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# Depression in Older People: Visual Impairment and Subjective Ratings of Health

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## ABSTRACT

***Purpose.*** The aim of this study was to establish the prevalence of depression in a sample of older adults with impaired vision and investigate associations between physical and visual disability and depression.

***Methods.*** We analyzed cross-sectional baseline data from 391 participants aged ≥75 years with visual acuity of 6/24 (20/80) or less, recruited for a randomized controlled trial of interventions to prevent falls (the VIP trial). Measures included the geriatric depression scale (GDS-15), the state-trait anxiety index, activities of daily living (Nottingham extended ADL scale), physical activity (human activity profile), an index of visual functioning (VF-14), health-related quality of life (SF-36), objective measures of physical ability, and a measure of visual acuity. Regression models were developed to investigate the association between depression scores and physical, psychological, and visual disability.

***Results.*** About 29.4% (115 of 391) of participants were identified as potentially depressed (GDS-15 score >4). Physical function, physical activity, physical ability, visual function, anxiety, and self-reported physical and mental health were significantly worse for those with depressive symptomatology. Physical, visual, and psychological factors collectively explained 41% of the variance in the depression score in a linear regression model ($R^2 = 0.421$, adjusted $R^2 = 0.410$, $F(7,382) = 39.680$, $p < 0.001$). Depression was not related to age, gender, living situation, ethnicity, or number of prescription or antidepressant medications taken.

***Conclusions.*** Depression was common in this population of older adults with severe visual impairment. Impaired visual and physical functions were associated with symptoms of depression. The effect of visual disability was independent of the effect of physical disability. The strength of this relationship, and the results of the regression analyses, indicate that a person who is visually or physically disabled is more likely to suffer from depression.

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Key Words: older people, visual impairment, depression, physical disability, visual disability, disablement

Disability is a major public health issue for older people. Age is associated with decreased physical competence[1] and increased prevalence of chronic illness.[2,3] An important, but not life threatening, chronic illness and cause of disability is visual impairment,[4,5] which has a direct effect on physical function and performance through decreased ability to see to walk and visualize where things are in space. Nine percent of people at age 70 suffer with moderate or more severe visual loss, but this increases to 30% for people over the age of 80.[4,6]

The physical effects of low vision are multiple. Low vision has been associated with decreased balance,[7] greater numbers of falls and injuries,[8,9] and increased visual disability.[10] Ultimately, untreated eye disorders can contribute to an avoidance of social situations, resulting in social isolation or leading to substantial physical decline, which may ultimately require a move into an assisted living arrangement.[11]

When advanced age is coupled with low vision, a person's level of activity is narrowed further than either age or visual impairment alone.[12] Furthermore, although older people can normally adjust well to environmental challenges, when the demands on their body are increased, such as when vision is disrupted, physical limitations may become problematic and affect quality of life (QOL).[13] For

example, a number of studies suggest that disability may contribute to depression.[14,15] Already high rates of depression in late life[16] are even higher for people living in institutions and those with functional limitations.[11] Consistent with other chronic disorders such as cancer[17] and cardiac conditions,[18] depression is common for people with low vision.[19,20] Studies show that the QOL of people with low vision is related to the levels of depression and the level of disability.[12,21]

Disability, or disablement, affects every aspect of life. In general, disablement is seen as following a sequential and hierarchical course, and various frameworks have been developed to describe the process. Holistic models of disablement[22–24] have tried to account for the effects of social and environmental barriers and facilitators on disablement. These can affect the rate of disablement as well as the extent of disability.[22]

The concept of disablement in mental health has been largely ignored,[25] yet psychological experiences, similar to physical disability and disease, can be a measure of the effect of mental illness on function. It is only recently that the psychosocial effects of low vision have been investigated. In previous low vision research, Rovner and colleagues found a positive relationship between general physical disability and depression.[26,27] However, the existing literature concerning vision and disability is limited by small sample size, lack of measures assessing vision-specific disability, reliance upon self-report to measure physical disability, and lack of consensus on a depression scale.

In response to this, the current study used objective and subjective measures of psychological, physical, and visual factors to assess the prevalence of depression and its relationship to disability in a sample of older adults with visual impairment from two New Zealand cities. The study was a cross-sectional analysis of the associations between physical disability, functional status, visual disability, and depression. It was hypothesized that the prevalence of depression would be high, and that the relationship between both physical function and visual disability and depression would be significant. The level of contribution of physical disability and visual factors to depression was explored. Understanding the relationships between disability and depression will be important when designing interventions to improve QOL in older people with low vision.

## METHODS

### Overview of the Study

The data for this study were collected at enrolment of a sample of older adults with severe visual impairment recruited for the VIP falls prevention trial,[28] a randomized controlled trial testing two interventions to prevent falls. Participants were recruited from the Royal New Zealand Foundation of the Blind registers, public hospital and university low vision services and private ophthalmology practices in Auckland and Dunedin, two cities in New Zealand.

Eligibility criteria included being 75 years of age and older, the ability to walk around their home, and visual acuity of 6/24 (20/80) or worse in the better eye after the best possible correction. People were excluded if they did not understand the study's requirements. Fifty-five percent (391 of 708) of the older adults contacted were enrolled in the trial. Reasons for not participating included unable to be contacted (9.1%), being deemed ineligible after contact (26.8%), being uninterested (30%), too unwell (13.4%), too busy (9.5%), too frail (6.5%), the person considering that they would be of no use to the study (3%), or that the person's doctor had advised against participating in the exercise part of the randomized trial (1.7%).

### Characteristics of Participants

A trained research nurse undertaking standardized procedures to administer questionnaires at baseline carried out all measures during a home visit. Demographic and relevant medical history data, consisting of participant's age, gender, ethnicity, living situation, cause of low vision, and medication use, were obtained by self-report during the nurse administered interview and direct observation of the medications.

We used the geriatric depression scale-15 item (GDS-15) to evaluate the prevalence of depression, which was the principle purpose of this study. The GDS-15 was developed specifically for older people and places less emphasis on somatic symptoms than do other generic depression scales.[29] It asks respondents to answer "yes" or "no" to 15 questions about how they have felt in the past week. The GDS-15 is a screening tool for depression rather than providing a clinical diagnosis of depression; the level of depressive symptomatology is related to level of depression. Significant depressive symptomatology was defined for the purposes of this study as a GDS-15 score $>4$, with scores between 5 and 9 indicating "mild/moderate" depressive symptomatology and scores $>9$ indicating "severe" depression. These cut points have been shown to yield a good combination of high sensitivity (91%) with a diagnosis of depression combined with an acceptable specificity (72%).[30]

High- and low-contrast visual acuity of the better eye was assessed using a logMAR chart adapted for this study from the Snellen criteria to a portable flip chart format. The chart was designed so that participants could stand between 1 and 4 m back from the chart and the smallest line of letters they could see at the farthest distance was recorded.

Balance was measured using the 4-test balance scale, developed for the "frailty and injuries: cooperative studies of intervention techniques" trial.[31] Balance and leg strength was measured with a chair stand test, which records whether a person can stand up successfully from sitting without support.

"Physical activity" was measured using the human activity profile (HAP),[32] which records the respondent's highest level of energy expenditure and generates a maximum activity score."Functional status" was measured with the Nottingham extended activities of daily living scale (NEADL).[33] A low score on this scale indicates that respondents are "not independent" in their activities as opposed to being "independent." The modified falls efficacy scale (MFES) was used to assess older people's self-efficacy in avoiding falls during daily activities.[34] Respondents rate 14 commonly performed daily activities in terms of how confidently they feel they can perform the activity without falling.

"Vision-specific function" was assessed with the visual function questionnaire-14 item (VF-14),[35] which records the degree of difficulty experienced by respondents in performing vision-related daily activities. The VF-14 assesses the impact of visual impairment, which is not adequately provided for by visual acuity measures. It is disease specific and, as such, is able to show outcomes related to a specific disease process[36]; in this case, visual impairment. The scale has proven valid for patients with age-related

macular degeneration[10] and was used as a measure of disability related to visual function for this study.

Psychological measures included state anxiety, health-related QOL, and the participant's perception of function and disability. "State anxiety" was measured with the state-trait anxiety inventory-6 item (STAI-6).[37] Health-related QOL was measured with the Short-Form Health Survey-36 item (SF-36).[38] The SF-36 generates a mental component summary (MCS) and a physical component summary (PCS) score. The SF-36 can also be considered a disability measure, as the questions on the tool are worded to reflect limitation in ability related to health issues. For the purposes of this study, the SF-36 was used as a measure of both function and disability.

### Statistical Analysis

SPSS 12.0 for Windows was used to analyze the data. The prevalence of depression was established by determining the number of participants scoring above 4 on the GDS-15. The relationships among physical disability, visual disability, and depression were examined using univariate analyses comparing participants categorized as "depressed" and "not depressed." Student's t-test and $\chi^2$ (or Fisher exact test), depending on whether the data were continuous or categorical, were used to demonstrate significance levels. A p value of $<0.05$ (two-tailed) was considered statistically significant.

Generalized linear regression analyses were used to examine factors that may be associated with depression in this group. In the regression analyses, the raw GDS-15 score was used as a continuous dependent variable as Rovner and Shmuely-Dulitzki[39] showed that this would yield the most information about a relationship. Choice of variables to enter into the models was based upon the literature and those that were identified from the univariate analyses in this data set as being significantly related to depression. The first general linear regression included 17 variables: research site (Auckland, Dunedin), gender (male, female), age, ethnicity (NZ European, other), number of medications taken (none, 1 to 5, 6 to 10, 11 to 15), taking antidepressant medication (yes or no), living situation (alone, retirement village, with others), ability to stand without support (yes or no), activity level (HAP), physical function (NEADL), visual function (VF-14), anxiety (STAI-6), falls efficacy (MFES), physical and mental health-related QOL (PCS and MCS), level of vision loss (logMAR), and top balance level achieved (unable to stand, parallel, semitandem, tandem, one leg stand). These were entered all together into a main model. Significant variables from this model were entered into a second regression to determine their contribution to the GDS-15 depression score.

Because psychological factors were expected to explain most of the variance in the GDS-15 score, the relative importance of physical health and visual function, over and above mental health, was assessed with a series of multiple regression models. In model 1, physical and visual measures were entered first then mental health measures were added. In model 2, visual function and mental health measures were entered first and physical measures were added. In model 3, physical and mental health measures were entered first and visual function was added.

## RESULTS

The distributions of all variables were examined. All maximum and minimum values were within the expected ranges and all measures, except the STAI-6 and VF-14, were normally distributed. Logarithmic and square root transformations, respectively, were conducted on these variables to satisfy the assumptions of normality in later analyses. As shown in Table 1, the majority of the 391 study participants were female (n = 267), lived alone (n = 208), and were born in New Zealand (n = 297). Age-related macular degeneration was the most common eye problem reported by participants (84%). Twenty-four percent of participants took more than 10 medications, and 38 participants (10%) took an antidepressant medication. The majority of participants in this sample were not depressed (n = 276), but of those who reported depressive symptoms (29.4% of the total sample scored >4 on the GDS-15), 100 (87%) had mild to moderate symptoms of depression, and 15 (13%) had severe symptoms of depression.

In the univariate analysis, many factors were significantly related to whether a person was depressed (Table 1). People with GDS-15 scores above 4 had lower levels of physical function and physical activity, greater physical and vision-specific disability, lower SF-36 scores, and greater anxiety. Depression was not related to age, gender, living situation, ethnicity, number of medications taken, whether or not antidepressants were used, or visual acuity.

Six variables were identified as independently related to the GDS-15 score after controlling for all other variables. These were the mental component of the SF-36 (MCS score), anxiety (STAI-6 score), the physical component of the SF-36 (PCS score), physical activity (HAP score), visual function (VF-14 score), and living situation (Table 2).

To determine the extent of their contribution to the depression score, these variables were entered together into a second general linear regression. The linear combination of the six variables explained 41% of the variance of the depression score ($R^2 = 0.421$, adjusted $R^2 = 0.410$, $F(7,382) = 39.680$, $p < 0.001$). Five variables had a significant association with depression, controlling for the other variables; however, living situation was no longer significant.

The relative contribution of physical health, visual function, and mental health to depression was assessed further by removing the variables in blocks and comparing $R^2$ values. We found that the amount of variability in depression score explained was reduced by removal of any block of factors (Table 3), indicating that mental health, physical health, and vision-specific disability were all important factors in explaining depression. The removal of the mental health factors affected the model the most.

## DISCUSSION

### Prevalence of Depressive Symptomatology

We found 29% of a community sample of 391 people 75 years and over with severe visual impairment self-reported significant depressive symptomatology. Earlier studies have found a strong association between low vision and depression.[6] As a group, though, older people have higher rates of depression than the general population.[16,40] The 12 months incidence of depression in all-age community studies is between 10% and 17%,[41] whereas for older people the rate of depression is 15% to 37%.[16, 40]

**TABLE 1.**
Comparison of sample demographics and scores on the physical, visual, and psychological measures for depressed and not depressed individuals

| | All participants N = 391 | Depressed N = 115 (29.4%) | Not depressed N = 276 (70.6%) | p |
|---|---|---|---|---|
| Demographic variables | | | | |
| Age (years) | 83.7 ± 4.8 | 83.7 ± 4.8 | 83.5 ± 4.8 | 0.705[a] |
| Gender | | | | |
| Males | 124 (31.7) | 36 (31.4) | 88 (31.9) | 1.00[b] |
| Females | 267 (68.3) | 79 (68.6) | 188 (68.1) | |
| Living situation | | | | |
| Alone | 208 (53.2) | 61 (53.1) | 147 (53.3) | 0.656[b] |
| With others | 162 (41.4) | 46 (40.0) | 116 (42.0) | |
| Retirement village | 21 (5.4) | 8 (6.9) | 13 (4.7) | |
| Ethnicity | | | | |
| New Zealand-born European | 297 (76.0) | 88 (76.5) | 209 (75.7) | 0.897[b] |
| Other | 93 (24.0) | 27 (23.5) | 67 (24.3) | |
| No. prescription medications taken | | | | |
| None | 20 (5.1) | 4 (3.5) | 16 (5.9) | 0.303[b] |
| Between 1 and 5 | 217 (55.6) | 58 (50.4) | 159 (57.7) | |
| Between 6 and 10 | 129 (33.1) | 45 (39.1) | 84 (30.5) | |
| Between 11 and 15 | 24 (6.1) | 8 (7.0) | 16 (5.9) | |
| No. antidepressant medications taken | | | | |
| None | 353 (90.3) | 100 (86.9) | 253 (91.7) | 0.189[b] |
| 1 or 2 | 38 (9.7) | 15 (13.1) | 23 (8.3) | |
| Physical measures | | | | |
| HAP score, range 0–100, higher score indicates more activity | 54.6 ± 13.7 | 50.6 ± 13.9 | 56.3 ± 13.3 | 0.000[a] |
| NEADL score, range 0–20, higher score indicates better function | 13.5 ± 3.6 | 12.3 ± 3.7 | 14.1 ± 3.5 | 0.000[a] |
| SF-36 component scales, range 0–100, higher score indicates better function | | | | |
| Physical function | 51.4 ± 25.4 | 43.0 ± 26.1 | 54.9 ± 24.3 | 0.000[a] |
| Role physical | 75.5 ± 37.7 | 60.2 ± 42.9 | 81.8 ± 33.3 | 0.000[a] |
| Bodily pain | 68.6 ± 27.9 | 60.4 ± 28.8 | 72.0 ± 26.9 | 0.000[a] |
| Physical component summary score (PCS) | 40.9 ± 10.2 | 37.4 ± 11.1 | 42.3 ± 9.4 | 0.000[a] |
| Top balance level achieved[c] | | | | |
| Unable to stand | 16 (4.1) | 6 (5.2) | 10 (3.6) | 0.031[b] |
| Parallel stand | 39 (10.0) | 15 (13.0) | 24 (8.7) | |
| Semi-tandem stand | 175 (44.8) | 58 (50.4) | 117 (42.4) | |
| Tandem stand | 134 (34.3) | 33 (28.7) | 101 (36.6) | |
| One leg stand | 26 (6.6) | 2 (1.7) | 24 (8.7) | |
| Chair stand test | | | | |
| Yes (able) | 347 (88.7) | 95 (82.6) | 252 (91.3) | 0.021[b] |
| No (unable) | 44 (11.3) | 20 (17.4) | 24 (8.7) | |
| Visual measures | | | | |
| VF-14 score, range 1–100, higher score indicates better visual function | 21.1 ± 15.1 | 16.3 ± 11.6 | 23.1 ± 16.0 | 0.000[a] |
| Visual acuity | | | | |
| LogMAR (high contrast acuity) | 1.3 ± 0.4 | 1.4 ± 0.5 | 1.3 ± 0.4 | 0.071[a] |
| LogMAR (low contrast acuity) | 1.9 ± 0.4 | 2.0 ± 0.4 | 1.9 ± 0.4 | 0.223[a] |
| Level of vision loss | | | | |
| Total blindness (no light perception) | 20 (5.1) | 8 (40.0) | 12 (60.0) | 0.093[b] |
| Near total blindness (logMAR ≥1.71) | 66 (16.9) | 24 (36.4) | 42 (63.6) | |
| Profound visual impairment (logMAR 1.31–1.7) | 103 (26.3) | 27 (26.2) | 76 (73.8) | |
| Severe visual impairment (logMAR 0.91–1.3) | 116 (29.7) | 39 (33.6) | 77 (66.4) | |
| Moderate visual impairment (logMAR 0.06–0.09) | 86 (22.0) | 17 (19.8) | 69 (80.2) | |
| Psychological measures | | | | |
| GDS-15 score, range 0–15, higher score indicates more depressed | 3.7 ± 2.7 | 7.2 ± 2.0 | 2.2 (1.3) | 0.000[a] |
| STAI-6 score, range 6–24, higher score indicates more anxious | 7.8 ± 2.2 | 9.1 ± 2.8 | 7.2 (1.6) | 0.000[b] |
| SF-36 component scales, range 0–100, higher score indicates less disability | | | | |
| Social function | 91.8 ± 19.8 | 84.0 ± 26.9 | 95.1 ± 25.6 | 0.000[b] |
| Role emotional | 85.2 ± 32.1 | 72.5 ± 41.9 | 90.5 ± 25.6 | 0.000[b] |
| Mental health | 78.3 ± 15.7 | 66.4 ± 17.4 | 83.2 ± 11.9 | 0.000[b] |
| Mental component summary score (MCS) | 54.8 ± 8.3 | 49.7 ± 10.4 | 56.9 ± 6.1 | 0.000[b] |

Values represent mean ± sd or number (%).

[a]t-test.

[b]$\chi^2$ or Fisher's exact.

[c]Top balance level achieved was taken from the 4-test balance scale.

NEADL, Nottingham extended activities of daily living scale; HAP, human activity profile; SF-36, medical outcomes study short form health survey-36 item; PCS, physical component summary score of the SF-36; MCS, mental component summary score of the SF-36; VF-14, visual function index-14 item; logMAR, logarithm of the minimum angle of resolution; GDS-15, geriatric depression scale-15 item; STAI-6, state trait anxiety scale-6 item.

**TABLE 2.**
Initial regression model explaining GDS-15 score

| | Unstandardized coefficients | | |
|---|---|---|---|
| | B | SE | p |
| Research site (Dunedin/Auckland) | −0.156 | 0.268 | 0.561 |
| Gender (male/female) | −0.401 | 0.236 | 0.090 |
| Sit to stand (able/not able) | 0.520 | 0.370 | 0.160 |
| Age (years) | −0.0139 | 0.023 | 0.553 |
| HAP score | −0.022 | 0.011 | 0.040 |
| NEADL score | −0.078 | 0.043 | 0.073 |
| VF-14 score | −0.215 | 0.087 | 0.014 |
| STAI-6 score | 6.064 | 1.314 | 0.000 |
| MFES score | 0.034 | 0.093 | 0.716 |
| PCS score | −0.060 | 0.013 | 0.000 |
| MCS score | −0.143 | 0.014 | 0.000 |
| Level of vision loss (moderate, severe, profound, near total, total) | 0.117 | 0.113 | 0.301 |
| Ethnicity (New Zealand European/ other) | 0.046 | 0.248 | 0.852 |
| Total number of medications | −0.213 | 0.171 | 0.215 |
| Takes antidepressants (yes/no) | 0.135 | 0.361 | 0.709 |
| Living situation (living at home/institution) | −0.424 | 0.185 | 0.022 |
| 4-test balance scale (highest level achieved, scored as 1–4) | 0.261 | 0.138 | 0.058 |

B, beta; SE, standard error; HAP, human activity profile; NEADL, Nottingham extended activities of daily living; VF-14, visual function index-14 item; STAI-6, state trait anxiety scale-6 item; MFES, modified falls efficacy scale; PCS, physical component summary score of the SF-36; MCS, mental component summary score of the SF-36.

Our prevalence figures are similar but at the higher end of prevalence rates found in unselected community samples of older people, yet our population had a specific visual disability. The relationship between disability and depression is complex.[42] The finding that the rate in our sample was high but consistent with other studies may reflect the high prevalence of all cause disability in the general population of this age. It may also indicate that disability is not a strong cause of depressive symptomatology in older people.

## Associations with Depressive Symptomatology

Visual function, as measured by the VF-14, physical disability, and psychological state, as measured by the STAI-6 and SF-36, were associated with depressive symptomatology, whereas visual acuity, age, gender, living situation, ethnicity, and use of antidepressants were not associated. The fact that living situation was not related to depression is surprising but has been found in other studies of mental health that include people with visual impairment.[5] For these people, companionship might be a more important variable than whether they live with someone else.[43]

This was a cross-sectional study so that association does not imply causation. For example, we found an association between decreased physical function and physical activity and depressive symptomatology. Physical disability has previously been related to depression,[42] and in this analysis, physical-health-related disability was more closely related to depression than physical performance measures. The depression may decrease function and activity or, alternatively, decrease of function from the disability may lower mood. A longitudinal study would be needed to explore this relationship. The value of knowing of the association lies in the clinician being more aware of the risk of depression in older people with visual impairment and physical disabilities.

Visual function was associated with depressive symptomatology but not the degree of impairment of visual acuity. All participants had severe visual impairment so that impairment beyond the level required to be registered blind may not add further to the sense of loss. There may be factors about the visual loss that reduce the risk of depressive symptomatology. The visual loss in most of the sample had been gradual, allowing adaptation. Depressive symptoms may be more common at the onset of the loss. For example, Ip et al.

**TABLE 3.**
Final multiple regression model exploring relative contribution of visual, physical, and mental health disability factors to GDS-15 Score

| | $R^2$ without these factors | Unstandardized coefficients | | Standardized coefficients $\beta$ | p |
|---|---|---|---|---|---|
| | | B | SE | | |
| Constant | | 10.506 | 1.945 | | 0.000 |
| Mental health factors | | | | | |
| Mental health (SF-36 MCS score) | | −0.143 | 0.014 | −0.447 | 0.000 |
| Anxiety (STAI-6 score) | 0.125 | 5.427 | 1.285 | 0.188 | 0.000 |
| Physical health factors | | | | | |
| Physical health (SF-36 PCS score) | | −0.059 | 0.012 | −0.228 | 0.000 |
| Physical activity (HAP score) | 0.341 | −0.021 | 0.009 | −0.108 | 0.018 |
| Visual function (VF-14 score) | 0.400 | −0.220 | 0.064 | −0.138 | 0.001 |
| Lives with others versus lives alone | | −0.159 | 0.216 | −0.030 | 0.446 |
| Lives in a retirement village versus lives alone | | −0.551 | 0.472 | 0.047 | |
| | Overall $R^2$ = 0.421 | | | | |

SE, standard error; VF-14, visual function index-14 item; PCS, physical component summary score of the SF-36; HAP, human activity profile; MCS, mental component summary score of the SF-36; STAI-6, state trait anxiety scale-6 item.

found that high levels of depression decreased after adaptation to a new environment.[11] Also visual loss is a recognizable impairment, and there are specific support processes available to help compensate for the loss. These provide information, services, and social and professional support.

The VF-14 measure of visual function assesses the person's perceived difficulty with a task. The finding that visual function but not visual acuity was associated with depressive symptomatology may indicate that low mood increases the apparent magnitude of a task heightening a feeling of inability to cope. The inability to perform activities that one values may contribute to depression.[27] Low mood and depression should be considered when disability appears greater than might be expected from the visual loss.

The measures of mental health disability are closely related to the measures of depression because, to some degree, they evaluate the same thing. The GDS-15 measures depressive symptomatology and the SF-36 MCS score measures the perceived limitations in ability related to mental health. Anxiety, which was measured by the STAI-6, is often present with depression, and there is a correlation between the two disorders.

Although 41% of the variance in the depression score was explained by the multiple regression model, 59% of the variance in depression score was unaccounted for in this analysis. Previous studies have identified causes of depression such as social isolation, bereavement, chronic illness, low socioeconomic status, being widowed or divorced, or undergoing life stress.[14, 15] Loneliness, for example, might result when a person with low vision lacks the opportunity or confidence to socialize. These factors, along with disability, might contribute to depression.[36] In the current study, only physical and visual disabilities were assessed so that these other factors remain possible contributory risk factors or mediators.

### Strengths of the Study

The recruitment of nearly 400 participants meant that the study was well powered to detect the prevalence of depressive symptoms with relative accuracy. In addition, all tools used in this study were well validated. The use of a vision-specific measure, the VF-14, also allowed for the assessment of vision-specific disability, which we found differed from general physical disability. A vision-specific disability measure was used here because visual impairment is a poor predictor of disability.[44]

### Limitations of the Study

The response rate in this study was 55% and reflects agreement to participate in a randomized trial of two interventions to prevent falls—exercise and home hazard assessment and modification. Although this is a relatively high response rate for a randomized trial, it is less than we would wish for in an epidemiological study. People with depression may be less likely to participate in an intervention trial, and thus, the true prevalence of depressive symptomatology in an elderly population with visual impairment may be higher than reported here.

This was a cross-sectional study so that causation cannot be determined.

Depressed participants may have over-reported disability by perceiving their physical ability to be worse than it actually was[38] or under-represented their psychological state by answering the interviewer-administered psychological tests in a socially desirable way.[39] However, the GDS-15 was intentionally designed to minimize the resistance respondents have to questions that seem to evaluate their psychological status.[25] The responses will have been as valid as in other studies using this measure.

## CONCLUSIONS

In this study, the prevalence of depressive symptoms was high and both physical and visual disability were significantly related to depression. Subjective perceptions of health, function, and disability were more important in explaining depression than measures of objective function. The relationship among visual impairment, functional ability, perceived functional ability, and depressive symptoms is complex. Attention to all these interrelated factors is necessary for the maintenance of function and a satisfactory QOL in older people with significant visual impairment.

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