5	2.76	0.22	1.21	1	0.471[n.s]	0.065	0.82	0.87

Note: ES = effect size using Cohen's d.
Abbreviation: [n.s.] = not statistically significant.
[a]Independent sample *t*-test for men and women.
[1]Significant at the 0.05 level (2-tailed).
[2]Significant at the 0.01 level (2-tailed).

evaluator-test reliability. Moreover, the convergent validity analysis showed a moderate to high correlation between the total score of OAEAS and other similar tools, such as Peters, Visser, and Kindt [19] and Shahriari-Namadi, Tabatabaei, and Soltani [18], indicating compatibility. The ROC analysis results demonstrated that the total score of OAEAS had sufficient diagnostic validity for classifying different levels of population and phobic status. The cutoff points for older adult men and women were determined to be 46 and 47, respectively. With knowledge of established score levels, researchers and physicians can utilize these cutoff points to design personalized therapeutic programs for older people.

4.1. Limitations. The majority of the participants in this study were young and middle-aged older adults (below 75 years old), and age classification was not considered in the entry criteria. This can be seen as a study limitation, and it is suggested that future research focuses on the old–old (75+) age group and includes age classification. In addition, considering the biological and psychosocial conditions of women and the higher prevalence of specific phobias among them, a significant portion of the sample consisted of older women. However, it is recommended to investigate the cutoff points and specific applications of this tool in different subgroups of older women in future studies.

4.2. Suggestions. It is suggested to use supporting tools such as animated artificial insects or other arthropods and, if possible, real insects or other arthropods to assess entomophobia. It is also advisable to form a cohesive research team comprising geriatric medicine experts, psychiatrists, gerontology professors, entomology experts, programmers, and software designers to develop a suitable entomophobia assessment tool tailored to the needs of the older people. This approach will enable a clear understanding of the psychological reactions of older adults to the subject matter and provide insights into the distinct fears experienced by them. Finally, considering the specific type of insects or other arthropods, the questionnaire should be designed with a specific focus on arthropod species.

In this study, a significant portion of the older participants (32%) resided in rural areas of Iran; however, geographical classification was not considered in the data analysis. It is recommended to examine this tool in different geographical and cultural climates, along with various arthropod species, allowing for a comparison of rural and urban older adults communities in future research.

5. Conclusion

The majority of older adults with specific phobias do not receive appropriate diagnosis or treatment because their phobia levels are not precisely measured, causing significant distress for them. Therefore, comprehensive identification of specific phobias, for example, entomophobia by OAEAS can significantly enhance their quality of life.

Data Availability Statement

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Ethics Statement

This study protocol was approved by the Ethics Committee of Shiraz University of Medical Sciences (IR.SUMS.SCHEANUT.REC.1401.009). The Ethics Committee approved the procedure for verbal consent since the study is observational and respected the code of ethics as stated in the Declarations of Helsinki (2013).

Consent

An informed consent for participation in the study was obtained from all participants.

Conflicts of Interest

The authors declare no conflicts of interest.

Author Contributions

M.N. and A.S. assisted in conceptualization and design of the study and oversaw data collection. M.N. collected the data, did data file preparation and screening it, and drafted the manuscript. A.A. has interpreted the data, analyzed it, and

extracted the results. All the authors have read and approved the final manuscript.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section. *(Supporting Information)*

The supporting information table one represents the correlation matrix of EEAS and its 20 items using Pearson coefficient. The 18 (without item nos. 16 and 20) items demonstrated the internal consistency of moderate to high between the items, total score of OAEAS, and measure of GAI, 5-item. The significance level for all of the path coefficients was the $p < 0.01$ level. The correlation matrix represented most correlations above 0.3 (Supporting information Table 1).

References

[1] R. S. Osorio, M. Á Martínez-García, and D. M. Rapoport, "Sleep Apnoea in the Elderly: A Great Challenge for the Future," *European Respiratory Journal* 59, no. 4 (2022): 2101649, https://doi.org/10.1183/13993003.01649-2021.

[2] J. D. Waring, S. E. Williams, A Stevens, et al., "Combined Cognitive Training and Vortioxetine Mitigates Age-Related Declines in Functional Brain Network Integrity," *American Journal of Geriatric Psychiatry* 31, no. 6 (2023): 385–397, https://doi.org/10.1016/j.jagp.2023.01.004.

[3] Y. Osuka, H. Sasai, N Kojima, et al., "Adherence, Safety and Potential Effectiveness of a Home-Based Radio-Taiso Exercise Program in Older Adults With Frailty: A Pilot Randomized Controlled Trial," *Geriatrics and Gerontology International* 23, no. 1 (2023): 32–37, https://doi.org/10.1111/ggi.14511.

[4] T. Wang, "Social Survey and Problem about Phobias Affecting People Daily Lives," in *2021 International Conference on Social Development and Media Communication (SDMC 2021)* (Sanya, China: Atlantis Press, November 2022).

[5] S. N. H. Barakbah and S. Sulaiman, "Insecto Aid: An Augmented Reality Mobile Application on Entomophobia Treatment," *Journal of Computing Technologies and Creative Content (JTec)* 6, no. 2 (2021): 72–80.

[6] M. A. Castellanos, B. Ausín, and M. Muñoz, "Specific Phobia Disorder Symptoms in People over 65 in Madrid: A Network Analysis," *Clinica Y Salud* 33, no. 2 (2022): 73–82, https://doi.org/10.5093/clysa2022a5.

[7] E. Mastrobattista, E. J. Lenze, C. F. Reynolds, et al., "Late-life Depression is Associated With Increased Levels of GDF-15, a Pro-Aging Mitokine," *American Journal of Geriatric Psychiatry* 31, no. 1 (2023): 1–9, https://doi.org/10.1016/j.jagp.2022.08.003.

[8] F. Rivero, R. J. Marrero, T Olivares, et al., "A Voxel-Based Morphometric Study of Gray Matter in Specific Phobia," *The Life* 13, no. 1 (2022): 119, https://doi.org/10.3390/life13010119.

[9] H. Kim, W. Jeong, S. H Kim, et al., "Association Between Social Phobia and the Risk of Arrhythmia Using the Korean National Sample Cohort: A Retrospective Cohort Study," *Bio Medical Central Psychiatry* 22, no. 1 (2022): 39–48, https://doi.org/10.1186/s12888-022-03689-6.

[10] Y. Wang, G. Yang, S. Li, Y. Li, L. He, and D. Liu, "Arrhythmia Classification Algorithm Based on Multi-Head Self-Attention Mechanism," *Biomedical Signal Processing and Control* 79 (2023): 104206, https://doi.org/10.1016/j.bspc.2022.104206.

[11] M. A. Castellanos, B. Ausín, and M. Muñoz, "Specific Phobia Disorder Symptoms in People over 65 in Madrid: A Network Analysis," *Clinica Y Salud* 33, no. 2 (2022): 73–82, https://doi.org/10.5093/clysa2022a5.

[12] A. Marzban, M.-R. Rezaei, and P. Emami, "Green Space and Mental Health of the Elderly People," *Jundishapur Journal of Health Sciences* 14, no. 2 (2022): https://doi.org/10.5812/jjhs-124527.

[13] V. Schiele and H. Schmitz, "Understanding Cognitive Decline in Older Ages: The Role of Health Shocks," *European Economic Review* 151 (2023): 104320, https://doi.org/10.1016/j.euroecorev.2022.104320.

[14] S. Liu, L. Chen, D. Li, Q. Yang, F. Liu, and Y. Cheng, "Study on Influencing Factors and Countermeasures of Elderly Nursing Services in the Elderly," *Applied Bionics and Biomechanics* 2022 (2022): 1–7, https://doi.org/10.1155/2022/4501228.

[15] S. Andreas, H. Schulz, J Volkert, et al., "Incidence and Risk Factors of Mental Disorders in the Elderly: the European MentDis_ICF65+ Study," *Australian and New Zealand Journal of Psychiatry* 56, no. 5 (2022): 551–559, https://doi.org/10.1177/00048674211025711.

[16] M. M. Bavani, N. Jesri, M. Sarvi, S. Saeedi, A. Saghafipour, and L. Shirani-Bidabadi, "New Data on Medically Important Scorpion Species of Iran Based on Seven Physiographic Areas," *Heliyon* 8, no. 7 (2022): e09877, https://doi.org/10.1016/j.heliyon.2022.e09877.

[17] B. Régnier, J. Legrand, P.-A. Calatayud, and F. Rebaudo, "Developmental Differentiations of Major Maize Stemborers Due to Global Warming in Temperate and Tropical Climates," *Insects* 14, no. 1 (2023): 51, https://doi.org/10.3390/insects14010051.

[18] M. Shahriari-Namadi, H. R. Tabatabaei, and A. Soltani, "Entomophobia and Arachnophobia Among School-Age Children: A Psychological Approach," *Shiraz E-Medical Journal.* 19, no. 7 (2018): https://doi.org/10.5812/semj.64824.

[19] J. Peters, R. M. Visser, and M. Kindt, "More Than Just Fear: Development and Psychometric Evaluation of the Spider Distress Scale to Assess Spider Fear and Spider-Related Disgust," *Journal of Anxiety Disorders* 90 (2022): 102602, https://doi.org/10.1016/j.janxdis.2022.102602.

[20] D. E. Beaton, C. Bombardier, F. Guillemin, and M. B. Ferraz, "Guidelines for the Process of Cross-Cultural Adaptation of Self-Report Measures," *Spine* 25, no. 24 (2000): 3186–3191, https://doi.org/10.1097/00007632-200012150-00014.

[21] The jamovi project, "JAMOVI. Version 2.3," (2022), https://www.jamovi.org.

[22] P. Mair, R. Hatzinger, M. Maier, T. Rusch, and R. Debelak, "ERm: Extended Rasch Modeling" (2021).
[23] G. Allali, E. I. Ayers, R. Holtzer, and J. Verghese, "The Role of Postural Instability/Gait Difficulty and Fear of Falling in Predicting Falls in Non-demented Older Adults," *Archives of Gerontology and Geriatrics* 69 (2017): 15–20, https://doi.org/10.1016/j.archger.2016.09.008.
[24] M. Furr, *Scale Construction and Psychometrics for Social and Personality Psychology* (SAGE publications ltd, 2011).
[25] F. S. Nahm, "Receiver Operating Characteristic Curve: Overview and Practical Use for Clinicians," *Korean journal of anesthesiology* 75, no. 1 (2022): 25–36, https://doi.org/10.4097/kja.21209.
[26] A. J. Larner, "Defining 'Optimal' Test Cut-Off Using Global Test Metrics: Evidence From a Cognitive Screening Instrument," *Neurodegenerative Disease Management* 10, no. 4 (2020): 223–230, https://doi.org/10.2217/nmt-2020-0003.
[27] H. Seol, "snowIRT: Item Response Theory for JAMOVI," (2023), https://github.com/hyunsooseol/snowIRT.
[28] R Core Team, "R: A Language and Environment for Statistical Computing," (2021), https://cran.rproject.org.
[29] A. Robitzsch, T. Kiefer, and M. Wu, "TAM: Test Analysis Modules," (2020), https://CRAN.R-project.org/package=TAM.
[30] P. Ahalawat and A. M. Baxodirovna, "To Evaluate the Effect of Cognitive Drill Therapy on Social Anxiety-A Preliminary Study," *Journal of Positive Psychology and Wellbeing* (2023): 1026–1035, https://www.journalppw.com/index.php/jppw/article/view/16510/10495.
[31] T. Bond, Z. Yan, and M. Heene, *Applying the Rasch Model: Fundamental Measurement in the Human Sciences* (Routledge, 2020).