ORIGINAL ARTICLE

# Designing a tool for measuring determinants of eye self-care and evaluating its psychometric properties

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**Background:** Eye care is crucial for maintaining healthy vision. This study aimed to design a determinants assessment instrument related to eye self-care in the student community and evaluate its psychometric properties. **Materials and Methods:** The present mixed-method cross-sectional study was conducted in two sections using Creswell and Plano Clark methods for instrument development. The study was conducted in Isfahan, Iran, in 2021. The first section (textual analysis and qualitative research) explained and developed the instrument's fundamental items. This section included in-depth, semi-structured interviews with 21 students and eight experts. In the second, the psychometric properties of the designed instrument have been evaluated. Twenty students assessed the instrument's qualitative and quantitative face validity. The instrument's content was measured by computing the content validity ratio and content validity index. In addition, exploratory factor analysis (performed on 251 students) was used to establish construct validity. Internal and test–retest reliability was determined using Cronbach's alpha and intraclass correlation coefficients (ICC), respectively. **Results:** During face and content validity assessment, a 39-item questionnaire was finalized. Exploratory factor analysis led to the extraction of seven factors, including "perceived self-efficacy and self-regulation," "outcome expectation," "perceived barriers," "motivation," "perceived susceptibility," "normative beliefs," and "perceived severity." The seven extracted factors explained 48.6% of the total variance. Cronbach's alpha was obtained to be 0.780, indicating good internal consistency, and the ICC for the total score of the questionnaire was 0.892 (95% confidence interval: 0.822–0.944), indicating excellent test–retest reliability. **Conclusion:** Our developed questionnaire was a valid and reliable instrument for assessing eye care determinants among students, a vulnerable population afflicted with eye defects and disorders.

**Key words:** Eyes, psychometrics, reliability, students, validity

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## INTRODUCTION

Eye care is crucial for preventing age-related eye diseases, as age-related eye diseases, including diabetic retinopathy, age-related cataracts, open-angle glaucoma, and visual impairment, are a challenge worldwide.[1] Globally, there are approximately 36 million blind individuals and 217 million with moderate or severe visual impairment. Approximately 80% of moderate-to-severe cases of blindness and visual impairment are preventable.[2] This prevalence of eye problems affects the quality of life, the cost of resources, and the availability of health services.[3] Because self-care at a young age reduces the risk of developing eye problems, attention should be paid to preventing and reducing the incidence of eye problems from a young age.[4]

Eye care is an essential part of maintaining an individual's health and preventing and treating relevant diseases.[5] The literature demonstrates that self-care is

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crucial to eye health.[6] Therefore, it is necessary to assess and quantify the condition of eye care, and identifying the factors related to eye self-care at a young age is crucial.

One of the best times to focus on eye health and prevention is during studenthood.[7] In light of the fact that computer use increases the risk of developing eye problems. Computers play a significant role in students' daily lives, who are susceptible to computer vision syndrome.[8-11] Changing behaviors during the academic year is deemed a relatively suitable time, according to research.[9,10] The behavioral change was beneficial for eye health, preventing and managing eye problems.[12,13]

To the best of the authors' knowledge, limited research exists on eye care for students, and this topic warrants further study. For self-care education, measuring the factors in the youth age group is essential, and a valid and dependable instrument is the starting point for conducting research.[12]

The authors could not identify appropriate tools for evaluating eye care determinants in this regard. Therefore, the purpose of the present study was to design an eye care determinants assessment instrument and evaluate its psychometric properties.

## METHODS

### Study design

The current cross-sectional mixed-method methodological study was carried out in Iran during October 2020–May 2021, among Persian-speaking students at Isfahan University of Medical Sciences. The Creswell and Plano Clark tool design methods were used to create the study.[13]

### Phase 1: Design of an eye care tool

Based on a qualitative study, the following items were designed and explored for the current instrument: (a) Reviewing scientific texts; (b) Obtaining expert (ophthalmologist, optometrist) and participant (students and experts) opinions; (c) Combining the results of reviewing texts with the opinions of experts and participants.

In-depth semi-structured interviews were conducted with 21 students (8 face-to-face and 13 telephone interviews) and eight experts for the present qualitative study.

### Phase 2: Psychometric properties of the eye care tool

#### *Face validity*

The questionnaire was communicated to 20 students with varying levels of education to evaluate its face validity, and they were asked to comment on the clarity and readability of each item.

#### *Quantitative face validity assessment*

On a 5-point Likert scale ranging from "not important at all" (score 1) to "very important" (score 5), the same 20 individuals were asked to rate the significance of each item. Consequently, the item impact score was calculated for each item. The impact score for each item was calculated using the following formula, "Impact score = Frequency (%) × Importance." "Frequency" in the formula was the number of patients rated the item 4 or 5, while "Importance" was the mean score of the item on the 1–5 rating scale. An item impact score of more than 1.5 was considered an acceptable criterion for the quantitative face validity of the questionnaire's items.[14]

#### *Content validity*

To evaluate the content validity using the qualitative method, the initial questionnaire was distributed among 10 specialists, including seven specialists in health education and promotion, one ophthalmologist, and two optometrists, who were asked to provide their corrective opinions regarding the use of appropriate words, adherence to Persian grammar, the suitable placement of items, and appropriate scoring.

#### *Quantitative content validity assessment*

The content validity ratio (CVR) and content validity index (CVI) of the instrument were calculated to evaluate the content validity of the quantitative method or the compatibility between the instrument's content and the study objectives.

#### *Content validity ratio*

Ten experts were given a 44-item questionnaire to determine the CVR. The panel of experts was then asked to provide their opinions on each item alongside the other items in the form of three options: "essential," "useful but not essential," and "not essential." CVR was computed for each item using the formula $CVR = [N_e-(N/2)]/(N/2)$, where $N_e$ represented the number of panelists who indicated "essential" and N represented the total number of panelists.[15] The items exceeding 0.62 were subsequently retained as per the Lawshe table.[15]

#### *Content validity index*

On a 4-point Likert scale, the same ten experts were asked to comment on each item separately for three criteria: (a) simplicity, (b) specificity, and (c) clarity for calculating the CVI. Based on the formula, CVI was then calculated (the number of professionals who answered 3 and 4, divided by the total number of professionals). An item was retained and considered acceptable if its CVI value was >0.79; it was questionable and required correction if the CVI value fell between 0.79 and 0.7, and it was considered unacceptable and removed if the value fell below 0.7.[15]

Finally, the necessity and relevance of the questions were determined by examining the validity of the content using qualitative and quantitative techniques. Per the experts' recommendations, the questions that required editing (simplicity and clarity) were revised.

### *Reliability*

A revised questionnaire based on the face and content validity stage was sent to 38 students to determine the instrument's reliability. The participants were then instructed to complete each questionnaire item carefully. The Cronbach's alpha coefficient was calculated to determine the instrument's internal reliability. Cronbach's alpha values >0.70 were considered acceptable.[16]

The test–retest reliability was determined by calculating the intraclass correlation coefficient (ICC). Thus, the questionnaire was sent to the same individuals 14 days later for a retest. The two-way mixed method was utilized to calculate the ICC (along with a 95% confidence interval for ICC). An ICC coefficient >0.70 was considered highly stable item.[16]

### *Construct validity assessment*

Exploratory factor analysis was performed on 251 students to determine construct validity. In this regard, a cross-sectional study was conducted. Multi-stage cluster random sampling was adopted for student selection from faculties as first-level clusters and classes in each faculty as the second-stage clusters. The study's objectives were explained to the participants before participating in our study. All participants gave their informed consent to take part in the current research. Electronic data entry was utilized to complete the questionnaire (sending the online questionnaire link to them through media and online tools).

The Kaiser–Meyer–Olkin (KMO) index was used to evaluate the adequacy of the sample size. The KMO value >0.6 indicated an adequate sample size.[16] Bartlett's test of sphericity was utilized to ensure the correlation between the questionnaire or to evaluate factorability. The number of factors was then determined using the slope of the Scree plot diagram and eigenvalues (eigenvalues more than 1 was considered), and the Varimax rotation method was used to enhance factor interpretability [Figure 1].

### *Criterion validity*

The criterion validity was determined by analyzing the correlation between each item and the corresponding and noncorresponding factor constructs. Each item with a correlation of more than 0.3 with corresponding constructs and a correlation lower than 0.3 with a noncorresponding construct indicates the establishment of criterion validity.[17]

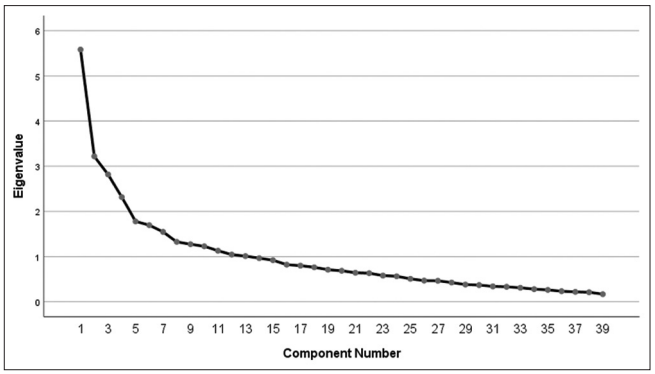


**Figure 1:** Scree plot of the exploratory factor analysis

### *Other variables and statistical analysis*

Age, gender, level of education, place of residence, level of education of parents, marital status, economic status, and refractive error status were also collected. This paper's qualitative and quantitative variables were expressed as frequency (percentage) and mean (standard deviation [SD]), respectively. SPSS-25 (IBM Corp., Armonk, N. Y., USA) was employed for data analysis.

### *Ethical considerations*

Isfahan University of Medical Sciences approved this study's design (IR.MUI.RESEARCH.REC.1399.544) per its ethical guidelines. All participants were informed of the study's objectives and then invited to participate.

The names of the students were initially encoded. The data were stored in a secure location protected by a username and password.

## RESULTS

### Content and face validity

Only a few items in the first version of the literature-based questionnaire design were modified during qualitative face and content validity. Finally, a 39-item questionnaire was subjected to quantitative validity and reliability analysis. The item impact score was determined for each item for evaluating face validity quantitatively. As a result, all questionnaire items with a score greater than 1.5 were retained. The panel of experts also evaluated each questionnaire item's necessity, simplicity, relevance, and clarity. Therefore, according to the Lawshe table, all items with a CVR score >0.62 were retained. CVI was determined for each item and all items had acceptable value, i.e., more than 0.79. Three items had a CVI of 0.8, while the remaining items had a CVI >0.8.

### Construct validity

The cross-sectional study on a sample of 251 students revealed that 31% of the participants were male, and 69% were female. The mean age ± SD was 22.6 ± 4.1 years (ranging

from 18 to 49 years). Table 1 displays the study samples' basic demographic characteristics.

The KMO index value of 0.78 indicated the adequacy of the sample size for exploratory factor analysis. Bartlett's test was also statistically significant ($P < 0.0001$). Thus, the data's factorability was approved. Using the Scree plot and an eigenvalue greater than one, the number of factors was determined to be seven [Figure 1 and Table 2]. According to the concepts of items in each factor, the identified seven factors were named: "perceived self-efficacy and self-regulation," "outcome expectation," "perceived barriers," "motivation," "perceived susceptibility," "normative beliefs," and "perceived severity." The seven extracted factors explained the total variance of 48.6% of the original variables. Table 2 shows the variance explained by each factor.

### Criterion validity

The correlation of each item with the corresponding and noncorresponding factor constructs was evaluated to determine criterion validity. Each item correlated with the corresponding construct >0.3 but <0.3, indicating excellent criterion validity [Table 3].

### Reliability analysis's results

Cronbach's alpha was obtained to be 0.780, indicating good internal reliability. The ICC was reported separately for each item and extracted factors as well as the total score of the developed instrument [Table 4]. The obtained ICC values indicate excellent repeatability of each item, factor, and total score of the instrument.

**Table 1: Participants' characteristics**

| Variable | Category | Frequency (%) |
|---|---|---|
| Marital status | Single | 214 (85.3) |
| | Married | 29 (11.6) |
| | Divorced | 1 (0.4) |
| Educational level | Associate degree | 4 (1.6) |
| | Bachelor's | 179 (71.3) |
| | Master's degree | 17 (6.8) |
| | Doctor of medicine | 36 (14.3) |
| | PhD | 13 (5.2) |
| Place of residence | City - Province capital | 131 (52.2) |
| | City - Not province capital | 108 (43.0) |
| | Village | 10 (4.0) |
| Father's education | Below the bachelor's degree level | 148 (59.0) |
| | Bachelor's degree | 47 (18.7) |
| | Above the bachelor's degree level | 54 (21.5) |
| Mother's education | Below the bachelor's degree level | 162 (64.6) |
| | Bachelor's degree | 60 (23.9) |
| | Above the bachelor's degree level | 27 (10.8) |
| Economic status | Very low | 11 (4.4) |
| | Average | 140 (55.8) |
| | High | 96 (38.2) |
| | Very high | 1 (0.4) |

### Methods of instrument's items scoring

All questionnaire items were scored using a 5-point Likert scale, and 30 items scored from "strongly agree" to "strongly disagree" (items 1 and 2 were scored from zero to four, while items 3–27 and 37–39 were scored reversely from four to zero). The scoring format for nine items (28–36) ranged from "never" to "always" (scoring from zero to four). With a minimum score of zero and a maximum score of four for each item, the maximum total score for the instrument was 156, and the minimum total score was zero [Table 5].

**Table 2: The factor loadings on 39 items obtained from exploratory factor analysis**

| Item number | Extracted factors[a] | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 16 | 0.494 | | | | | | |
| 17 | 0.513 | | | | | | |
| 18 | 0.505 | | | | | | |
| 21 | 0.358 | | | | | | |
| 29 | 0.480 | | | | | | |
| 32 | 0.601 | | | | | | |
| 33 | 0.705 | | | | | | |
| 34 | 0.723 | | | | | | |
| 35 | 0.681 | | | | | | |
| 36 | 0.653 | | | | | | |
| 3 | | 0.502 | | | | | |
| 9 | | 0.196 | | | | | |
| 20 | | 0.455 | | | | | |
| 22 | | 0.658 | | | | | |
| 23 | | 0.634 | | | | | |
| 24 | | 0.556 | | | | | |
| 25 | | 0.638 | | | | | |
| 26 | | 0.598 | | | | | |
| 27 | | 0.622 | | | | | |
| 4 | | | 0.570 | | | | |
| 10 | | | 0.512 | | | | |
| 11 | | | 0.671 | | | | |
| 12 | | | 0.615 | | | | |
| 37 | | | 0.549 | | | | |
| 38 | | | 0.379 | | | | |
| 13 | | | | 0.268 | | | |
| 19 | | | | 0.661 | | | |
| 30 | | | | 0.825 | | | |
| 31 | | | | 0.824 | | | |
| 1 | | | | | 0.702 | | |
| 2 | | | | | 0.728 | | |
| 28 | | | | | 0.334 | | |
| 14 | | | | | | 0.744 | |
| 15 | | | | | | 0.717 | |
| 39 | | | | | | 0.451 | |
| 5 | | | | | | | 0.625 |
| 6 | | | | | | | 0.796 |
| 7 | | | | | | | 0.647 |
| 8 | | | | | | | 0.224 |
| Variance explained* (%) | 10.093 | 8.608 | 7.999 | 7.171 | 4.927 | 4.918 | 4.886 |

*Explained variation resulted from factor analysis, [a]Exploratory factor analysis incorporating Varimax rotation factor loadings <0.2 are omitted for simplicity

**Table 3: Corrected item-total correlation**

| Item number | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 | Factor 6 | Factor 7 |
|---|---|---|---|---|---|---|---|
| 16 | 0.375 | 0.118 | −0.090 | 0.076 | −0.044 | −0.033 | −0.009 |
| 17 | 0.438 | 0.254 | −0.093 | 0.110 | 0.082 | −0.070 | 0.078 |
| 18 | 0.471 | 0.256 | −0.077 | 0.205 | 0.009 | −0.218 | −0.065 |
| 21 | 0.301 | 0.224 | −0.079 | 0.073 | 0.090 | −0.117 | 0.114 |
| 29 | 0.396 | 0.153 | −0.140 | 0.210 | 0.072 | −0.157 | −0.153 |
| 32 | 0.516 | 0.122 | −0.175 | 0.285 | 0.113 | −0.187 | −0.096 |
| 33 | 0.574 | 0.175 | 0.057 | 0.290 | −0.013 | −0.118 | −0.175 |
| 34 | 0.565 | 0.047 | 0.000 | 0.213 | 0.077 | −0.053 | −0.069 |
| 35 | 0.550 | 0.104 | −0.133 | 0.204 | −0.017 | −0.129 | −0.109 |
| 36 | 0.560 | 0.239 | −0.063 | 0.301 | 0.103 | −0.101 | −0.073 |
| 3 | 0.144 | 0.414 | −0.065 | 0.133 | −0.041 | −0.150 | 0.175 |
| 9 | −0.220 | 0.019 | 0.131 | −0.101 | −0.058 | 0.039 | 0.072 |
| 20 | 0.187 | 0.341 | −0.413 | 0.201 | 0.372 | −0.099 | −0.072 |
| 22 | 0.216 | 0.532 | −0.151 | 0.023 | 0.205 | −0.214 | 0.018 |
| 23 | 0.213 | 0.461 | −0.016 | 0.313 | 0.131 | −0.001 | −0.068 |
| 24 | 0.346 | 0.362 | 0.052 | 0.196 | 0.108 | −0.048 | −0.011 |
| 25 | 0.242 | 0.473 | 0.073 | 0.224 | 0.062 | −0.001 | 0.024 |
| 26 | 0.134 | 0.505 | −0.207 | 0.056 | 0.343 | −0.169 | −0.030 |
| 27 | 0.195 | 0.501 | −0.035 | 0.167 | 0.089 | −0.150 | 0.023 |
| 4 | −0.088 | −0.066 | 0.414 | −0.146 | −0.105 | 0.058 | 0.266 |
| 10 | −0.170 | 0.001 | 0.327 | −0.085 | −0.086 | 0.171 | 0.087 |
| 11 | −0.043 | −0.173 | 0.552 | −0.150 | −0.223 | 0.223 | 0.206 |
| 12 | −0.071 | 0.002 | 0.436 | −0.187 | −0.286 | 0.138 | 0.163 |
| 37 | −0.049 | −0.139 | 0.355 | −0.102 | −0.232 | 0.226 | 0.044 |
| 38 | −0.030 | −0.037 | 0.233 | −0.143 | −0.077 | 0.112 | 0.046 |
| 13 | 0.209 | 0.242 | −0.249 | 0.319 | 0.038 | 0.054 | −0.059 |
| 19 | 0.208 | 0.261 | −0.144 | 0.488 | 0.037 | 0.069 | −0.224 |
| 30 | 0.310 | 0.177 | −0.160 | 0.720 | 0.059 | −0.026 | −0.209 |
| 31 | 0.253 | 0.096 | −0.125 | 0.702 | −0.011 | 0.047 | −0.243 |
| 1 | −0.014 | 0.163 | −0.154 | −0.054 | 0.609 | −0.259 | −0.013 |
| 2 | −0.051 | 0.145 | −0.114 | −0.078 | 0.609 | −0.161 | 0.079 |
| 28 | 0.183 | 0.160 | −0.286 | 0.173 | 0.107 | 0.027 | −0.106 |
| 14 | −0.105 | −0.117 | 0.121 | 0.029 | −0.055 | 0.459 | 0.051 |
| 15 | −0.085 | −0.073 | 0.120 | 0.068 | −0.100 | 0.474 | 0.028 |
| 39 | −0.225 | −0.127 | 0.312 | 0.000 | −0.199 | 0.268 | 0.042 |
| 5 | −0.005 | 0.050 | 0.085 | −0.074 | 0.005 | −0.083 | 0.360 |
| 6 | −0.054 | 0.082 | 0.120 | 0.001 | −0.024 | −0.008 | 0.403 |
| 7 | −0.078 | −0.040 | 0.201 | −0.045 | 0.024 | 0.184 | 0.345 |
| 8 | −0.121 | −0.005 | 0.130 | −0.491 | −0.098 | 0.059 | 0.189 |

## DISCUSSION

This research aimed to design a determinants assessment instrument related to eye self-care in the student community and evaluate its psychometric properties. Due to the passage from a scientific procedure, the seven factors and their related questions were the most significant determinants for eye self-care. The name determinants for eye self-care-39 (DES-39) was given to the present questionnaire by the research team due to its function of assessing eye self-care determinants. The DES-39 determined the status of the most significant eye self-care determinants. "Perceived self-efficacy and self-regulation" (10 items), "outcome expectation" (9 items), "perceived barriers" (6 items), "motivation" (4 items), "perceived susceptibility" (3 items), "normative beliefs" (3 items), and "perceived severity" (4 items).

The Cronbach's alpha coefficient of 0.78 for the DES-39 indicated that the questionnaire's internal consistency was comparable to instruments derived from other valid psychometric studies.[16] The ranges of ICC (95% confidence interval) for the questionnaire items and factors and the seven factors were 0.727–0.970 and 0.787–0.906, respectively, indicating the DES-39 questionnaire's good external reliability.[17] Each item correlated strongly with both the corresponding and non-corresponding factor constructs of the present questionnaire.

The percentage of the total variance explained by the questionnaire was 48.6%, ranging from 4.88% to 10.09% for the seven factors; therefore, the result was acceptable. The first factor, perceived self-efficacy, and self-regulation for eye care accounted for the greatest percentage of variance explained (10.09%).

The percentage of the total variance explanation of the questionnaire was 48.6%, ranging from 4.88% to 10.09% for the seven factors; hence, the result was appropriate. Among the factors, the first factor, the perceived self-efficacy and self-regulation for eye care, had the highest percentage of variance (10.09%).

### Study properties

(a) The application of its psychometric stages to students of various disciplines and academic levels (age range of 18–49 years). (b) The present questionnaire items were designed based on the population's needs, culture, and other characteristics after qualitative research was conducted on the population.

## CONCLUSION

The questionnaire developed in this study was a valid and reliable instrument for assessing eye care determinants among students, a vulnerable population afflicted with eye defects and disorders. To this end, we recommend measuring eye care with the developed instrument. The questionnaire is self-reported, and its items are simple to comprehend. Moreover, the questionnaire requires approximately 20 min to complete.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

**Table 4: Test-retest reliability evaluated by intraclass correlation coefficients**

| Factor name | Item number | Description | ICC (95% CI) | ICC (95% CI) |
|---|---|---|---|---|
| Perceived self-efficacy and self-regulation | 16 | I can maintain a distance of at least 40 cm (1.5 times the length of an A4 sheet of paper) when using electronic devices with screens (e.g., mobile phones and laptops) | 0.818 (0.658-0.908) | 0.906 (0.848-0.950) |
| | 17 | I can perform proper blinking (completely closing my eyes and then reopening them) at short intervals when using electronic devices with screens | 0.775 (0.533-0.891) | |
| | 18 | After approximately 20 min of using electronic devices with screens, I can close my eyes for at least 20 s | 0.868 (0.725-0.936) | |
| | 21 | I am unable to use electronic devices with screens (such as cell phones, laptops, and tablets) in a dark or dim environment | 0.826 (0.635-0.917) | |
| | 29 | I have chosen to develop a strategy for using electronic devices with screens (mobile phones, laptops, tablets) | 0.746 (0.473-0.877) | |
| | 32 | Since the last month, I have resisted the temptation to use screen electronics (mobile phones and laptops) due to insufficient ambient light | 0.872 (0.731-0.939) | |
| | 33 | Since last week, I have been following the 20-20-20 rule (every 20 min spent using a screen, try to look away at something 20 feet (6 m) away from you for 20 s) when using electronic devices with screens (e.g., mobile phones and laptops) | 0.800 (0.579-0.905) | |
| | 34 | For the past week, I have blinked properly when using electronics with screens (closing my eyes completely and repeating) | 0.898 (0.789-0.951) | |
| | 35 | For the past week, I have maintained a minimum distance of 40 cm when using electronic devices with screens (1.5 times the length of an A4 sheet of paper) | 0.852 (0.692-0.928) | |
| | 36 | I have felt the benefits of eye care practices for the past month | 0.921 (0.837-0.962) | |
| Outcome expectation | 3 | My eyes' health or disease directly depends on how I care for them | 0.760 (0.502-0.884) | 0.891 (0.825-0.940) |
| | 9 | When using electronic devices with screens, you are unable to stop viewing the content due to its importance (e.g., mobile phones and laptops) | 0.879 (0.746-0.942) | |
| | 20 | I have regular eye exams (at least once every 2 years by an ophthalmologist or optometrist) to prevent visual impairments and eye diseases | 0.945 (0.885-0.973) | |
| | 22 | I can follow medical advice to prevent eye diseases and impairments | 0.869 (0.727-0.937) | |
| | 23 | Daily and regular use of sunglasses reduce the risk of eye disease and impairments | 0.817 (0.620-0.912) | |
| | 24 | By observing the 20-20-20 rule and other guidelines, I reduce the risk of eye problems when using electronic devices with screens. (the 20-20-20 rule means that every 20 min of screen time, you should look at something 20 feet (6 m) away for 20 s) | 0.938 (0.872-0.970) | |
| | 25 | I prevent eye problems by reducing the time I use electronic devices with screens (e.g., mobile phones, laptops, and tablets) | 0.913 (0.820-0.958) | |
| | 26 | Regular and periodic eye examinations (by an ophthalmologist or optometrist at least every 2 years) help improve my eye health and vision | 0.774 (0.531-0.891) | |
| | 27 | Activities in a well-lit environment prevent headaches, poor eyesight, and other eye problems | 0.869 (0.728-0.937) | |
| Perceived barriers | 4 | I cannot afford the price of treating possible eye disorders and diseases | 0.942 (0.879-0.972) | 0.820 (0.710-0.901) |
| | 10 | Due to the high cost of printing educational materials, I spend more time using electronic devices with screens | 0.852 (0.693-0.929) | |
| | 11 | I am unable to afford periodic eye examinations (by an ophthalmologist or optometrist at least once every 2 years) | 0.853 (0.694-0.929) | |
| | 12 | I am unable to book regular eye examinations | 0.884 (0.759-0.944) | |
| | 37 | I have access to an ophthalmologist or optometrist for periodic eye exams | 0.847 (0.759-0.944) | |
| | 38 | The glasses available in the market are nonstandard | 0.779 (0.541-0.893) | |
| Motivation | 13 | Family and friends in my neighborhood, and I recommend wearing sunglasses | 0.878 (0.747-0.941) | 0.847 (0.746-0.919) |
| | 19 | I can wear sunglasses daily and continuously | 0.913 (0.818-0.959) | |
| | 30 | I was sufficiently motivated to wear sunglasses daily for the past month | 0.861 (0.711-0.933) | |
| | 31 | I have used sunglasses daily and continuously over the past month | 0.867 (0.720-0.937) | |

*Contd...*

**Table 4: Contd...**

| Factor name | Item number | Description | ICC (95% CI) | ICC (95% CI) |
|---|---|---|---|---|
| Perceived susceptibility | 1 | I am not at risk for eye diseases and impairments because I have never experienced an eye problem | 0.964 (0.926-0.972) | 0.839 (0.732-0.913) |
| | 2 | The resilience and healthy features of my eyes have rendered them invulnerable | 0.970 (0.938-0.986) | |
| | 28 | I have planned to have my eyes examined by an ophthalmologist or optometrist at least every 2 years | 0.871 (0.732-0.938) | |
| Normative beliefs | 14 | I follow the advice of those around me and wear sunglasses | 0.751 (0.484-0.880) | 0.787 (0.678-0.831) |
| | 15 | My decision to wear sunglasses is determined by feedback from my neighbors | 0.727 (0.434-0.868) | |
| | 39 | Due to my environmental conditions, I have to use electronic devices with screens in a dim or dark places | 0.813 (0.612-0.910) | |
| Perceived severity | 5 | If I have an eye disease or impairment, my family members become anxious | 0.854 (0.697-0.930) | 0.804 (0.671-0.897) |
| | 6 | If I have an eye disease or impairment, my daily activities cease | 0.810 (0.601-0.910) | |
| | 7 | If I have an eye disease or impairment, I may lose total or partial vision | 0.911 (0.813-0.958) | |
| | 8 | The continuous and daily use of sunglasses bores me | 0.898 (0.786-0.952) | |

CI: Confidence interval

**Table 5: Instrument's items scoring**

| Item number | Likert scale (5-point) |
|---|---|
| | Strongly agree (score)-Strongly disagree (score) |
| 1 and 2 | 0-4 |
| 3-27 and 37-39 | 4-0 |
| - | Never (score)-Always (score) |
| 28-36 | 0-4 |

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