

Impact of the Severity of Distance and Near-Vision Impairment on Depression and Vision-Specific Quality of Life in Older People Living in Residential Care

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PURPOSE. To determine the relationship between the severity of distance and near-vision impairment on vision-specific quality of life (QoL) and depression in residential care residents.

METHODS. Residents from three low-level residential care facilities in Victoria (Australia) were recruited. All participants were assessed for cognitive impairment, distance and near-vision impairment (VI), and depression. Sociodemographic and other clinical data were also collected. The subscales of the Nursing Home Vision-Targeted Health-Related Quality-of-Life questionnaire (NHVQoL) were the main outcome measures and were validated by Rasch Analysis.

RESULTS. Seventy-six residents were enrolled. The mean \pm SD of the participants' age was 83.9 ± 9.9 years, and most were women ($n = 44$; 60%); 46.4% ($n = 35$) had binocular presenting VI ($<6/12$), and 59% ($n = 44$) had at least mild near VI (worse than N8); 16% ($n = 14$) recorded depression symptoms, although depression was not associated with VI ($P > 0.05$). In linear regression models, distance and near VI were independently associated with poorer QoL on seven of the eight subscales of the NHVQoL scale ($P < 0.05$). The β coefficients ranged from -12.3 to -80.2 , which suggests that, on average, people with vision loss had poorer QoL, ranging between 12 and 80 points (scale range: 0-100) than did those with no VI. The QoL aspects most affected by vision loss were related to general vision, reading, hobbies, emotional well-being, and social interaction.

CONCLUSIONS. VI remains a major form of disability in individuals living in residential care facilities and affects vision-specific functioning and socioemotional aspects of daily living. A larger study is needed to confirm these findings. (*Invest Ophthalmol Vis Sci.* 2009;50:4103-4109) DOI:10.1167/iovs.08-3294

The prevalence of vision impairment in residential care or nursing home residents is substantially higher than that recorded in community-dwelling older adults.¹⁻⁵ In the United States, rates ranging between 34% and 36%, have been re-

corded in two separate studies.^{4,5} Even higher prevalences have been recorded in large population-based trials in Australia. The Blue Mountains Eye Study (BMES) found 62% of nursing home residents to be visually impaired ($<6/12$) with a third considered to have severe vision loss (visual acuity $<6/60$).² Similarly, the Melbourne Vision Impairment Project (VIP) found that 41% of people in residential care have moderate, severe, or profound visual impairment (visual acuity $<6/18$).⁶

In community-living adults, impaired vision significantly reduces activities associated with participation in society and religion, mobility, daily living, and intensive visual tasks, and poorer functioning scores increase the risk of hip fractures; the need for community and/or family support; nursing home placement; and reports of low self-rated health.⁷⁻¹⁷ To date, however, despite the high prevalence of vision loss in residential care individuals, there is little information about the impact of vision impairment on vision-specific functioning, emotional well-being, and quality of life (QoL). Furthermore, although there is evidence that older adults with visual impairments may be more prone to depression and other types of mental health problems when adapting to residential care environments,¹⁸ there is scarce information in Australia and other developed countries about the impact of vision loss on vision-related emotional health.

The ENVORC trial (ENVironment and Vision Optimisation in Residential Care) was designed to investigate the effectiveness of combined vision and environmental intervention, including staff training, on the residents' QoL in three residential care facilities in the state of Victoria, Australia. In this article, we present the baseline and cross-sectional data describing the prevalence of vision impairment and its impact on several specific aspects of QoL, using the Nursing Home Vision-Targeted Health-Related Quality-of-Life Questionnaire (NHVQoL). A secondary purpose was to determine the relationship between depression and vision loss in this sample. This information is fundamental in understanding the impact of visual impairment and in establishing prevention and rehabilitation programs for visually impaired persons living in residential care facilities in Australia.

METHODS

Participants were recruited from three low-level-care residential facilities in Melbourne. The management, organization, and affiliation of the three facilities varied, but broadly represent the main types of residential care facilities within Melbourne. The John H. Kerr Centre is a nonprofit organization that is affiliated with the Christian church. The Olivet Aged Persons Home is a religious-affiliated organization owned and operated by the Christadelphian Welfare Association. Percy Baxter Lodges is a public and government-operated facility. Participants were eligible to participate after they were identified by the residential care staff as capable of answering questions about their vision and daily activities. There were no other eligibility criteria; residents were not excluded on the basis of age, cognitive ability, or English language proficiency. For those not fluent in English, an interpreter was used.

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Only three participants needed a Croatian interpreter for the assessment, who was trained in administering the questionnaires. Eligible participants were approached by the project investigators who explained the study and obtained signed consent. Ethics approval for this project was granted by the Barwon Health Research and Ethics Committee. The study was conducted in accordance with the Declaration of Helsinki.

Assessment

The baseline assessments were conducted by two trained research assistants. Both were extensively experienced in our vision screening and interviewer questionnaire administration procedures, having worked on several similar projects. Assessments were generally conducted face to face in the participants' rooms or in a well-illuminated room specifically allocated for the study. Participants completed the six-item Cognitive Impairment Test (6-CIT)¹⁹ and provided sociodemographic details and background information about eye condition, eye care history, and general health. Data were also obtained and verified from the residents' facility files.

All participants underwent a visual acuity screening test with the validated E-test.²⁰ This vision screening test has been designed for use in older people of all abilities, including those with speech, cognitive, and motor impairments. It can easily be used by people who are not fluent in English. Vision was tested binocularly, as this indicates the level of functional vision available for daily activities. The E-test was administered at 3 m and distance visual acuity levels were tested at 6/12, 6/18, 6/60, and 3/60. Each participant's level of vision was determined by recording the smallest set of symbols from which three of four could be correctly identified. If visual acuity was $<6/12$, the procedure was repeated with a pinhole mask to test for refractive error. Near visual acuity was measured at N8 (normal), N20 (mild), and N48 or worse (moderate or worse) and the smallest of the three sizes that were read correctly was recorded. These sizes correspond to normal newspaper print, large-print in books, and newspaper headlines.

Residents with a distance visual acuity of $<6/12$ who showed improvement with the pinhole mask, or those who displayed unclear results, were referred to an optometrist from the Victorian College of Optometry Outreach Services for a full eye examination. In addition, residents with a distance visual acuity of $\geq 6/12$ but a near visual acuity worse than N8 were provided reading glasses on the spot and referred to the optometrist for further examination. Residents with diabetes who reported not having an eye examination within the past 2 years were also referred to the optometrist. The optometrist's assessment was undertaken at the participant's residential care facility. Residents who had a distance visual acuity of $<6/12$ who did not show improvement with a pinhole mask were referred to a general practitioner (GP), ophthalmologist, or low-vision services, as appropriate.

Vision-Related QoL

Vision-related QoL was measured with the 57-item NHVQoL, which was specifically developed for use in nursing homes.²¹ The questionnaire was designed to evaluate the impact of visual impairment and eye disease on QoL and mental health in older nursing home residents and to assess the affect of psychosocial and eye care interventions in nursing home settings.²¹ It consists of nine subscales focusing on general vision (6 items), reading (3 items), ocular symptoms (9 items), mobility (7 items), psychological distress (10 items), activities of daily living (6 items), social activities and hobbies (8 items), adaptation and coping (2 items), and social interaction (6 items). The NHVQoL subscales have demonstrated good internal consistency, reliability, and validity.²¹ Scores for each subscale range between 0 and 100, where a high score indicates high vision-related QoL.²¹

Depression

Symptoms of depression were measured with the nine-item version of the Patient Health Questionnaire (PHQ9).²² Responses to the PHQ9 are

rated using a four-category Likert scale: 0, not at all; 1, several days; 2, more than half the days; and 3, nearly every day. The total score is calculated by summing each of the PHQ9 items (range, 0–27), with higher scores indicating the presence of more symptoms. The scores of 5, 10, 15, and 20 represent thresholds demarcating the lower limits of mild, moderate, moderately severe, and severe depression. The criterion, construct, and external validity of the PHQ9 have been well established using large samples from a range of patient populations.^{23,24} Recently, the PHQ9 has been shown to be a valid tool to assess depression symptoms in people with visual impairment.²⁵

Statistical Analysis

We used Rasch analysis to determine whether each subscale of the NHVQoL questionnaire had valid measurement characteristics.^{26–29} We used RUMM2020 (2003; RUMM Laboratory, Perth, WA, Australia) and the Andrich rating scale, to determine whether the data fitted the Rasch model.³⁰ An overall item-trait interaction score (χ^2) with a statistically nonsignificant probability ($P > 0.05$) indicates model fit and that hierarchical ordering of the items (i.e., from difficult to easy) is consistent across all levels of vision function. Person separation reliability (PSR) values were also reported,^{31,32} as they are closely linked to the targeting of each subscale as it differentiates the number of statistically distinct groups of respondents who can be identified on the trait.³³ We also assessed disordered thresholds that occur when participants have difficulty discriminating between the response options. The unidimensionality of each subscale was assessed. Finally, to aid interpretability, each subscale score was converted from the Rasch logit range to a scale from 0 to 100, where a high score indicates high vision-related QoL.

We analyzed the association between each subscale of the NHVQoL, vision (distance and near), and depression, adjusting for relevant sociodemographic and clinical variables. Individual subscale mean scores were fitted to linear regression models and the *t*-based 95% confidence interval (CI) was used for the regression coefficients. Regression models were presented to demonstrate the changes in coefficients associated with each aspect of QoL. Statistical analyses were performed with standard statistical software (Statistical Package for Social Sciences, ver. 15.0; SPSS Inc., Chicago, IL).

RESULTS

Participants' Characteristics

Participants from the three residential care facilities did not differ in age, sex, near and distance visual acuities, nonocular comorbidity, and the impact of nonocular comorbidity on daily living ($P > 0.05$ for all). We therefore present the data for 76 participants from the three facilities as one group (Table 1). The mean \pm SD (standard deviation) age of the sample was 83.9 ± 9.9 years. Most were women ($n = 44$; 58%) and single (or widowed; $n = 49$; 64.5%). The mean \pm SD length of stay at the facilities was 2.8 ± 3.2 years. Of those participating, 71.1% ($n = 54$) were born in Australia, and for most (96%), English was the main spoken language. The majority ($n = 70$; 92.1%) had comorbidities other than vision impairment and almost a third reported that these nonocular comorbidities affected their daily lives a great deal. A quarter of the residents rated their overall health as only fair or poor. More than a quarter of the surveyed residents ($n = 20$; 26.3%) reported that they were currently suffering from anxiety or depression. Almost 60% ($n = 44$) of our sample passed the cognitive impairment test. One fifth of the residents ($n = 15$) reported having diabetes, of which a third ($n = 5$) stated that they had not seen an eye specialist during the past 2 years.

Screening Outcomes

Vision data were not available for one participant; 46.4% ($n = 35$) of the sample had binocular presenting visual impairment

TABLE 1. Personal and Sociodemographic Characteristics of the Residential Care Participants Stratified for Binocular Presenting Distance VI (<6/12) and Near VI (Worse Than N8)

Characteristics	n (%)	Distance VI	Near VI
Sex			
Male	32 (42.1)	13 (41.9)	17 (54.8)
Female	44 (57.96)	22 (50.0)	27 (61.4)
Age (y)			
≤80	18 (23.7)	6 (33.3)*	7 (38.9)*
81-90	40 (52.6)	16 (41.0)	23 (59.0)
>90	18 (23.7)	13 (72.2)	14 (77.8)
Hearing difficulty			
Yes	44 (57.9)	18 (40.9)	25 (56.8)
No	323 (42.1)	17 (54.8)	19 (61.3)
Education			
Primary	11 (14.5)	4 (36.4)	5 (45.5)
Secondary	49 (64.5)	25 (51.0)	33 (67.3)
Tertiary	15 (19.7)	6 (42.9)	6 (42.9)
Nonocular comorbidity (SR)			
Yes	70 (92.1)	33 (47.8)	39 (56.5)
No	6 (7.9)	2 (33.3)	5 (83.3)
Impact of comorbidity on daily living (SR)			
Not at all	27 (39.1)	12 (44.4)	14 (51.9)
A little	20 (29.0)	12 (63.2)	13 (68.4)
A great deal	22 (31.9)	9 (40.9)	12 (54.5)
Overall health assessment (SR)			
Excellent	3 (3.9)	2 (66.7)	3 (100.0)
Very good	18 (23.7)	7 (38.9)	10 (55.6)
Good	35 (46.1)	16 (47.1)	19 (55.9)
Fair	10 (13.2)	4 (40.0)	4 (40.0)
Poor	10 (13.2)	6 (60.0)	8 (80.0)
Depression or anxiety (SR)			
Yes	20 (26.3)	7 (35.0)	11 (55.0)
No	56 (73.7)	28 (50.9)	33 (60.0)
Antidepressant medication			
Never	57 (78.1)	30 (47.6)	37 (58.7)
Current	11 (15.1)	1 (20.0)	2 (40.0)
Past	5 (6.8)	1 (100.0)	1 (100.0)
Cognitive Impairment- 6-CIT			
Yes	29 (38.2)	16 (55.2)	23 (79.3)*
No	44 (57.9)	18 (41.9)	20 (46.5)
Glass utilization			
None	7 (9.3)	7 (100.0)*	7 (100)
Near	23 (30.7)	12 (52.2)	13 (56.5)
Distance	3 (4.0)	1 (33.3)	1 (33.3)
Near and distance	5 (6.7)	2 (40.0)	2 (40.0)
Bifocals or multifocals	37 (49.3)	13 (35.1)	21 (56.8)
Diabetes (SR)			
Yes	59 (77.6)	8 (53.3)	6 (40.0)
No	15 (19.7)	26 (44.1)	37 (62.7)

Data are the number of subjects (percentage of total group). SR, self-report.

* Significant difference ($P < 0.05$).

(VI) (<6/12; Table 2). Of these, more than one fourth ($n = 10$) were considered to have severe VI (<6/60). Almost 60% ($n = 44$) of the sample were considered to have near VI worse than N8. Of these, 80% had mild to moderate (worse than N8-N20) near VI and the remaining 20% ($n = 9$) were considered to be at the severe end of the spectrum (N48). Almost three quarters of the sample were referred to an optometrist (49.3%, $n = 37$), GP, or ophthalmologist (16.0%; $n = 12$), or low-vision rehabilitation centers (6.7%; $n = 5$).

Almost 60% ($n = 46$) of the group reported to have some form of ocular condition, of which cataract was the most prevalent (71.7%; $n = 33$). There was a significantly greater proportion of participants who reported no eye condition and no distance visual impairment (6/12 or better) compared with those with no eye condition and impaired distance vision (<6/12) (71% vs. 29%, $P = 0.01$). In univariate analyses, compared with participants with no distance VI, those with impaired distance vision (VA <6/12) were 3.5 times (95% CI:

1.32-9.23) more likely to report having an ocular eye condition. Similarly, those with near VI (worse than N8) were 2.6 times (95% CI: 1.10-6.72) more likely to report having an eye disease. This result provides some validity to the participants' self-report of their ocular conditions.

Vision and Depression

Based on the PHQ9 severity scores, 10.5% ($n = 10$) of the participants had mild symptoms of depression (total score ranging from 5 to 9), and 5.5% ($n = 4$) had at least moderate symptoms of depression (PHQ9 total score, ≥ 10). There was, however, no difference between levels of depression symptoms and VI (distance and near, $P > 0.05$ for both).

Validation of the Subscales of the NHVQoL

Data of each subscale of the NHVQoL were fitted to the Rasch model to determine their validity and measurement properties.

TABLE 2. Outcomes of the Screening Eye Examinations

Presenting distance vision	
$\geq 6/12$ (normal)	40 (53.3)
$< 6/12$ – $6/18$ (mild)	14 (18.7)
$< 6/18$ – $6/60$ (moderate)	11 (14.7)
$< 6/60$ (severe)	10 (13.4)
Presenting near vision	
N8 (normal)	31 (41.3)
N20 (mild)	35 (46.7)
N48 or worse (moderate or worse)	9 (12.0)
Eye condition (self report)	
None	32 (42.1)
AMD	8 (10.5)
Cataract	33 (43.4)
Glaucoma	1 (1.3)
Other	2 (2.6)
Referrals	
None	21 (28.0)
Optometrist	37 (49.3)
Low vision rehabilitation	5 (6.7)
GP or ophthalmologist	12 (16.0)

Data are the number of subjects (percentage of total group), $n = 75$.

The two items forming the adapting/coping subscale recorded a suboptimal power of test-of-fit score, and their fit to the Rasch model could not be assessed. These two items were therefore added to the psychological subscale. All eight subscales had items with fit residuals < 2.5 , indicating no significant item misfit. As shown in Table 3, all overall item-trait interaction values (χ^2) were statistically nonsignificant ($P > 0.05$), indicating that each subscale achieved fit to the Rasch model and that hierarchical ordering of the items (i.e., from difficult to easy) was consistent across all levels of each trait being assessed. There was evidence of disordered thresholds in seven subscales that required category collapsing. There was no evidence of differential item functioning (DIF) and multidimensionality. Targeting was not optimal, and person separation indices varied from moderate to good. This result anticipated, considering the relatively small number of items in each subscale and the small sample size. Overall, these results collectively show that the eight subscales of the NHVQoL questionnaire are valid to assess vision-specific aspects of QoL in this sample. The overall score of each subscale conforms to an interval scaling. The mean transformed logit scores for each subscale show that overall this sample had high levels of vision-specific QoL in several aspects of daily living (Table 3).

Visual Acuity and Vision-Related QoL

In univariate analyses, age, gender, impact of nonocular comorbid conditions on daily living, and ocular conditions were found to be significantly associated with at least one subscale of the NHVQoL ($P < 0.05$). Nonocular comorbid conditions,

cognitive impairment (assessed by the 6-CIT scale), depression (assessed by the PHQ9 scale), level of education, and self-reported diabetes were not significantly associated with vision-related QoL ($P > 0.05$).

The relationship between presenting near and distance vision and vision-related QoL are shown in Figure 1. There was a systematic dose-response relationship between near and distance vision and QoL, as assessed by the NHVQoL. With the exception of the ocular symptoms subscale, there was a consistent overall deterioration in the remaining seven subscales: general vision, reading, activities of daily living, mobility, hobbies, psychological, and social interaction with a worsening of both distance and near vision ($P < 0.05$).

In linear regression models, after adjustment for age, gender, cognitive impairment, the impact of nonocular comorbid conditions on daily living, and ocular conditions, severe distance VI ($< 6/60$) was independently associated with poorer QoL on all subscales except ocular symptoms (Table 4). The β -coefficients ranged from -14.5 to -73.3 , suggesting that, on average, people with severe vision loss had a poorer QoL, ranging from 14 to 73 points, compared with those with no VI. Similar results were obtained for severe near VI (N48 or worse), with β -coefficients ranging between -12.3 and -80.2 . The aspects most affected by severe vision loss (distance and near) were related to general vision, reading, hobbies, emotional well being, and social interaction.

Similarly, moderate distance vision loss ($< 6/18$ to $6/60$) was independently associated with six subscales of QoL: general vision, reading, mobility, hobbies, and psychological, and social interaction. A similar finding emerged for mild/moderate near VI (N20). Mild distance VI ($< 6/12$ to $6/18$) was independently associated with three subscales: general vision, reading; and hobbies (Table 4).

DISCUSSION

This study was conducted to determine the impact of vision loss on vision-related QoL and depression in people living in residential care facilities in Melbourne, Australia, as data in this population are scarce. Our findings indicate that both distance and near-vision loss are independently associated with poor QoL in this population. We found a dose-response relationship between distance and near vision on several critical vision-related components of daily living and emotional health. The areas of QoL most affected were tasks pertinent to general vision, reading, activities of daily living, mobility, social activities and hobbies, psychological distress, adaptation and coping, and social interaction.

Although there was unequivocal evidence that moderate and severe distance VI, as well as mild/moderate and severe near-vision loss, substantially affect QoL, our findings also indicate that even mild distance vision loss independently pre-

TABLE 3. Parameters of the Eight Subscales of the NHVQoL

NHVQoL Subscales	Item Fit Residual	Person Fit Residual	Person Location	Person Separation Reliability	Total-Item χ^2 (P)	Transformed Logit Score
General vision	-0.53 ± 0.61	-0.48 ± 0.89	0.89 ± 1.01	0.74	14.6 (0.25)	77.49 ± 20.13
Reading	-0.16 ± 0.59	-0.17 ± 0.78	0.62 ± 0.77	0.81	12.0 (0.06)	75.78 ± 32.19
Ocular symptoms	-0.31 ± 0.71	-0.28 ± 0.71	1.91 ± 0.80	0.76	13.8 (0.73)	90.22 ± 13.02
ADLs	-0.33 ± 0.53	-0.29 ± 0.54	1.40 ± 0.64	0.74	8.91 (0.53)	94.78 ± 12.57
Mobility	-0.54 ± 0.35	-0.34 ± 0.59	1.66 ± 0.50	0.73	13.4 (0.49)	90.55 ± 12.97
Activities/hobbies	-0.17 ± 0.37	-0.26 ± 0.53	1.32 ± 0.92	0.89	14.1 (0.58)	75.04 ± 22.93
Psychological	-0.37 ± 0.84	-0.25 ± 0.86	1.26 ± 0.63	0.89	34.8 (0.07)	85.78 ± 21.91
Social interaction	-0.01 ± 1.02	-0.15 ± 0.68	1.68 ± 0.49	0.82	11.6 (0.48)	91.63 ± 16.62

Data are the mean \pm SD. ADLs, activities of daily living.

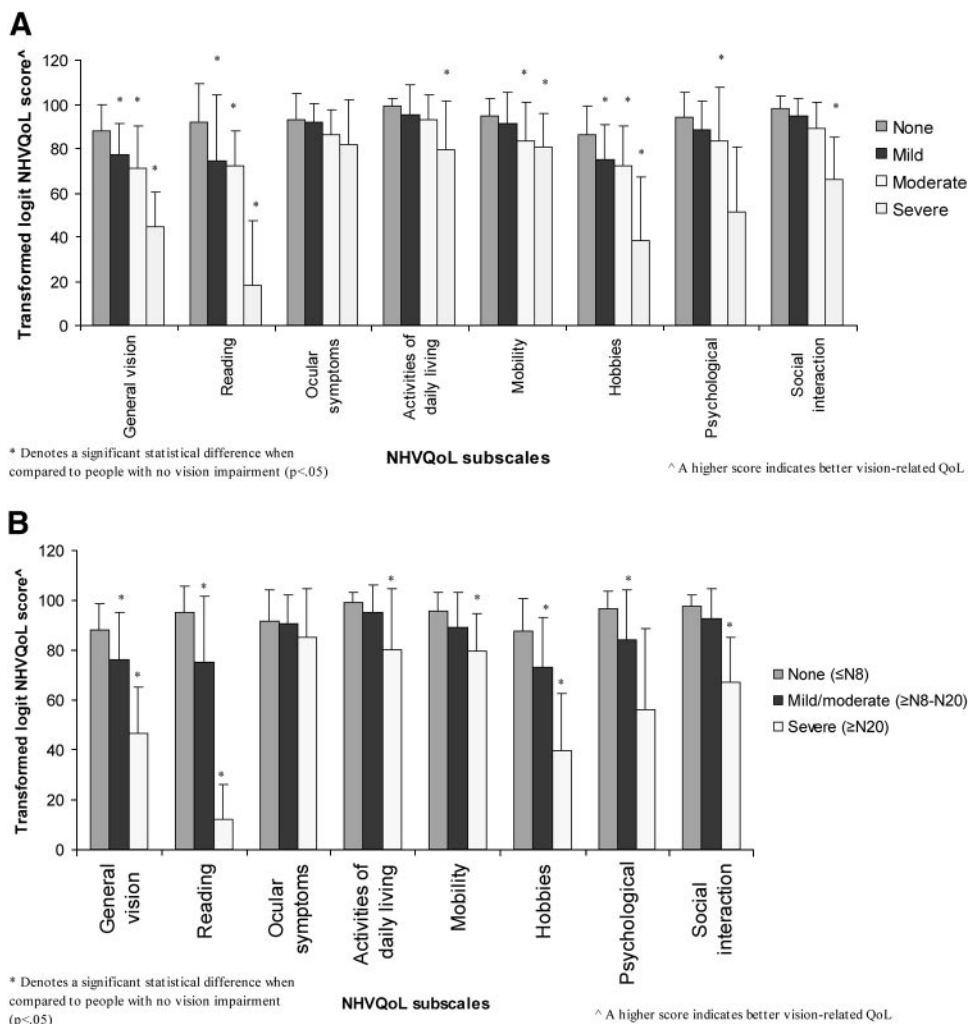


FIGURE 1. The relation between distance (A) and near (B) VI on the subscales of the NHVQoL questionnaire.

dicts poor QoL in activities associated with general vision, reading, pastimes, and hobbies. These overall findings are important for three main reasons. First, they provide specific areas where psychosocial and eye care interventions and rehabilitation programs should be targeted in residential care facilities and nursing homes. Second, they suggest that most individuals along the spectrum of VI should be targeted including those with mild/moderate VI. Third, while our study did not find an association between vision loss and depression, vision-related emotional well-being and social interaction are essential components of QoL that are affected by vision loss and should be given our attention.

This is the first time that the impact of vision loss has been investigated using a residential care-specific QoL scale validated using one aspect of item response theory (i.e., Rasch Analysis). Our results, however, are similar to those in another study^{21,34} which also used the NHVQoL but classic test theory methods such as traditional Likert scoring. Our findings are also substantiated by previous studies that have shown that compared with individuals with good vision, older adults with vision impairment are more dependent on others for daily living activities,³⁵ are less likely to partake in social and recreational activities,¹⁸ and are more likely to have mobility disorders and falls.^{36,37} On the other hand, although previous findings have shown that visually impaired residents experience more disruptive behavior³⁸ and have higher rates of depression compared with those with normal vision,³⁹ we did not find such association. We found a relatively lower rate of depres-

sion (16%) compared with other Australian studies involving residential care participants (25%–39%).^{40,41} Potential explanations include the low-level care status of our participants, implying that perhaps a higher rate would have been found among high-level-care residents: our recruitment strategy, which relied on having residential care staff identify participants able to answer the study questions, which could have left out those with poorer emotional health (i.e., depression); our selection of the depression screening scale (PHQ9); and the relatively small sample size.

Our data also show that almost half of this sample was considered to have distance VI (<6/12). This crude rate is substantiated by one large population-based study, the Melbourne Vision Impairment Project (MVIP; 44%)⁶ and a large cross-sectional study (43%)³ in the state of Victoria. We found that 60% of our sample was considered to have near VI. As there are limited data on the prevalence of near VI in residential care facilities in Australia, it is difficult to compare our findings. Nonetheless, our data indicate that the current crude prevalence rates of distance and near VI are high in this population. Considering that more than 40% of the sample reported having cataracts and approximately half of the group was considered to have correctable VI, our findings indicate that a large proportion of residential care residents are unnecessarily living with visual impairment that can easily be corrected.

One of the strengths of this study is the use of the Rasch analysis to validate each subscale of the NHVQoL questionnaire

TABLE 4. Differences in the Seven Subscales of the NHVQoL Scale by the Severity of Distance and Near Vision in Eight Linear Regression Models

	General Vision	Reading	Activities of Daily Living	Mobility	Hobbies	Psychological	Social Interaction
Distance vision							
None (Ref) (n = 40)	89.8 ± 3.9	93.4 ± 6.7	95.4 ± 2.9	92.3 ± 2.9	88.7 ± 4.8	97.7 ± 4.5	99.9 ± 3.1
Mild (n = 14)	-10.7 (-19.5 to -2.0)	-17.4 (-32.2 to -2.7)	-3.7 (-10.5 to 3.1)	-3.5 (-10.9 to 3.9)	-13.2 (-25.6, -4.8)	-5.3 (-15.8 to 5.3)	-3.4 (-11.4 to 4.6)
Moderate (n = 11)	-16.9 (-26.5 to -7.2)	-19.0 (-32.5 to -5.6)	-5.8 (-13.2 to 1.7)	-11.5 (-19.6 to -3.4)	-14.5 (-25.9 to -3.1)	-10.5 (-22.1 to -1.1)	-8.8 (-17.6 to -1.2)
Severe (n = 10)	-43.5 (-53.5 to -33.5)	-73.3 (-88.6 to -58.0)	-19.8 (-27.5 to -12.1)	-14.5 (-22.9 to -6.1)	-48.0 (-59.8 to -36.1)	-42.8 (-54.8 to -30.8)	-32.2 (-41.3 to -23.0)
Near vision							
None (Ref) (n = 31)	89.8 ± 5.3	89.8 ± 3.9	96.4 ± 3.5	95.8 ± 3.9	90.3 ± 5.8	98.9 ± 6.9	95.9 ± 2.6
Mild/moderate (n = 35)	-10.3 (-18.6 to -2.1)	-18.0 (-28.3 to -7.7)	-2.9 (-8.4 to 2.6)	-5.7 (-11.6 to 0.2)	-13.7 (-22.8 to -4.5)	-12.5 (-22.3 to -2.8)	-3.7 (-10.8 to -3.3)
Severe (n = 9)	-39.7 (-53.4 to -25.9)	-80.2 (-97.4 to -62.9)	-12.3 (-21.5 to -3.1)	-11.6 (-21.4 to -1.8)	-48.6 (-63.8 to -33.4)	-42.1 (-58.3 to -25.9)	-28.5 (-39.5 to -17.4)

Data reflect adjustment for age, sex, cognitive impairment, eye conditions and the impact of nonocular comorbidity on daily living. Adjusted means ± SE (standard error) are given for the reference categories and β (confidence intervals) values for others. ref, reference. Bold coefficients represent independent variables significantly associated with vision-specific quality of life (P < 0.05).

and produce estimated linear interval measures on several aspects of vision-dependent QoL. To our knowledge, this is the first time this technique has been used in this population. Conversely, one of the limitations of this study is its relatively small sample size as, for practical reasons, we were unable to screen all participants living in the three residential care facilities. However, as mentioned earlier, our prevalence data are very comparable to a large cross-sectional trial³ and other population-based studies in Australia.^{2,6} Larger international trials have also recorded similar prevalence data for distance visual impairment^{4,5,42} and refractive error.^{5,43} Nonetheless, a larger trial is needed to confirm our findings.

In conclusion, our study found that distance and near-vision loss is highly prevalent in residential care Australian residents and has a significant impact on critical areas of daily living including emotional well being and social interaction. Considering that our findings were delimited to those considered by the staff as capable of answering questions about their vision and daily activities, it is very likely that the prevalence and impact of vision loss is even higher in this section of the population. Vision screening is urgently warranted in this population to identify and refer patients to appropriate eye care services or low vision rehabilitation. Multidisciplinary interventions programs involving refractive error, cataract surgery, low-vision rehabilitation and psychosocial components should be implemented to determine their effectiveness in improving the QoL in people living in residential care facilities. Recent trials have been promising, indicating that refractive error correction^{3,4,43,44} and cataract surgery^{3,4,43,45} significantly enhance functional status and vision-targeted health-related QoL, in addition to improving vision.

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