Relationship Between Self-reported Depression and Self-reported Visual Function in Latinos

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**Objective:** To validate and assess the relationship between self-reported depression as measured by a single item on the Medical Outcomes Study Short-Form 12 (SF-12) and self-reported visual function.

**Methods:** The Los Angeles Latino Eye Study is a population-based and designed to assess the prevalence of visual impairment, ocular disease, and visual functioning in Latinos. Both the 25-item National Eye Institute–Visual Function Questionnaire (NEI VFQ-25) (self-reported visual function) and the SF-12 (health-related quality of life) were administered. A single item from the SF-12 was used to measure self-reported depression and validated against the Center for Epidemiologic Studies–Depression measure of depression. Covariate-adjusted NEI VFQ-25 subscale scores were contrasted across the 6 response choices of the SF-12, as well as across 3 combined response categories of the SF-12 using analysis of covariance. Covariate-adjusted regression analyses assessed the contribution of self-reported depression in explaining self-reported visual function.

**Results:** The sensitivity and specificity of the SF-12 single item with the Center for Epidemiologic Studies–Depression measure was 0.96 and 0.50, respectively. Using the 3 combined response categories of the SF-12 single item, it was found that (1) all covariate-adjusted subscales of the NEI VFQ-25 were statistically significantly different across the self-reported depression categories (P<.001) and (2) covariate-adjusted self-reported depression was a significant predictor of self-reported visual function (P<.001).

**Conclusions:** A single SF-12 item may be used as a measure of self-reported depression. In addition, self-reported depression is an important covariate to consider when assessing self-reported visual function in Latinos.

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of the questionnaire and participant burden need to be considered. The objectives of this article are to assess (1) whether a single item of the Medical Outcomes Study Short-Form 12 (SF-12) can be used as a measure for self-reported depression in Latinos and (2) whether self-reported depression measured with the one item of the SF-12 is associated with self-reported visual function as measured by the 25-item National Eye Institute–Visual Function Questionnaire (NEI VFQ-25). This research will assist in determining in situations in which the administration of lengthy detailed questionnaires is impossible, whether a simple measure of depression can and should be used to adjust the levels of self-reported visual function.

METHODS

STUDY DESIGN

The study cohort consisted of a sample of participants recruited for the LALES. The study design of the LALES has been described elsewhere.16 In brief, the LALES is a population-based prevalence survey of ocular disease in noninstitutionalized, self-identified Latinos, aged 40 years and older living in and around the city of La Puente, Calif. The study protocol was approved by the institutional review board at the University of Southern California, Los Angeles, and followed the recommendations of the Declaration of Helsinki. Informed consent was obtained at the participants’ home before enrolling the participant in the study. After informed consent was obtained, an in-home interview was conducted to determine demographic and other information regarding ocular and medical conditions, risk factors, and access to medical and ocular care. Specifically, data from the in-home interview included age, sex, country of birth, acculturation, working status, educational level, marital status, total household income level, comorbidities, medical and vision insurance, and satisfaction with current vision. The 9-item Cuellar Acculturation scale was used to measure acculturation (which ranged from 1 [lowest acculturation] to 5 [highest acculturation]).17 The number of comorbid medical conditions was the summation of a list of 13 medical conditions including angina, asthma, arthritis, heart attack, heart failure, skin cancer, other cancer, back problems, hearing problems, hypertension, diabetes mellitus, stroke and/or brain hemorrhage, and other major health problems.

A subsequent detailed eye examination, including visual acuity testing, was performed in a standardized manner at the LALES Local Eye Examination Center, La Puente. Presenting distance visual acuity for each LALES participant was measured for each eye with the presenting correction (if any) at 4 m using the Early Treatment Diabetic Retinopathy Study distance charts (Precision Vision, La Salle, Ill) transilluminated with the Early Treatment Diabetic Retinopathy Study illuminator cabinet (Precision Vision). Visual impairment was defined as binocular presenting distance visual acuity of 20/40 or worse. Also assessed at the clinic were self-reported, health-related quality of life using the SF-12, and vision-related quality of life using the NEI VFQ-25.18,19 Interviews were conducted in a standardized manner in the language of each participant’s choice, either English or Spanish, and administered by trained interviewers prior to the eye examination.

MEASUREMENT AND VALIDATION OF SELF-REPORTED DEPRESSION FROM THE SF-12

For this study, a single question about depression from the SF-12 was used to determine the presence and magnitude of self-reported depression. Previous studies have indicated that this question can be used as an indicator of depression.20 This single question asks how often a person has felt “downhearted and blue” during the last 4 weeks. The 6 response choices are (1) all of the time, (2) most of the time, (3) a good bit of the time, (4) some of the time, (5) a little of the time, and (6) none of the time.

We assessed the criterion validity of the response categories of the single item of the SF-12 against the standard criterion, namely, the Center for Epidemiologic Studies-Depression (CES-D) measure of depression, in a convenience sample of 76 LALES participants stratified by their SF-12 responses.21 The CES-D instrument was developed to assess depressive symptoms (both somatic and affective) in epidemiologic studies, and it has been used in numerous epidemiologic studies in Latinos.22-26

We first assessed the sensitivity and specificity of the single SF-12 item with the CES-D. To this end, we categorized participants on the SF-12 item as “not depressed” (response choice 6) and “depressed” (response choices 1-5). Using the standard criterion for the CES-D, we categorized participants as not depressed (CES-D score <16) or depressed (CES-D score ≥16).27 The sensitivity (rate of true-positive results) was calculated (as depressed most of the time or some of the time on the SF-12, divided by the total number of responses of depressed on the CES-D), and the specificity (rate of true-negative results) was calculated (as depressed none of the time on the SF-12, divided by not depressed on the CES-D).

Next, we assessed the linear association of the 6 response choices of the SF-12 single-item score with the CES-D score using correlation analysis and contrasted average CES-D scores across the 6 choices of the SF-12 question employing analysis of variance with pairwise comparisons using the Tukey Honestly Significant Difference procedure. We also conducted these analyses across 3 revised categories of the SF-12 depression question defined as most of the time (response choices, 1, 2, or 3), some of the time (response choices, 4 or 5), and none of the time (response choice, 6).

MEASUREMENT OF SELF-REPORTED VISUAL FUNCTION

Self-reported visual function was measured using the NEI VFQ-25. The NEI VFQ-25 is composed of 25 questions that fall into 12 vision-specific subscales (General Health, General Vision, Near Vision, Distance Vision, Ocular Pain, Vision-Related Social Function, Vision-Related Role Function, Vision-Related Mental Health, Vision-Related Dependency, Driving Difficulties, Color Vision, and Peripheral Vision). Self-reported visual function for each subscale ranges from 0 to 100, with 100 representing the best possible self-reported visual functioning, and 0, the worst possible.

STATISTICAL ANALYSES

The demographic profile, acculturation, and visual impairment of the study participants were compared across categories of self-reported depression using the χ² test for discrete variables and analysis of variance for continuous variables. The average NEI VFQ-23 subscales were contrasted across the categories of self-reported depression using analysis of covariance, and post hoc pairwise comparisons between categories of self-reported depression used the Tukey Honestly Significant Difference. Covariates were factors that have previously been found to be associated with self-reported visual functioning (age, acculturation, sex, comorbidities, income level, visual impairment, working status, marital status, and educational level). Finally, 2 multiple regression models were assessed to evaluate the contribution of self-reported depression in estimating the association with the NEI VFQ-25 subscales. The first model related self-reported visual functioning to the covar-
ates listed earlier. The second model included self-reported depression as well as the covariates. The statistical significance of self-reported depression as a predictive variable, given the covariates, was evaluated using the F test for the partial correlation coefficient. All analyses used SAS software Version 8 (SAS Institute, Cary, NC). Statistical significance was set at $P<.05$.

## RESULTS

### OBJECTIVES

**Objective 1: Validation of SF-12 Single Item**

In our sample of 76 participants, using the single item of the SF-12, 25 participants (33%) and 51 participants (67%) were classified as being not depressed or depressed, respectively. Using the standard cutoff of 16 for the CES-D, 28 participants (37%) and 48 participants (63%) were classified as being not depressed or depressed, respectively. The sensitivity (rate of true-positive results) was 96%; the specificity (rate of true-negative results) was 50%.

When analyzing the 6 response choices of the SF-12 item, we found a significant correlational relationship with the CES-D ($r=-0.58$, $P<.001$). The mean CES-D scores increased from 10.1 to 22.0 across the 6 categories of the SF-12 measure of self-reported depression ($P<.001$). However, Tukey Honestly Significant Difference multiple pairwise comparisons indicated an overlap in CES-D means between pairs of SF-12 response choices. In contrast, in the 3-category analyses, not only was there a significant correlation with the CES-D scores ($r=-0.61$, $P<.001$), as well as significant differences in means across the 3 categories of the SF-12 ($P<.001$), but there was also no overlap in the CES-D means between pairs of SF-12 response categories (Table 1). Based on these analyses, all subsequent analyses will be presented for 3-category distribution of the depression item of the SF-12.

**Objective 2: Association of Self-reported Depression With Self-reported Visual Function**

For this objective, the cohort consisted of 1916 participants recruited from 2 US Bureau of the Census tracts who completed both the in-home questionnaire and clinic questionnaire and examination. The mean (SD) age was 55 (11.2) years. Fifty-eight percent of the participants were female, 76% were born outside of the United States, 48% were employed, 65% had completed less than a high school education, 69% were married, 46% had an annual household income below $20000, 45% had 2 or more comorbidities, 9% had varying degrees of visual impairment, 65% had medical insurance, 49% had vision insurance, and 43% were either very satisfied or satisfied with their current vision. In this cohort, 281 (15%) of the participants were depressed most of the time, 882 (46%) were depressed some of the time, and 753 (39%) were never depressed.

An additional 708 subjects completed only the in-home questionnaire but not the clinic interview and examination. Because data on the SF-12 and NEI VFQ-25 were unavailable for these subjects, they were excluded from the study cohort and are regarded as nonparticipants. Participants and nonparticipants were similar for sex, educational level, health insurance, spoken language, comorbidities, visual impairment, satisfaction with their vision, and overall health status. In contrast with participants, nonparticipants were younger ($P<.001$), more likely not to have vision insurance, and more likely to be working ($P<.006$).

### DEMOGRAPHIC DIFFERENCES ACROSS SELF-REPORTED DEPRESSION CATEGORIES

No statistically significant differences were found across the 3 categories of self-reported depression for age, acculturation, country of birth, level of visual impairment, medical insurance, and vision insurance (Table 2). In contrast, statistically significant differences were found across the categories for sex, educational level, working status, marital status, income level, number of comorbidities, and satisfaction with current vision ($P<.05$). Study participants who reported being depressed most of the time were more likely to be female, unemployed, had less than a high school education, were married, had an annual household income below $20000, reported having 2 or more comorbidities, and were more dissatisfied with their vision.

### NEI VFQ-25 SCORE DIFFERENCES ACROSS SELF-REPORTED DEPRESSION CATEGORIES

The mean scores for all (covariate-adjusted) subscales of the NEI VFQ-25 were statistically significantly different across the 3 groups of self-reported depression ($P<.001$, Table 3). Tukey Honestly Significant Difference pairwise comparisons revealed that all pairwise comparisons of self-reported visual function subscales between categories of self-reported depression were statistically significantly different (ranging from $P=.04$ to $P<.001$). For all NEI VFQ-25 subscales, the mean scores were highest (ie, better self-reported visual functioning) in the group with no self-reported depression and the mean NEI VFQ-25 scores were lowest in the group with depression being reported to be present most of the time. The following subscales with more than 10 points' difference between mean NEI VFQ-25 subscale scores in the 2 extreme categories of self-reported depression were: Vision-Related Depen-

### Table 1. Relationship Between Single-Item Medical Outcomes Study Short-Form 12 (SF-12) Depression Question and Center for Epidemiologic Studies-Depression (CES-D) Scores$

<table>
<thead>
<tr>
<th>SF-12 Question on Depression$</th>
<th>Overall, No. (%) of Participants (N = 76)</th>
<th>Mean CES-D Score, No. (%)‡</th>
</tr>
</thead>
<tbody>
<tr>
<td>None of the time</td>
<td>25 (32.8)</td>
<td>Most of the time (N = 30 (39.4))</td>
</tr>
<tr>
<td>Some of the time</td>
<td>30 (39.4)</td>
<td>Some of the time (N = 25 (32.8))</td>
</tr>
<tr>
<td>Most of the time</td>
<td>21 (27.6)</td>
<td>None of the time (N = 21 (43.7))</td>
</tr>
</tbody>
</table>

*For this analysis, the 6 possible responses to the SF-12 item, “How much of the time during the past 4 weeks have you felt downhearted and blue?” were collapsed and recoded into 3 categories: “Most of the time” (response choices 1, 2, or 3), “Some of the time” (response choices 4 or 5), and “None of the time” (response choice 6).

1 A CES-D score of 16 or higher is considered “depressed.”

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Adjusted regression analyses for each of the subscales were then completed to assess the effect of self-reported depression on the model that included the standard covariates (Table 4). Model 1 explained from 7% to 21% ($r^2 \times 100$) of the variation in NEI VFQ-25 subscale scores. Compared with the model with standard covariates (model 1), the addition of the depression variable (model 2) improved the model for each of the 12 subscales as reflected by the increase in the proportion of variation explained by the second model. The change in $r^2$ was statistically significant for all 12 subscales ($P < .001$). Of the 12 subscales, Vision-Related Mental Health had the greatest increase in $r^2$ (6%). The addition of self-reported depression to the Near Vision subscale increased the explainable variation by 5%.

**COMMENT**

**ASSOCIATION BETWEEN SELF-REPORTED DEPRESSION AND SELF-REPORTED HEALTH-RELATED QUALITY OF LIFE**

This study was stimulated by an observation at the LALES clinic that participants who seemed to be depressed consistently gave responses that were at the lower end of the visual function scale despite the fact that many of them had normal visual acuity. This observation was also reinforced by previous studies that have shown a strong association between depressive symptoms and scores of overall mental health. The results of the study suggest that depression significantly influences the perceived quality of life in patients with vision loss.
self-reported, health-related quality of life and functioning.1,10 This inverse association between higher levels of depression and lower self-reported functioning scores has also been found in patients with different diseases.13,15,30,47 For example, depression seems to be one of the variables having a significant influence on disease-specific quality of life and functioning in patients with Parkinson disease,48 cardiovascular disease,46,49 and Paget disease.47

In addition, depression has been shown to be prevalent among older persons with impaired vision. Both Rovner et al14 and Brody et al15 discuss the fact that depression seems to affect visual function in older people with age-related macular degeneration. Depression also seemed to be a more powerful predictor of functional disability than any other comorbid condition, including the severity of vision loss in a random community sample of noninstitutionalized persons aged 68 years and older.50-52

**DESCRIPTON OF THE ASSOCIATION BETWEEN SELF-REPORTED DEPRESSION AND SELF-REPORTED VISUAL FUNCTION IN LATINOS**

For our analysis of the association between self-reported depression and self-reported visual function, we included all LALES participants from 2 census tracts; most of these participants had no evidence of visual impairment (91%). In addition, the prevalence of self-identified depression (depressed most of the time) was low and was similar to other population-based surveys of Latinos (14% in LALES compared with 19% in other studies).25,26,53,54 Thus, despite this low prevalence of visual impairment and self-reported depression, the presence of self-reported depression was significantly associated with decreased self-reported visual function. Participants who scored higher on the NEI VFQ-25 (better self-reported visual functioning) reported lower levels of depression (none of the time). This inverse association between self-reported depression and self-reported visual function remained significant even though visual impairment was similar across the 3 groups of self-reported depression, and after adjusting for covariates. Also, the NEI VFQ-25 subscales showed statistically significant decrements when compared with different categories of self-reported depression. Many of these differences were not only statistically significantly different, on a pairwise basis, but they were also clinically meaningful since they had a 10-point difference in the mean scores across the extreme categories of self-reported depression (depressed most of the time to depressed none of the time) (Table 3). Additionally, the increase in explanation of the variation in visual functioning subscale scores resulting from the addition of our measure of self-reported depression to the regression analysis was large (13% to 63%) (Table 4).

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**Table 3. Adjusted Mean Scores of 25-Item National Eye Institute Visual Function Questionnaire Subscales Stratified by Self-reported Depression on the Medical Outcomes Study Short-Form 12 (SF-12) (Recoded as 3 Categories)**

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Most of the Time (n = 281)</th>
<th>Some of the Time (n = 882)</th>
<th>None of the Time (n = 753)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color Vision</td>
<td>90.4 (0.89)</td>
<td>89.4 (0.68)</td>
<td>94.2 (0.70)</td>
</tr>
<tr>
<td>Vision-Related Dependency†</td>
<td>79.1 (1.21)</td>
<td>89.4 (0.68)</td>
<td>94.2 (0.70)</td>
</tr>
<tr>
<td>Driving Difficulties†</td>
<td>83.7 (1.35)</td>
<td>86.8 (0.70)</td>
<td>90.4 (0.68)</td>
</tr>
<tr>
<td>Distance Vision†</td>
<td>78.4 (1.08)</td>
<td>84.5 (0.61)</td>
<td>89.6 (0.66)</td>
</tr>
<tr>
<td>General Health†</td>
<td>40.2 (1.35)</td>
<td>46.7 (0.76)</td>
<td>53.8 (0.82)</td>
</tr>
<tr>
<td>General Vision</td>
<td>65.3 (1.01)</td>
<td>67.16 (0.57)</td>
<td>71.8 (0.62)</td>
</tr>
<tr>
<td>Vision-Related Mental Health†</td>
<td>66.2 (1.31)</td>
<td>75.1 (0.74)</td>
<td>82.4 (0.80)</td>
</tr>
<tr>
<td>Near Vision†</td>
<td>70.4 (1.27)</td>
<td>78.1 (0.71)</td>
<td>84.8 (0.78)</td>
</tr>
<tr>
<td>Ocular Pain†</td>
<td>68.8 (1.26)</td>
<td>76.1 (0.71)</td>
<td>82.6 (0.77)</td>
</tr>
<tr>
<td>Peripheral Vision†</td>
<td>81.7 (1.26)</td>
<td>86.8 (0.71)</td>
<td>91.2 (0.76)</td>
</tr>
<tr>
<td>Vision-Related Role Function†</td>
<td>76.5 (1.31)</td>
<td>86.1 (0.74)</td>
<td>92.3 (0.80)</td>
</tr>
<tr>
<td>Vision-Related Social Function</td>
<td>88.8 (0.86)</td>
<td>93.9 (0.49)</td>
<td>96.0 (0.53)</td>
</tr>
<tr>
<td>Composite: Mean of q1-q25†‡</td>
<td>73.9 (0.83)</td>
<td>81.2 (0.47)</td>
<td>86.7 (0.51)</td>
</tr>
</tbody>
</table>

*Data are given as mean (SEM). For this analysis, the 6 possible responses to the SF-12 item, “How much of the time during the past 4 weeks have you felt downhearted and blue?” were collapsed and recoded into the following 3 categories: Most of the time” (response choices 1, 2, or 3), “Some of the time” (response choices 4 or 5), and “None of the time” (response choice 6). Analysis of covariance was used to compare covariate-adjusted mean subscale scores across groups of self-reported depression. Covariates were age, acculturation, sex, number of comorbidities, annual income, visual impairment, working status, marital status, and educational level. All subscale scores were statistically significantly different across all 3 categories of self-reported depression ($P < .001$). Tukey pairwise comparisons for all subscales except General Vision revealed statistically significant differences between all pairs of categories of self-reported depression ($P < .05$). †Denotes subscales with a 10-point or more difference between the means for “None of the time” vs “Most of the time” categories of self-reported depression.

‡q1-q25 indicates question 1 through question 25 of the 25-item National Eye Institute–Visual Function Questionnaire.
POSSIBLE EXPLANATIONS FOR THIS ASSOCIATION

One possible explanation for this observation is that both depression and visual function are related constructs in health-related quality of life and visual function instruments. In our study, measures of self-reported depression and self-reported visual function both contain questions about the inability to function; therefore, higher depression scores might correlate with lower functioning scores. Many of the visual function scales in the NEI VFQ-25 also have a mental component. For example, one question on the NEI VFQ-25 is: “How much of the time do you worry about your eyesight?” Additionally, decreased affect also influences function as demonstrated by the decline in the Near Vision subscale, which is based on a functional inventory. Another explanation for the relationship between self-reported depression and self-reported visual function might be that diminished self-esteem and depression and negative feelings could have an effect in both self-reported depression and visual function since both are subjective perceptions. A depressed subject with a certain level of disability might score lower on his or her self-reported visual function since his or her own perception of health is worsened by depression. Therefore, as an individual's self-perception of his or her health decreases, the magnitude of self-reported depression will increase along with a decrease in the visual functioning scores.

INSTRUMENTS TO ASSESS DEPRESSION AND VALIDATION OF THE USE OF ONE SINGLE ITEM OF THE SF-12

Although there are a variety of instruments that can be used to assess depression, there is no agreement as to which one is the most optimal. Studies have used the CES-D, Beck Depression Inventory, and the Hamilton Rating Scale for Depression. The State-Trait Anxiety Inventory and the Hopelessness Inventory can also assess self-evaluated mood. All of these instruments are scored to provide an estimate of perceived level of anxiety or depression of the individual. However, none of them have been validated in Latinos, and because of time restraints, we were unable to administer any of these multi-item depression questionnaires. Depression or mental health is also included as a subscale for general health status questionnaires. For instance the SF-36, which was developed from the Medical Outcomes Study, has several questions, which compose the mental health subscale. This subscale has been validated in populations with various chronic and acute diseases. One question from this subscale remains in the abbreviated version of the general health status instrument, the SF-12. Similar to Lopes et al, we found that the SF-12 item is an appropriate measure for self-reported depression. Our analysis of the single SF-12 question along with the CES-D score also confirmed the validity of this method as a variable that needs to be adjusted for when measuring self-reported visual function. The purpose of the study was to determine if this single item could be used as a covariate in studies that need to adjust for self-reported depression and if depression was not directly measured. In our study, we showed that this one item of the SF-12 can be used as a measure of self-reported depression and, therefore, as a variable to be controlled for when measuring self-reported visual function. The prevalence of self-reported depression measured by this single item of the SF-12 was similar to that reported in other studies of Latinos using the CES-D instrument. This further validates the use of a single question to assess self-reported depression. This approach of using a single question is not unique; in fact Williams et al in their analysis of different questionnaires to measure depression include the single question: “Have you felt depressed or sad much of the time in the past year?” and go on to suggest “For clinicians who wish to screen only for depression, the single question is an attractive alternative that could be asked during preventive medicine evaluations or in response to triggers that increase the likelihood of depression.” However, as with any screening tool, there is a risk for false-negative and false-positive results. In our validity study, depression was slightly overestimated (false-positive result rate of 4%). There were more false-negative results (50%). The sensitivity and specificity of this single item is sufficient as a screening tool and surrogate measure of self-reported depression.

CONCLUSIONS

Our analysis indicates that self-reported depression has an association with self-reported visual function as measured by the NEI VFQ-25 in the LALES cohort. Individual scores of self-reported visual function questionnaires are affected by self-reported depression. Therefore, adjustment for self-reported depression should be considered when evaluating self-reported visual function scores, even in individuals who have low levels of visual impairment. However, the LALES is a population-based study of Latinos and, therefore, the reported observations should be validated in other ethnic groups. Other visual function deficits that might affect NEI VFQ-25 scores are glare and contrast sensitivity. We did not measure these variables, but future studies should include them as they might be affecting this association as well. When self-reported visual function scores are considered to be outcome measures in ophthalmic intervention studies, it is important to include a measure of depression so that visual function scores can be adjusted for depression. We have shown that a single question can accomplish this and, therefore, should be used in situations when time constraints are present.


