Original Article

Validity and Reliability Assessment of the Persian ASQ-17 Questionnaire

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Abstract

Purpose: To evaluate the reliability, content validity, and cultural appropriateness of the Persian translation of the Asthenopia Questionnaire (ASQ-17) among Persian-speaking adults.
Materials and Methods: Thirty adults aged 20–54 years completed the Persian ASQ-17. Translation followed a forward–backward protocol. Internal consistency was assessed using Cronbach's alpha for the total scale and its subscales. Content validity was evaluated by 20 experts using the Content Validity Index (CVI). Face validity was assessed through structured cognitive interviews.
Results: The overall scale demonstrated strong internal consistency ($\alpha = 0.888$). Subscale coefficients ranged from 0.618 to 0.841. All items achieved CVI values between 0.80 and 1.00. Interview feedback confirmed clarity, comprehensibility, and cultural suitability of all items.
Conclusion: The Persian ASQ-17 shows strong reliability, content validity, and face validity, supporting its use for assessing asthenopia symptoms in Persian-speaking adults.

Keywords: Asthenopia; Eye Strain; Surveys and Questionnaires; Psychometrics; Reproducibility of Results; Translations; Cross-Cultural Comparison.

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Introduction

Asthenopia, commonly known as eye fatigue, is a subjective symptom complex that includes a wide range of visual discomfort symptoms such as fatigue, blurred vision, headache, and difficulty concentrating, along with several systemic manifestations that often occur after prolonged near work [1-4]. Asthenopia may present with various physical or perceptual symptoms including headache, watering, burning or itching of the eyes, blurred vision, ocular pain, a sensation of dryness, and diplopia [2,5-8]. The external symptoms of asthenopia, such as burning, irritation, tearing, and dryness, are closely related to ocular surface disturbances, whereas the internal symptoms, such as fatigue, pain, and retro-orbital headache, are typically associated with accommodative and/or binocular visual stress [1,2]. These symptoms commonly arise during activities requiring sustained near vision, such as reading or writing, and computer use where accommodation and convergence demands are elevated [9-13].

Estimates of asthenopia prevalence have varied widely due to differences in study populations and methods of identifying asthenopia [14-16]. Many existing questionnaires lack specificity for asthenopia and instead focus on related constructs, such as the Dry Eye Questionnaire [17], the Digital Eye Strain Questionnaire [18], the Computer Vision Symptom Questionnaire [19,20], and the Binocular Visual Dysfunction Questionnaire [21]. To address this gap, a research group developed the 19-item Asthenopia Survey Questionnaire (ASQ-19), considered the most comprehensive asthenopia-specific instrument to date [22]. Its development was based on classical test theory, expert consensus, and statistical validation [22]. Subsequently, the same group refined the questionnaire through Rasch analysis [23], resulting in the ASQ-17, which offers improved item hierarchy and measurement precision compared with the ASQ-19 [24]. The ASQ-17 provides an effective assessment tool with an optimal threshold score of 12.5, supporting its use in diagnosing and evaluating the effects of clinical interventions for eye strain [24].

Recent studies have shown a substantial rise in eye strain prevalence due to increased digital device use [15,16]. Reported prevalence ranges from 53.3 % to 71.0 % globally [25-27], and in Iran, rates as high as 76.2 % have been documented [25]. Among individuals under 18 years of age, prevalence ranges from 12.4 % to 26.4 %, with a pooled estimate of 19.7 % [28]. Assessment of asthenopia has been challenging due to inconsistent definitions and the frequent use of non-validated or unidimensional tools lacking predictive scoring [29-31]. This highlights the need for psychometrically robust, culturally appropriate instruments to assess asthenopia accurately.

Validation is essential to ensure a questionnaire's applicability across linguistic and cultural contexts. This study addresses the validation of the Persian version of the Asthenopia Questionnaire (ASQ-17), evaluating its reliability and content validity within the Iranian population. Establishing these psychometric properties supports the use of the Persian ASQ-17 in ophthalmology, optometry, and occupational health settings, enabling early identification and targeted intervention for individuals experiencing visual fatigue in Persian-speaking communities.

Accordingly, this study aims to translate, culturally adapt, and evaluate the reliability and content validity of the Persian ASQ-17 for use among Persian-speaking adults.

Materials and Methods

Study Design and Participants

A cross-sectional study was conducted to validate the Persian version of the ASQ-17 questionnaire. Participants were selected from working and student populations in Iran using a convenience sampling method. Inclusion criteria included age 18 to 60 years, literacy, and proficiency in the Persian language. Individuals with diagnosed eye diseases or neurological disorders were excluded. All participants provided informed consent prior to participation. The study protocol was approved by the institutional Ethics Committee (IR.SBMU.RETECH.REC.1404.519).

Translation Process

The translation of the ASQ-17 followed a standard forward–backward translation protocol. Two bilingual experts independently translated the original English questionnaire into Persian. A third expert compared and consolidated these translations into a unified preliminary version. This version was then back-translated into English by two independent translators who were unfamiliar with the original instrument. All discrepancies were examined and resolved by a panel consisting of ophthalmologists, optometrists, and linguists to ensure semantic, conceptual, and cultural equivalence between the source and target versions.

Reliability Assessment

Internal consistency was assessed using Cronbach's alpha for the entire questionnaire and for each of the three subscales (ocular symptoms, visual function, and systemic/physiological symptoms). Alpha values above 0.70 were considered acceptable.

Questionnaire Reliability Background

Reliability is a fundamental psychometric property reflecting the extent to which a measurement instrument consistently produces stable results under equivalent conditions. Abel and Frisbee (1989) define reliability as "the correlation between one set of scores and another set of scores on an equivalent test obtained independently on a group of subjects." Accordingly, the reliability coefficient ranges from 0 (no correlation) to +1 (perfect correlation). This coefficient reflects the degree to which a measuring instrument captures stable characteristics of the respondent rather than temporary or inconsistent attributes. Several methods exist for estimating reliability; among them, Cronbach's alpha is widely used to evaluate internal consistency [32].

Cronbach's Alpha Calculation

Cronbach's alpha is commonly used for tools such as questionnaires or tests that include multiple items measuring different aspects of a construct. In such instruments, the response to each question can take numerical values [32,33]. To calculate Cronbach's alpha, the variance of each subset of questionnaire items (subtest) and the total variance of the test must first be calculated. The alpha coefficient is then derived using the following formula:

$$r_a = \frac{j}{j+1}\left(1-\frac{\sum S_j^2}{S^2}\right)$$

Where:

$j =$ Number of subsets of questions in the questionnaire or test.

$S_j^2 =$ j -test subvariance

$S^2 =$ is the total variance of the test.

An alpha value of 0 indicates no internal consistency, while +1 indicates perfect reliability. Values greater than 0.60 are typically considered acceptable for early-stage questionnaire validation [32].

Content Validity Assessment

Content validity was assessed using both the Content Validity Ratio (CVR) and the Content Validity Index (CVI). CVI was applied to sections with four-option Likert responses, with an acceptable threshold of 0.79 [32]. For the content validity assessment of the Persian ASQ-17, 20 experts rated each item across four dimensions, usefulness, relevance, clarity, and simplicity, using a four-point Likert scale. Items with a CVI ≥ 0.79 were considered acceptable [32].

Statistical Analysis

Data were analyzed using SPSS version 27. Descriptive statistics were calculated for demographic variables, and inferential statistics were used to evaluate reliability and content validity outcomes. Reliability coefficients ≥ 0.70 and CVI ≥ 0.80 were considered acceptable. A significance level of $P < 0.05$ was used for all analyses.

Results

Participant Characteristics

The mean age of participants was 42.60 ± 7.51 years, and 76.7 % were female. Educational attainment was highest at the bachelor's and master's levels, each representing 33.3 % of the sample. Participants reported an average of 5.33 ± 3.05 working hours per day. With respect to visual task exposure, 60 % primarily used mobile devices, 30 % worked on computers, and 10 % engaged in study or technical activities. The reliability coefficients for the entire questionnaire and its subscales are presented in table 1.

Content Validity Assessment (CVR and CVI)

Overall Findings

All 17 items achieved CVI values between 0.80 and 1.00 across the four evaluated dimensions: usefulness, relevance, clarity, and simplicity. No item scored below the acceptable threshold of 0.79; therefore, none required deletion or modification.

Table 1: Internal consistency of the Persian ASQ-17 questionnaire

Scale / Subscale	Number of Items	Cronbach's Alpha (α)	Interpretation
Total ASQ-17 Score	17	0.888	Excellent internal consistency
Ocular Symptoms	7	0.832	Strong internal consistency
Visual Function	6	0.841	High internal consistency
Systemic/Physiological Symptoms	4	0.618	Acceptable for early validation

Usefulness

CVI scores for usefulness ranged from 0.80 to 1.00, with most items scoring 0.90 or above. Expert evaluations demonstrated strong consensus that each item was appropriate for assessing asthenopia-related symptoms. As the CVI scores for all items met or exceeded the 0.79 criterion, all items were confirmed to possess adequate content validity, and no revisions were needed (Table 2).

Relevance

Relevance scores ranged from 0.80 to 1.00. All items met the minimum required threshold, indicating that each question was considered clearly relevant to the construct of eye strain by the expert panel (Table 3). No items required removal or modification.

Clarity

CVI scores for clarity also ranged from 0.80 to 1.00. The panel found the items to be clearly worded, with no significant concerns regarding ambiguity or phrasing. All items fulfilled the clarity requirements, and no changes were deemed necessary (Table 4).

Simplicity

Simplicity scores ranged from 0.80 to 1.00, confirming that all items were easy to understand and appropriate for the target population. Given that all questions exceeded the CVI threshold, none required revision (Table 5).

Table 2: Content validity index (CVI) for usefulness dimension of the Persian ASQ-17 questionnaire

Item	Not Useful	Somewhat Useful	Useful	Very Useful	Combined Useful (n)	CVI
Q1	0	2	5	13	18	0.90
Q2	0	1	7	12	19	0.95
Q3	1	1	5	13	18	0.90
Q4	0	1	2	17	19	0.95
Q5	1	1	2	16	18	0.90
Q6	1	1	2	16	18	0.90
Q7	0	2	6	12	18	0.90
Q8	0	2	5	13	18	0.90
Q9	0	1	4	15	19	0.95
Q10	0	0	5	15	20	1.00
Q11	0	0	4	16	20	1.00
Q12	0	1	2	17	19	0.95
Q13	0	4	5	11	16	0.80
Q14	1	0	2	17	19	0.95
Q15	2	2	5	11	16	0.80
Q16	0	0	2	18	20	1.00
Q17	1	3	7	9	16	0.80

Table 3: Content validity index (CVI) for relevance of the Persian ASQ-17 questionnaire items

Item	Not Relevant	Somewhat Relevant	Relevant	Very Relevant	Combined Relevant (n)	CVI
Q1	0	1	3	16	19	0.95
Q2	0	3	3	14	17	0.85
Q3	1	2	5	12	17	0.85
Q4	0	1	2	17	19	0.95
Q5	0	2	1	17	18	0.90
Q6	0	1	4	15	19	0.95
Q7	0	1	6	13	19	0.95
Q8	1	0	6	13	19	0.95
Q9	1	0	7	12	19	0.95
Q10	0	0	5	15	20	1.00
Q11	0	2	6	12	18	0.90
Q12	0	1	3	16	19	0.95
Q13	1	3	4	12	16	0.80
Q14	1	1	4	14	18	0.90
Q15	3	1	7	9	16	0.80
Q16	1	1	4	14	18	0.90
Q17	1	3	5	11	16	0.80

Table 4: Content Validity Index (CVI) for Clarity Dimension of the Persian ASQ-17 questionnaire

Item	Not Clear	Somewhat Clear	Clear	Very Clear	Combined Clear (n)	CVI
Q1	1	3	4	12	16	0.80
Q2	0	4	4	12	16	0.80
Q3	1	1	6	12	18	0.90
Q4	0	1	5	14	19	0.95
Q5	1	1	6	12	18	0.90
Q6	1	3	9	7	16	0.80
Q7	0	3	1	16	17	0.85
Q8	0	0	5	15	20	1.00
Q9	0	0	4	16	20	1.00
Q10	0	0	5	15	20	1.00
Q11	0	0	3	17	20	1.00
Q12	0	1	3	16	19	0.95
Q13	0	3	1	16	17	0.85
Q14	1	0	7	12	19	0.95
Q15	0	2	8	10	18	0.90
Q16	0	1	2	17	19	0.95
Q17	0	3	4	13	17	0.85

Table 5: Content validity index (CVI) for simplicity of the Persian ASQ-17 questionnaire Items

Item	Not Simple	Somewhat Simple	Simple	Very Simple	Combined Simple (n)	CVI
Q1	0	2	7	11	18	0.90
Q2	0	4	6	10	16	0.80
Q3	1	2	6	11	17	0.85
Q4	1	1	3	15	18	0.90
Q5	1	1	6	12	18	0.90
Q6	0	3	10	7	17	0.85
Q7	0	1	3	16	19	0.95
Q8	0	0	2	18	20	1.00
Q9	0	1	2	17	19	0.95
Q10	0	1	3	16	19	0.95
Q11	0	0	2	18	20	1.00
Q12	0	0	5	15	20	1.00
Q13	1	1	2	16	18	0.90
Q14	1	0	7	12	19	0.95
Q15	0	2	6	12	18	0.90
Q16	0	1	4	15	19	0.95
Q17	1	2	4	13	17	0.85

Summary of Content Validity

The results of the CVI analysis demonstrate that the Persian ASQ-17 possesses strong content validity across all assessed dimensions. Expert feedback indicated that all items were useful, relevant, clear, and simple and no item needed modification or removal.

Reliability Analysis

Internal consistency of the Persian ASQ-17 was examined using Cronbach's alpha coefficients for the total scale and its three subscales (Table 1). The 17-item questionnaire demonstrated excellent overall internal consistency, with a Cronbach's alpha of 0.888. The ocular symptoms subscale, comprising seven items, showed strong reliability with an alpha of 0.832. The visual function subscale, consisting of six items, demonstrated high internal consistency with an alpha of 0.841. The systemic/physiological symptoms subscale, which includes four items, yielded an alpha of 0.618, meeting the minimum acceptable threshold for reliability in early-stage validation studies.

Discussion

This study evaluated the psychometric properties of the Persian translation of the Asthenopia Questionnaire (ASQ-17), focusing on reliability and content validity, and represents the first such investigation in Iran. The study followed three stages, translation, cultural adaptation, and psychometric analysis, and the results demonstrate that the Persian ASQ-17 performs well as a tool for assessing

eye strain symptoms in Persian-speaking adults.

The internal consistency of the questionnaire was strong, with a Cronbach's alpha of 0.888 for the total scale. Subscale analyses also supported the reliability of the instrument, as the ocular symptoms (α = 0.832) and visual function (α = 0.841) domains demonstrated high internal consistency. Although the systemic/physiological symptoms subscale showed a lower alpha coefficient (α = 0.618), it still met the minimum threshold commonly accepted in early-stage validation studies. These findings are consistent with the original ASQ-17 and previously translated versions, suggesting that the Persian adaptation maintains the structural and conceptual integrity of the original instrument [24].

Content validity analysis further supported the appropriateness of the questionnaire. Expert evaluations across the four dimensions, usefulness, relevance, clarity, and simplicity, yielded CVI values ranging from 0.80 to 1.00 for all items. These results demonstrate strong alignment between the translated items and the underlying construct of asthenopia, indicating that the questionnaire is both culturally appropriate and clinically meaningful. The consistently high CVI scores confirm that the translation process effectively preserved the semantic intent of each item, which is essential for ensuring cross-cultural comparability.

Collectively, these findings indicate that the Persian ASQ-17 is psychometrically robust and contextually relevant. Its strong reliability and content validity support its use for identifying and monitoring symptoms of eye strain among Persian-speaking adults.

However, several limitations should be noted. The sample size was relatively small, which limits generalizability of the findings. Test–retest reliability was not assessed, preventing evaluation of temporal stability. In addition, the study did not examine construct validity using exploratory or confirmatory factor analysis, and item-level metrics such as item–total correlations, floor and ceiling effects, and score distributions were not analyzed. These omissions restrict the depth of psychometric evaluation. The comparatively lower reliability of the systemic/physiological symptoms subscale may also reflect greater variability in how these symptoms are perceived or reported [24,34]. Furthermore, although expert judgment was used to establish content validity, broader input from end users may strengthen the instrument's practical applicability in future research.

Overall, the Persian ASQ-17 demonstrates favorable psychometric properties and provides clinicians and researchers with a useful instrument for screening and studying eye strain. Future investigations should examine its construct validity, incorporate larger and more diverse populations, and evaluate its responsiveness to clinical treatments.

Conclusion

The Persian ASQ-17 demonstrates strong reliability and content validity and is a suitable tool for assessing eye strain symptoms in Persian-speaking adults. Its solid psychometric performance supports its use in clinical screening and research settings. Future studies with larger and more diverse samples, as well as advanced analyses such as Rasch modeling and responsiveness testing, will further strengthen its clinical utility.

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Footnotes and Financial Disclosures

Conflict of interest:

The authors have no conflict of interest with the subject matter of the present manuscript.