

# Assessment of Vision-Related Quality of Life in Dry Eye Patients

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**PURPOSE.** To determine vision-related quality of life (QoL) measured with the National Eye Institute Visual Function Questionnaire (NEI-VFQ) and the Ocular Surface Disease Index (OSDI) in dry eye patients, and establish potential correlations with the Zung Self Rating Anxiety Scales (SAS), the Zung Self Rating Depression Scales (SDS), ocular surface parameters, and sociodemographic measures.

**METHODS.** The comparative study included 87 dry eye patients and 71 healthy volunteers who visited the department of ophthalmology, Eye and Ear Nose and Throat (EENT) Hospital of Fudan University, Shanghai, China, between June 2009 and December 2009. Surveys were administered to participants to evaluate their sociodemographic characteristics and disease-related factors. Data collected from the NEI-VFQ and OSDI survey instruments were analyzed to identify potential differences between the dry eye group and the control group. Correlations with sociodemographic characteristics, clinical parameters, and psychological status were evaluated.

**RESULTS.** Compared with the control group, our patient group had lower (worse) NEI-VFQ scores for the subscales of general health, general vision, ocular pain, short distance vision activities, long distance vision activities, vision related social function, vision related mental health, vision related role difficulties, vision related dependency, and driving (all  $P < 0.05$ ), and higher (worse) OSDI composite and subscale scores of ocular symptoms, vision-related function, and environmental triggers (all  $P < 0.001$ ). Significant correlations were found between QoL scores and patient anxiety and depression levels.

**CONCLUSIONS.** Vision-related QoL in dry eye patients was impaired and was correlated with anxiety and depression, further implicating this condition as an important public health problem deserving increased attention and resources. (*Invest Ophthalmol Vis Sci.* 2012;53:5722–5727) DOI:10.1167/iov.11-9094

Dry eye is recognized as a growing public health problem, with a prevalence of 30.05% in people over the age of 20 in Shanghai.<sup>1</sup> Dry eye is characterized by nagging symptoms including watery eyes, burning or stinging, ocular grittiness, foreign body sensation, blurred vision, and photophobia,<sup>2–4</sup>

which have been reported to negatively impact patient quality of life (QoL),<sup>5–9</sup> including general quality of life<sup>5,7</sup> and vision-related daily life.<sup>6</sup>

Patient perception of QoL while coping with dry eye is an important factor to consider when planning and evaluating treatment interventions. Objective clinical measures only form part of the assessment that provides insight into patient experience, but does not provide the full scope of the experience.<sup>7</sup>

There are usually two categories of vision-related QoL instruments: generic, which are designed to be used for a broad spectrum of visual disorders and ocular disease, and disease-specific, which are tailored toward aspects of a specific ocular disorder.<sup>10</sup> In general, disease-specific instruments tend to be more sensitive in detecting vision-related QoL impairments, but the generic can provide a broader characterization of vision-related QoL.<sup>10</sup> If possible, both should be used to gain the full scope of information on patient status.<sup>10</sup> However, to the best of our knowledge, there are still few studies that investigate vision-related QoL in dry eye patients.<sup>6</sup> Herein, we conducted a comparative study focusing on vision-related QoL of dry eye patients using both generic and disease-specific QoL instruments. We also examined the associations between patient QoL scores with sociodemographic measures, clinical parameters, and patient psychological status.

## MATERIALS AND METHODS

### Study Design

This comparative study included 87 dry eye patients and 71 healthy volunteers who visited the department of ophthalmology at the Eye and Ear Nose and Throat (EENT) Hospital (Fudan University, Shanghai, PR China) from June 2009 to December 2009. Written informed consent was obtained from all subjects after being given a complete description of the study and ample opportunity to ask questions.

The medical outcomes study National Eye Institute Visual Function Questionnaire (NEI-VFQ) and Ocular Surface Disease Index (OSDI) were used to assess the vision-related QoL. The Zung Self Rating Anxiety Scales (SAS) and the Zung Self Rating Depression Scales (SDS) were used to evaluate the degree of anxiety and depression. Sociodemographic and clinical measures, and anxiety and depression measures, were also taken to establish potential correlations with vision-related QoL measures. The study protocol was approved by the ethics committee at Fudan EENT hospital and all principles outlined in the Declaration of Helsinki were followed in carrying out this research.

### Population Selection

Dry eye patients who were referred to the EENT Hospital between June 2009 and December 2009 were recruited if they were at least 18 years of age and had symptoms of dry eye for at least 3 months. The diagnostic criteria for dry eye included<sup>11</sup>: (1) a frequent or sustained occurrence of a burning sensation, gargalesia, foreign body sensation, sensation of stabbing pain, dryness, photophobia, or

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asthenopia, (2) a Schirmer test without anesthesia (SIT) value of less than 10 mm/5 minutes, and a tear break-up time (TBUT) of less than 10 seconds, and (3) positive corneal fluorescein staining. In the case that any two of the above three conditions were present, the subject was diagnosed with dry eye. We excluded patients who were diagnosed with Sjögren's syndrome and those who used tear supplements on the day that they participated in the study, as tear supplements may greatly influence patient visual acuity (VA) and survey scores.

The 71 control subjects consisted of volunteers being treated in the Department of Ophthalmology with refraction-related complaints (< -6.0 diopter [D]), and who met the following inclusion criteria: no symptoms of dry eye, a SIT value greater than 10 mm/5 minutes, and a TBUT greater than 10 seconds. We excluded subjects with ocular disease and subjects who used tear supplements in the month leading up to the study.

Subjects from either group who were using any medication with a potential risk for causing dry eye or a psychiatric disorder; subjects who had an uncontrolled systemic disease or disability that affected their daily activities (including ocular allergy, infection, or irritation that was not related to dry eye); subjects who had worn contact lenses in the past six months; subjects who had external ocular disease or had undergone ocular surgery within the last 6 months; subjects who were known to have an allergy to any component of any of the agents used in the study (e.g., fluorescein); or subjects who had undergone temporary or permanent punctal occlusion were excluded from participation in the study.

All subjects had corrected VA of 20/40 or better in each eye, were literate in Chinese, were willing and able to finish a series of questionnaires without significant assistance, and were willing to undergo clinical testing for dry eye as part of the study.

## Survey Instrument

The 25-item NEI-VFQ, is a non-disease-specific (i.e., generic) instrument designed to measure the impact of ocular disorders on vision-related QoL. A 14-item appendix was also administered to all subjects to enhance the reliability of various subscales of the 25-item NEI-VFQ. Thus, the NEI-VFQ used in our study contained 39 items and 12 domains, or subscales. The 12 domains were as follows: (1) general health, (2) general vision, (3) ocular pain, (4) difficulty with short distance vision activities, (5) difficulty with long distance vision activities, (6) vision related limitations in social functioning, (7) mental health symptoms related to vision, (8) vision related role difficulties, (9) vision related dependency, (10) vision related driving difficulties, (11) limitations with color vision, and (12) with peripheral vision. The standard algorithm was used to calculate the scale scores. Scores range from 0 to 100, with higher scores indicating better function. Eleven of the 12 scale scores (excluding the general health item) were averaged to yield a composite score.<sup>12</sup> The Chinese version of NEI-VFQ used in this study has been assessed for reliability and validity and it has been shown to accurately measure vision-related QoL in Chinese individuals.<sup>13-15</sup>

The OSDI, developed by Allergan, Inc., is a 12-item, patient reported outcome. It has been psychometrically tested and has been reported to be valid and reliable for quantifying the specific impact of dry eye on vision-related QoL.<sup>16</sup> Subjects were questioned with three different subscales; ocular symptoms, vision-related functions and limitations, and environmental triggers during a 1 week recall period. Each answer was scored based on frequency of symptoms using a 4-point scale from zero (indicating no problem) to four (indicating a significant problem). We have not found any published literature that validated the OSDI in a Chinese population, although it is widely used and accepted by ophthalmologists in China.<sup>17-19</sup>

Validation of the OSDI in a Chinese population was performed using Rasch analysis, which is a modern psychometric method used in healthcare research to evaluate and score survey instruments<sup>20</sup> to investigate the reliability and validity of questionnaires. We first assessed the presence of disordered thresholds, which indicate if

participants have difficulty discriminating between the response options of the scale. Content validity was assessed by the person separation index (PSI), which measures the ability of the scale to distinguish distinct levels of participant ability. A PSI of at least 2.0 and a person reliability score of at least 0.8 were considered acceptable. Targeting of the scale items is assessed by a person-item map, where the person and item measures are displayed on the same calibration ruler. Similarity in person and item means is considered good targeting. Unidimensionality was evaluated by item fit statistics and principal component analysis (PCA). Items with item infit mean square (MNSQ) within the range of 0.7 and 1.3 were considered acceptable. PCA analysis of Rasch residuals was used to investigate unidimensionality. Factors with eigenvalues greater than 2.0 were considered to be evident of significant multidimensionality.<sup>20</sup> The Rasch analysis was performed using Winsteps software (Version 3.74; Winsteps, Chicago, IL).

Following the questionnaires, NEI-VFQ and OSDI scores were evaluated with respect to the sociodemographic and clinical characteristics to determine if potential correlations existed. These QoL scores were also assessed for potential correlation with levels of anxiety and depression, which were measured with SAS<sup>21</sup> and SDS,<sup>22</sup> respectively. The Chinese versions of both scales have been validated and have been widely used to assess anxiety and depression associated with a wide range of diseases.<sup>23</sup> Subjects receiving converted scores of more than 50 on the SAS and SDS were considered to have symptoms of anxiety and depression, respectively.<sup>23</sup>

## Sociodemographic and Clinical Measures

Subject records were reviewed for sociodemographic data (name, sex, age, ethnicity, career, educational level, marital status, and household income), comorbidities, disease duration, and clinical data including visual acuity, corneal fluorescein staining, TBUT, and SIT. All ophthalmologic examinations were performed by the same ophthalmologist.

Tear film stability was assessed based on TBUT. A fluorescein-impregnated strip (Jingming, Tianjing, China) wetted with non preservative saline solution was placed in the lower conjunctival sac and the patient was asked to blink several times. Using the cobalt blue filter and slit lamp biomicroscopy, the time required to observe the first area of tear film breakup after a complete blink was recorded as the TBUT. The test was repeated three times and the average of the measurements was calculated.

A Schirmer 1 test of tear secretion function without anesthesia was performed by inserting a Schirmer tear test strip (30 mm; Jingming) into the inferior fornix, at the junction of the middle and lateral third of the lower eyelid margin, for 5 minutes with eyes closed. The extent of wetting was measured according to the scale provided by the manufacturer. Potential scores range from 0 to 30 mm, with lower scores indicating reduced function.

## Statistical Analysis

Data were analyzed using the Stata 9.0 software package (StataCorp, College Station, TX) and reported as means  $\pm$  SD or medians. Comparison of continuous variables was done by a Kruskal-Wallis test and the Mann-Whitney *U* test. Statistical analysis of categorical variables was performed using the  $\chi^2$  test. Linear regression was used to adjust for the selected covariate (age) to control for potentially confounding factors, by holding the selected covariate constant and then observing the association of the dependent variable and the independent variable. Associations of QoL scores (NEI-VFQ/OSDI) with sociodemographic, clinical (right eye was selected), and psychological measures were examined by Spearman's rank correlation test. For the OSDI, Rasch transformed scores were used in analysis. A higher person measure (in logits) suggests a higher level of the measured latent trait (worse vision-related functioning). Statistical significance level was set at 0.05.

**TABLE 1.** Comparison of Sociodemographic and Clinical Data between the Patient and the Control Group

Characteristics	Patients (n = 87)	Controls (n = 71)	P Value
Age (mean ± SD, y)	40.6 ± 10.9	35.7 ± 9.3	0.0036†
Range of age (y)	18–59	23–59	
Sex, n (%)			0.203‡
Male	17 (19.54%)	20 (28.17%)	
Female	70 (80.46%)	51 (71.83%)	
Marital status, n (%)			0.966‡
Married	70 (80.46%)	56 (78.87%)	
Single	16 (18.39%)	14 (19.72%)	
Divorced	1 (1.15%)	1 (1.41%)	
Duration of disease (m)	3.04 ± 3.06	0	
TBUT (right eye)*	4 (3–7)	11 (10–12)	<0.0001§
TBUT (left eye)*	4 (3–7)	11 (10–12)	<0.0001§
SIT (right eye)*	4 (2–6)	11 (10–14)	<0.0001§
SIT (left eye)*	4 (1–7)	11 (10–15)	<0.0001§
Corneal fluorescein staining (right eye)	0 (0–1)	0 (0–0)	<0.0001§
Corneal fluorescein staining (left eye)	0 (0–1)	0 (0–0)	<0.0001§

\* Median (P25 to P75).

† Two-sample *t*-test.‡ Pearson  $\chi^2$  test.

§ Wilcoxon rank sum test.

## RESULTS

### Baseline Demographics

Table 1 summarizes the baseline demographics and clinical variables of the 87 patients and 71 healthy volunteers in this study. The mean age ( $\pm$ SD) of the patient group at the time of enrollment was 40.6  $\pm$  10.9 years (range 18 to 59 years) and 35.7  $\pm$  9.3 years (range 23 to 59 years) for the control group, showing a statistically significant difference ( $P = 0.0036$ ). No statistically significant differences between the patient and control group were detected in other demographic data including sex and marital status. A statistically significant difference was detected between the dry eye group and

control group for ophthalmologic data, including TBUT, SIT, and corneal fluorescein staining (Table 1).

### Psychometric Validation of the Chinese Version of OSDI Questionnaire

Rating scale analysis showed that the average logit measures for the five rating scale categories increased monotonically with rating scale from  $-1.46$  to  $0.38$  logit. The average logit measures were all close to those predicted by the Rasch model. All the categories had outfit MNSQ values less than 2.0.<sup>24</sup> Therefore, there was no evidence of disordered thresholds indicating that the number of response categories was appropriate and participants were able to discriminate between them. The PSI and the person reliability scores were 2.12 and 0.82, respectively, suggesting that the OSDI can adequately discriminate between participants. The participants' mean  $\pm$  SD overall score was  $-1.20 \pm 1.57$  logits. Visual inspection of the person-item map indicated that the targeting of the OSDI is not ideal, as the participants had an ability level higher than the level of most of items. Item fit statistics showed that one item (item 5, poor vision) with infit MNSQ of 1.34 was found slightly higher than the acceptable range. Finally, PCA analysis of residuals indicated that multidimensionality was detected, with first contrast eigenvalue of 2.1 (9.7% of the total variance) and the second contrast eigenvalue of 2.1 (9.4%). Taken together, the Chinese version of OSDI is a valid, reliable tool to evaluate the impact of vision-related function on patients.

### Comparison of NEI-VFQ Scores between the Patient Group and the Control Group

As shown in Table 2, in all categories of NEI-VFQ except color vision and peripheral vision, the patient group scored significantly lower (worse) than the control group (all  $P < 0.05$ ), indicating that dry eye patients perceived greater suffering than the controls for the subscales of general health, general vision, ocular pain, short distance vision activities, long distance vision activities, vision related social function, vision related mental health, vision related role difficulties, vision related dependency, and driving.

**TABLE 2.** Comparison of NEI-VFQ/OSDI/SAS/SDS Scores between the Patient Group and the Control Group

Scale*	Patient Group	Control Group	P Value
General health	47.50 (37.50–62.50)	65.0 (60.0–77.5)	<0.0001
General vision	60 (50–70)	75.0 (65.0–85.0)	<0.0001
Ocular pain	62.5 (37.5–62.5)	87.5 (75.0–100)	<0.0001
Short distance vision activities	87.50 (75–100)	100 (95.8–100)	<0.0001
Long distance vision activities	91.67 (79.17–100)	100 (91.67–100)	<0.0001
Social function	100 (91.67–100)	100 (100–100)	0.0005
Mental health	70 (55–90)	95.0 (90.0–100)	<0.0001
Role difficulties	75 (56.25–87.5)	100 (87.5–100)	<0.0001
Dependency	87.5 (62.5–100)	100 (93.75–100)	<0.0001
Driving	83.33 (54.17–91.67)	83.33 (83.33–100)	0.0326
Color vision	100 (100–100)	100 (100–100)	0.1966
Peripheral vision	100 (100–100)	100 (100–100)	0.0519
Composite NEI-VFQ score	80.04 (71.59–86.96)	94.13 (89.71–96.67)	<0.0001
Composite OSDI score	$-0.26$ ( $-0.77$ to $-0.23$ )	$-1.64$ ( $-3.36$ to $-1.1$ )	<0.001
Ocular symptoms	$-0.56$ ( $-1.14$ to $-0.14$ )	$-2.2$ ( $-4.46$ to $-1.2$ )	<0.001
Vision-related function	$-0.37$ ( $-1.47$ – $0.46$ )	$-4.05$ ( $-4.29$ to $-1.7$ )	<0.001
Environmental triggers	$-0.63$ ( $-1.83$ – $1.17$ )	$-2.9$ ( $-4.35$ to $-1.12$ )	<0.001
SAS	46.0 $\pm$ 9.3	39.7 $\pm$ 7.5	<0.001
SDS	49.3 $\pm$ 11.3	41.3 $\pm$ 9.2	<0.001

\* Adjusted age by linear regression model.

TABLE 3. Correlations of NEI-VFQ Scores with Sociodemographic/Clinical Parameters/Psychological Status in the Dry Eye Group (Spearman)

	Age	Duration	VA	TBUT	SIT	SAS	SDS
General health	-0.1779	-0.0994	0.1493	0.1592	0.1533	-0.3447*	-0.3707*
General vision	-0.1092	0.0029	0.3319*	-0.0224	0.0873	-0.2701*	-0.2566*
Ocular pain	-0.0792	-0.1532	0.0584	-0.2399*	-0.0027	-0.2873*	-0.2904*
Short distance vision activities	-0.4052*	-0.2135*	0.0885	-0.1007	-0.2356*	-0.3114*	-0.3338*
Long distance vision activities	0.0306	-0.0117	-0.0824	-0.1382	-0.2356*	-0.2444*	-0.2721*
Social function	0.0472	-0.0058	-0.0670	-0.0723	-0.1868	-0.4002*	-0.3685*
Mental health	0.0065	0.0014	0.0604	-0.0953	-0.0245	-0.4541*	-0.4542*
Role difficulties	-0.1276	-0.1051	-0.0120	-0.1726	-0.0310	-0.2802*	-0.2105*
Dependency	-0.0192	0.0529	-0.0417	-0.1911	0.6056	-0.3334*	-0.3316*
Driving	-0.2004	0.1258	0.2405	0.1870	-0.1923	-0.2108	-0.2901
Color vision	0.0273	-0.0891	-0.0689	0.0324	0.1369	-0.2164	-0.1291
Peripheral vision	0.0663	-0.0604	-0.1972	-0.1070	-0.0684	-0.3496*	-0.2387*
Composite NEI-VFQ score	-0.0907	-0.0937	0.0082	-0.1670	-0.044	-0.4701*	-0.4260*

\* P < 0.05 statistically significant.

**Comparison of OSDI Scores between the Patient Group and the Control Group**

The median (P25–P75) values of the composite score of OSDI for patient and control group were -0.26 (-0.77 to -0.23) logits and -1.64 (-3.3 to -1.1) logits, respectively. Results showed that the patient group had significantly higher (worse) scores compared with the control group for the composite scores of OSDI and its three subscales; ocular symptoms, vision-related function, and environmental triggers (all P < 0.001) (Table 2). This indicates that dry eye patients perceived suffering more impairment in vision-related QoL.

**Comparison of SAS/SDS Scores between the Patient Group and the Control Group**

The results of the psychological status of the two groups were presented in Table 2. After statistical correction of baseline covariate (age), both the SAS and SDS scores of the dry eye group were significantly higher than those of the control group (both P < 0.001).

**Correlations between Overall Scores and Sociodemographic and Clinical Parameters**

Results of Spearman’s rank correlation test showed weak or nonexistent correlations between vision-related QoL scores (NEI-VFQ/OSDI) and key variables (age, duration of disease, TBUT, SIT, VA) (Tables 3 and 4).

**Correlations between Overall Scores and Psychological Status**

Results of Spearman’s rank correlation test showed that correlations were found between vision-related QoL scores (NEI-VFQ/OSDI) and patient-reported anxiety and depression scores (SAS/SDS) (Tables 3 and 4). The composite OSDI scores and its three subscale scores were positively correlated with

the SAS/SDS scores (all P < 0.05). The composite NEI-VFQ score and the 12 subscales, with the exceptions of driving and color vision, were all negatively correlated with SAS/SDS scores (all P < 0.05), demonstrating that patient perception of QoL was correlated with patient psychological status.

**DISCUSSION**

Increasing research attention and funding has been directed to the assessment of patient-centered outcomes, most prominently QoL.<sup>7,25</sup> This evaluation is important for obtaining a more complete understanding of the effects of treatments and the natural history of disease on an individual’s daily routine. Miljanovic et al.<sup>6</sup> evaluated the impact of dry eye on vision-related QoL in the Women’s Health Study and Physicians’ Health Study by sending a supplementary questionnaire asking how much everyday activities were limited by symptoms of dry eye, and to what degree eye problems limited reading, driving, working at the computer, professional activity, and watching television. Mertzanis et al.<sup>7</sup> assessed the general health related QoL of dry eye patients with Short Form 36, which contains questions that are not specific to dry eye. Schiffman et al.<sup>5</sup> assessed dry eye patient QoL with a time trade off method. Although the definition of dry eye and the survey instruments used between studies were different, they detected reduced QoL in the dry eye population. In our study, we used the NEI-VFQ, a generic vision-related QoL instrument, and the OSDI, a dry eye-specific instrument, to gain a full scope of information on patient status. The NEI-VFQ incorporates questions addressing both the frequency and intensity of symptoms and their impact on activities with no specified recall period, while OSDI queries the frequency of a symptom or difficulty with an activity over a 1 week recall period. The combination of the generic and disease specific questionnaires gave a more comprehensive picture of vision-related quality of life than used in previous studies.

TABLE 4. Correlations of OSDI Scores with Sociodemographic/Clinical Parameters/Psychological Status in the Dry Eye Group (Spearman)

	Age	Duration	VA	TBUT	SIT	SAS	SDS
Composite score	-0.0344	0.1147	-0.1079	0.1134	0.1852	0.2862*	0.2589*
Ocular symptoms	0.0637	0.1777	-0.1666	0.0444	-0.0009	0.1446	0.2532*
Vision-related function	-0.0401	0.0681	-0.0564	0.1194	0.2518*	0.3081*	0.2295*
Environmental triggers	-0.0569	0.0526	-0.0241	0.1372	0.2231*	0.2245*	0.2056*

\* P < 0.05 statistically significant.

In our study, both NEI-VFQ and OSDI questionnaires detected reduced vision-related QoL in dry eye patients as compared with healthy individuals. The composite NEI-VFQ score was similar to those reported in Sjögren's syndrome-related dry eye.<sup>10</sup> The domain scores were similar to or lower than those reported in studies assessing patients with other chronic diseases, such as keratoconus patients after penetrating keratoplasty, with the exceptions of short distance vision activities, long distance vision activities, vision-related social functioning, driving, and color vision.<sup>25</sup>

In this study, no statistically significant differences were observed in the color vision and peripheral vision domains of the NEI-VFQ between dry eye and control groups. This was expected, as dry eye has little impact on the fundus, which is involved in both color vision and peripheral vision.

We did not find a correlation between QoL scores and duration of dry eye disease. An explanation for this lack of correlation might be the relatively short disease duration in our patient group (mean  $\pm$  SD,  $3.04 \pm 3.36$  years).

Correlations of QoL (NEI-VFQ/OSDI) with ocular surface parameters (BUT, SIT) tended to be weak or nonexistent, consistent with several other studies demonstrating poor correlations between quantitative and perceptual measures of dry eye.<sup>8,26,27</sup> As QoL measures reflect patient perception of the impact of dry eye, they should be used in conjunction with clinical measures to observe the full scope of the patient experience.

As expected, correlations between QoL scores (NEI-VFQ/OSDI) and psychological status (SAS, SDS) were detected, indicating that patient psychological status and perception of QoL are related. However, this result should be interpreted with caution due to the weak or moderate correlations. In our previous work,<sup>28</sup> we found that dry eye patients are more anxious and depressed than those without dry eye. In the psychiatric clinical setting, anxiety and depression disorders are the most common diseases encountered, so they can be identified easily and treated. However, in nonpsychiatric clinical settings, diagnosis of anxiety and depression is not easily and rapidly made by health professionals. Therefore, if additional professional help is necessary, patients should be referred to a psychiatrist for an in depth consultation and proper treatment strategies.

There are several limitations of this study. First, the mean age of the control group was significantly less than that of the dry eye group. When recruiting control subjects, we noted that those of a younger demographic were more willing to participate in our study. To account for this we used a linear regression to control for this potentially confounding factor. Secondly, the control group included subjects with refraction-related complaints, which potentially had a negative impact on QoL. Finally, although the OSDI questionnaire demonstrated adequate ability to distinguish between participants, multidimensionality and suboptimal targeting were detected. Therefore, future studies should pay attention to these issues to ensure unidimensionality and better targeting. Despite the fact that dry eye is usually not sight-threatening, findings of the present study indicate that dry eye is associated with an adverse impact on vision-related QoL, which is correlated with anxiety and depression symptoms. These data add further weight to the consideration of dry eye as a significant public health problem that merits further study.

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