British Journal of Health Psychology (2006), 11, 303–317

The British Psychological Society

www.bpsjournals.co.uk

Psychological distress and visual functioning in relation to vision-related disability in older individuals with cataracts

J. G. Walker[1]*, K. J. Anstey[1] and S. R. Lord[2]

[1]Centre for Mental Health Research, Canberra, Australia

[2] Falls and Balance Research Group at the Prince of Wales Medical Research Institute, Sydney, Australia

Objective. To determine whether demographic, health status and psychological functioning measures, in addition to impaired visual acuity, are related to vision-related disability.

Methods. Participants were 105 individuals (mean age = 73.7 years) with cataracts requiring surgery and corrected visual acuity in the better eye of 6/24 to 6/36 were recruited from waiting lists at three public out-patient ophthalmology clinics. Visual disability was measured with the Visual Functioning-14 survey. Visual acuity was assessed using better and worse eye logMAR scores and the Melbourne Edge Test (MET) for edge contrast sensitivity. Data relating to demographic information, depression, anxiety and stress, health care and medication use and numbers of co-morbid conditions were obtained.

Results. Principal component analysis revealed four meaningful factors that accounted for 75% of the variance in visual disability: recreational activities, reading and fine work, activities of daily living and driving behaviour. Multiple regression analyses determined that visual acuity variables were the only significant predictors of overall vision-related functioning and difficulties with reading and fine work. For the remaining visual disability domains, non-visual factors were also significant predictors. Difficulties with recreational activities were predicted by stress, as well as worse eye visual acuity, and difficulties with activities of daily living were associated with self-reported health status, age and depression as well as MET contrast scores. Driving behaviour was associated with sex (with fewer women driving), depression, anxiety and stress scores, and MET contrast scores.

Conclusion. Vision-related disability is common in older individuals with cataracts. In addition to visual acuity, demographic, psychological and health status factors

* *Correspondence should be addressed to J. G. Walker, Centre for Mental Health Research, Australian National University, Canberra ACT 0200, Australia (e-mail: janine.walker@anu.edu.au).*

DOI:10.1348/135910705X68681

influence the severity of vision-related disability, affecting recreational activities, activities of daily living and driving.

Cataracts and related visual impairments are highly prevalent throughout the world (Michon, Lau, Chan, & Ellwein, 2002; Rochtchina *et al.*, 2003). In 2001, 1.7 million Australians had a clinically significant cataract in either eye and 320,000 Australians had previously undergone cataract surgery (Rochtchina *et al.*, 2003). The number of Australians with cataracts will grow by two-thirds during the next 20 years, reflecting population ageing (Ivers, Mitchell, & Cumming, 2000). Health care systems will need to develop methods to handle this increased workload.

The significance of the increasing prevalence of cataract and related visual impairment is that adequate vision is recognized as an important factor for everyday physical functioning, mobility and independence in older adults. Studies using generic self-report functioning measures indicate that individuals with vision impairment have levels of difficulty with everyday functioning comparable to those with a history of cancer or stroke (Jang *et al.*, 2003; Massof, 2002; McGwin, Scilley, Brown, & Owsley, 2003; Ryan, Anas, Beamer, & Bajorek, 2003). Vision impairment may lead to difficulties with basic activities of daily living, as well as more complex tasks such as driving and participating in social activities. Cross-sectional studies have demonstrated that vision impairment, self-reported and performance-based, is associated with physical disability and falls (Coleman *et al.*, 2004; Elliott, Patla, Furniss, & Adkin, 2000; West *et al.*, 2002). In longitudinal analyses, poor visual acuity is associated with self-reported limitations in mobility and performance of everyday tasks (Boisjoly *et al.*, 2002; Haymes, Johnston, & Heyes, 2002). However, little is known about the relationship between vision impairment, as measured by clinical tests such as visual acuity, and resulting difficulties with everyday functioning (Haymes *et al.*, 2002).

Recently, a number of biopsychosocial investigations have shown that a range of medical, demographic, psychological and social variables may influence objective and self-report measures of vision-related disability in older individuals with ocular conditions (Paz, Globe, Wu, Azen, & Varma, 2003; Williams, Brody, Thomas, Kaplan, & Brown, 1998).

There is substantial evidence that psychological variables, such as health beliefs and depression, are closely related to vision-related disability in ocular conditions, including cataracts (Brody *et al.*, 2001; Rovner, Casten, & Tasman, 2002; Rovner & Shmuelydulitzki, 1997; Tsai *et al.*, 2003). Depression has been shown to be a more powerful predictor of functional disability than any other co-morbid condition, including severity of vision loss in a random community sample of non-institutionalized individuals aged over 67 years (Rovner & Ganguli, 1998). Brody *et al.* found that 33% of age-related macular degeneration patients had a depressive disorder, which is approximately twice as high as that found using similar diagnostic methods in populations of older community-dwelling individuals and is comparable to out-patients with life-threatening diseases.

To date, there is limited multidisciplinary research on how a range of medical, psychological and demographic variables impact on self-report vision-related disability in older individuals with cataracts. Those studies that include psychological functioning almost exclusively focus on depressive symptoms with little consideration of the impact of other aspects of psychological well-being, such as stress and anxiety, on vision-related disability (Billig, Stockton, & Cohenmansfield, 1996; Fagerstrom, 1994; Stockton, Cohen-Mansfield, & Billig, 2000; Wilson *et al.*, 2002). Investigations of potential

disability outcomes for individuals with ophthalmological conditions tend to treat vision-related disability as one domain. Even studies that adopt a more biopsychosocial framework examine the impact of demographic, health, psychological and visual functioning variables on vision-related disability using measures, such as the Visual Function-14 index (VF-14 index; Steinberg *et al.*, 1994), that group basic activities of daily living, complex tasks (e.g. driving) and social activities (e.g. games, sport) within the same construct (Kamel, Guro-Razuman, & Shareeff, 2000; Massof, 2002; Massof & Rubin, 2001; Valbuena, Bandeen-Roche, Rubin, Munoz, & West, 1999). A serious limitation of examining vision-related disability as one construct is that different variables may be more or less important in predicting difficulties with different activities and tasks. Using only one vision-related disability factor may hide this fact.

Hence, this study aims to determine whether a range of demographic, health status, psychological functioning and visual measures are interrelated with vision-related disability. It will also be determined whether there are distinct areas of vision-related disability and if they are related to the same demographic, health, psychological and visual acuity variables.

Methods

Participants

The sample comprised 105 participants (44 men, 61 women) requiring cataract surgery who were recruited from waiting lists of out-patient ophthalmology clinics in three teaching hospitals in Sydney, Australia. Cases were restricted to predominantly posterior subcapsular opacities to reduce the variability in measurements of corrected visual acuity from refractive changes that are often seen with nuclear cataracts. For inclusion, it was necessary that participants have pre-operative visual acuity in the better eye of 6/24 to 6/36. The minimum inclusion age was 55 years and there was no specified maximum age. The exclusion criteria were: a history of neurological conditions, a mini-mental state examination score below 24/30, significant eye disease other than cataracts, marked hearing impairment and poor English language skills.

Design and procedures

Potential participants were given the study information and asked to complete a consent form in order to meet the ethical requirements of study involvement. The participating hospitals, as well as the University of New South Wales, were granted human research ethics approval. A home-based assessment included measures of visual acuity and cognitive tasks in both visual and auditory modalities. Participants completed self-report surveys, including demographic information, health status, health care and medication use, number of co-morbid conditions, psychosocial functioning and vision-related disability.

Measures of health

Five health status items were used to determine potential co-morbid conditions, medication use and health care use of individuals with cataracts. The names of all currently used medications were directly transcribed from the medication containers to the coding form by the interviewer; a score was then tallied. To determine health care use, respondents reported the number of times they had visited a physician for any

health issue over the past 12 months. Participants were asked to list any other conditions they had been diagnosed or treated for, such as high blood pressure, emphysema and arthritis, to determine whether co-morbid conditions were present. The number of conditions selected was added for a total co-morbid condition score. As well, two health-belief items investigated individuals' beliefs about their current health, and their health in relation to same-age peers on a seven-point Likert scale (1 = very poor to 7 = excellent). Studies indicate that self-reported health beliefs are a good predictor of disability outcomes and are linked with psychosocial adjustment and chronic health problems including rheumatic, cardiovascular and ophthalmological conditions (Affleck, Tennen, Pfeifer, & Fifield, 1987; Dahlin-Ivanoff, Klepp, & Sjostrand, 1998; Dahlin-Ivanoff, Sonn, & Vensson, 2001). The five health status measures have been used in numerous clinical ophthalmological studies with older people (Brody *et al.*, 2001).

Measures of vision

Visual acuity was determined using a logMAR transparency on an illuminated light box. The alphabetical characters on the transparency varied in size by 0.1 logMAR units between rows, which participants read at a testing distance of 3 m (Haymes *et al.*, 2002). The smallest visual angle, namely, the smallest line read with one or no errors, was recorded. Distance acuity was measured in terms of the logarithm of the minimum angle resolvable in minutes of arc (i.e. logMAR) because this metric is easily fitted to statistical analyses (Haymes *et al.*, 2002).

The Melbourne Edge Test (MET) assessed edge contrast sensitivity at 25 cm with a background luminance of 50-Cd m^{-2} (Haymes *et al.*, 2002). The MET measures the contrast threshold for a single luminance profile edge, which is an aperiodic stimulus, by presenting 20 circular patches containing edges with reducing contrast and variable orientation; testing ceases at two consecutive errors. Correct identification of the orientation of the patch edges provides a measure of contrast sensitivity in decibel units, where $dB = -10 \log_{10}$ contrast. The reliability and external validity of the MET has been established in clinical investigations (Verbaken & Johnston, 1986).

Measures of psychological function

Psychosocial functioning was measured using the Depression anxiety stress scale (DASS) (Lovibond & Lovibond, 1995), which is a 21-item self-report measure that yields three factors of negative affect including depression, anxiety and stress. The three subscales each contains seven items in which participants rate the extent to which the symptoms described have been experienced over the past week using a 4-point Likert scale (0 = did not apply to me at all to 3 = applied to me very much or most of the time). Responses to each subscale were summed to give scores between 0 and 21 with a higher score indicating greater severity levels. Alpha coefficients indicated that the depression, anxiety and stress subscales had good internal consistency with Cronbach's alphas of .87, .71 and .85, respectively. Lovibond and Lovibond provide evidence of adequate external, construct and discriminant validity in relation to other measures of depression and anxiety, including the Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) and Beck Anxiety Inventory for both clinical and community samples (Beck, Epstein, Brown, & Steer, 1988).

Measure of visual disability

Vision-related disability was measured using the VF-14 index (Steinberg *et al.*, 1994). The VF-14 is a brief self-report questionnaire designed to measure functional impairment caused by cataracts and has been used with other ophthalmological disorders (Alonso *et al.*, 1997; Boisjoly *et al.*, 2002; Boisjoly *et al.*, 1999; Cassard *et al.*, 1995; Castells *et al.*, 1999; Pager, 2004; Stifter, Sacu, & Weghaupt, 2004). The VF-14 consists of 14 items rated on a 5-point Likert scale (0 = cannot do activity to 4 = have no difficulty with activity) that assess how much difficulty is experienced during vision-related activities, including reading a newspaper, seeing steps, reading traffic signs, cooking and driving (e.g. Do you have difficulty driving during the day, even with eyeglasses, because of your vision?). Responses were summed and then weighted to give a total disability score between 0 and 100 with a lower score indicating greater vision-related disability. The VF-14 has excellent internal consistency for cataract patient samples with $\alpha = .85$ and correlates more strongly with patient self-reported difficulties and satisfaction with vision than do several measures of visual acuity and general health status (Cassard *et al.*, 1995; Friedman *et al.*, 2002; Linder *et al.*, 1999; Riusala, Sarna, & Immonen, 2003; Steinberg *et al.*, 1994).

Statistical analyses

SPSS version 11.5 was used for all the statistical analyses. Maximum likelihood (ML) estimation was used to impute and replace missing data imputation, which ranged from 0% to 4.5% for all the variables included in analyses (Tabachnick & Fidell, 1996). Individuals with varying vision-related disabilities categorized as mild or moderate to severe were compared with respect to demographic, health status, visual acuity and psychological functioning variables.

Principal components analysis (PCA) with varimax rotation determined whether there were coherent subscales that could be composed with individual items of the VF-14 and Cronbach's coefficient α was calculated to assess internal consistency. Stepwise hierarchical multiple regression analyses determined whether demographic, health status, psychological functioning and visual acuity were predictive of vision-related functioning, including total vision-related functioning, recreational activities (e.g. taking part in sports like bowling), reading and fine handiwork (e.g. reading a newspaper, doing fine handiwork like sewing), intermediate activities of daily living (e.g. cooking) and driving. Four blocks of variables were entered into the analyses, including: (1) demographic – age, sex, and partnered, (2) health status variables – health status, number of co-morbid conditions, number of co-morbid conditions that create difficulties with activities of daily living, medication use and number of GP visits in the last year, (3) psychological functioning – depression, anxiety and stress, and, lastly, (4) visual acuity – MET and logMAR scores for better and worse eye.

Results

Participant characteristics

Participants' ages ranged from 58 to 91 years (mean age = 73.69 years; $SD = 7.10$) and 58.1% were women. The majority of participants were married (57.1%), spoke English at home (88.6%) and had not completed secondary education (74.3%; Table 1). Most participants rated their health as better than average (57.1%), despite the fact that 74.3%

had multiple co-morbid health conditions (e.g. high blood pressure), and the mean number of visits to a general practitioner during the past twelve months was 11.84 ($SD = 12.36$; Table 2). For visual acuity, the mean logMAR for the better eye was 2.52 ($SD = 1.36$) and the mean MET score was 19.48 ($SD = 2.86$). The participants had low levels of depression ($M = 6.13$, $SD = 8.18$), anxiety ($M = 5.76$, $SD = 6.10$) and stress ($M = 7.47$, $SD = 7.78$) compared with normative data (Antony, Bieling, Cox, Enns, & Swinson, 1998). Participants had difficulty with vision-related functioning ($M = 78.75$, $SD = 15.91$, range = 28.85–100), which is similar to previous cataract studies (Friedman *et al.*, 2002; Steinberg *et al.*, 1994).

Table 1. Demographic characteristics of 105 participants with cataracts

Characteristics	Number	Percent
Age, years	73.69*	7.10*
Sex		
Male	44	41.90
Female	61	58.10
Education, years	9.76*	2.81*
≤ 9 years	63	60.00
10–13 years	31	29.60
≥ 14 years	11	10.60
Marital status		
Married/*de facto*	60	57.10
Single	7	6.70
Divorced/separated	9	8.60
Widowed	29	27.60
First language		
English	93	88.60
Southern European	4	3.90
Northern European	7	6.70
Arabic	1	1.00

* Data are shown as mean ± *SD*.

Principle components analysis for the VF-14

A PCA was conducted on the VF-14 items in order to reduce the number of variables into meaningful subscales for multiple regression analyses. The two driving items were excluded from the PCA, as many of the subjects ($N = 56$) were not current drivers. Tests of data appropriateness indicated that the subscales including the raw data were suitable for PCA. The Kaiser–Meyer–Olkin measure of sampling adequacy was .623 and the Bartlett's test of sphericity was significant, indicating that the hypothesis that there were no factors present could be rejected with $\chi^2(66) = 158.40$, $p < .0001$.

The PCA on 12 VF-14 items converged to yield four factors with eigen values greater than one, accounting for 74.7% of the variance. Factor 1 was labelled 'recreational activities' and included games, sports, watching television, seeing steps and reading traffic signs. Factor 2 ('reading and fine-work activities') included reading small print and newspapers, and craftwork. Factor 3 included 'instrumental activities of daily living' (IADL) such as cooking, writing cheques and reading large print and Factor 4 was the recognizing faces item (Table 3). The internal consistencies were good for each factor

with a Cronbach's alpha coefficient of .73 for recreational activities, .74 for reading and fine-work and .53 for IADL.

Table 2. Clinical characteristics of 105 participants with cataracts

Characteristics	Mean	*SD*
Health status		
Health rating	4.54	1.38
Health compared with peers rating	5.01	1.33
Number of prescription medications	3.86	2.99
Number of times seen a GP in the last 12 months	11.84	12.33
Number of co-morbid conditions	2.77	1.92
Visual acuity		
LogMAR for better eye	2.14	1.26
LogMAR for worse eye	3.80	2.06
Melbourne Edge Test	19.48	2.86
Vision-related functioning	78.75	15.91
Psychological functioning		
Depression	6.13	8.18
Anxiety	5.76	6.10
Stress	7.47	7.78

Table 3. Rotated factor loadings following principal components analysis for the VF-14

Items	Factor 1 Recreational activities	Factor 2 Reading and fine work	Factor 3 IADL	Factor 4 Face recognition
Reading small print	−.01	**.91**	.07	.01
Reading newspaper	.15	**.86**	.17	−.01
Reading large print	.05	.12	**.85**	−.13
Recognizing faces	.04	.04	−.07	**.94**
Seeing steps	**.89**	.09	−.21	−.04
Reading traffic signs	**.64**	.36	.31	.23
Fine handiwork	.39	**.68**	.19	.04
Writing cheques	.15	.57	**.59**	−.01
Games	**.56**	.39	.28	.01
Sports	**.83**	.21	.01	−.21
Cooking	.01	.15	**.87**	.07
Watching television	**.74**	.12	.13	.34

Note: excludes driving questions.

An additional driving subscale was also derived. This factor comprised day- and night-time driving items and reading traffic and street signs items. A Cronbach's alpha coefficient of .74 indicated that this subscale had good internal consistency. Overall, the adequate loadings of the three subscales in combination with the robust internal consistencies for all the subscales indicated that they were all permissible in further analyses.

Group comparisons

An ANOVA was conducted to determine if there were any differences in a range of demographic, health status, psychological and visual functioning variables between groups with normal or moderate to severe levels of difficulty with vision-related disabilities. Individuals with normal or moderate to severe vision-related disabilities did not differ on a range of demographic, health status and psychological functioning variables (Table 4). Individuals with moderate to severe vision-related disability, however, had worse visual acuity scores in the better, $F(1, 103) = 6.57$, $p = .012$, and worse, $F(1, 103) = 10.83$, $p = .001$, eyes and poorer visual contrast sensitivity, $F(1, 103) = 3.96$, $p = .049$.

Table 4. Comparisons on demographic, health status, psychological functioning and visual acuity variables for individuals with normal or moderate to severe levels of difficulty with vision-related functioning

	Normal			Moderate to Severe			
	N	*M*	*SD*	*N*	*M*	*SD*	*p*
Demographic							
Age	72	73.13	6.50	33	74.91	8.25	.234
Education years	72	9.69	2.71	33	9.91	3.05	.718
Health rating							
Health rating	72	4.67	1.43	33	4.27	1.23	.176
Health compared with peers	72	5.07	1.31	33	4.88	1.36	.497
Number of prescription drugs	72	3.85	3.05	33	3.88	2.91	.960
Number of visits to general practitioner	72	11.79	11.31	33	11.94	14.49	.955
Number of co-morbid conditions	72	2.71	1.95	33	2.91	1.86	.621
Psychological functioning							
Depression	72	6.03	7.81	33	6.36	9.06	.846
Anxiety	72	5.80	5.96	33	5.69	6.48	.934
Stress	72	7.44	7.02	33	7.53	9.36	.958
Visual acuity							
LogMAR for better eye	72	2.40	1.30	33	2.59	1.40	.012
LogMAR for worse eye	72	3.37	1.85	33	4.74	2.23	.001
Melbourne Edge Test	72	19.85	2.68	33	18.67	3.12	.008

Correlates of vision-related functioning

Multiple regression analyses indicated that the visual acuity variables, worse eye logMAR and MET scores accounted for 19.90% of the variance for total vision-related functioning, $\beta = -0.24$, $F(2, 102) = 12.64$, $p < .001$, with no other variables accounting for any further variance (Table 5). Stress was associated with difficulties with recreational activities, accounting for 16.20% of the variance, while visual acuity, specifically worse eye logMAR scores, accounted for a further 29.90% of the unique variance, $\beta = -0.54$, $F(2, 34) = 14.05$, $p < .001$. As well, the worse eye logMAR score was modestly related to reading and fine handiwork difficulties, accounting for 5.60% of the variance with $\beta = -0.24$, $F(1, 86) = 5.11$ and $p = .026$ (Table 5). IADL difficulties were associated with health status, depression and the MET, which accounted for 4.80, 5.20 and 5.20% of the variance, respectively, $\beta = -0.24$, $F(3, 80) = 4.77$, $p = .004$. Lastly, sex was related to driving behaviour with less women driving, accounting for

Table 5. Hierarchical regression analyses for vision-related disabilities of individuals with cataracts

	VF-14 ($N = 104$)			REC ($N = 88$)			READ ($N = 81$)			IADL ($N = 84$)			DRIVE ($N = 48$)[#]		
Variable	β	R^2 change	*p*	β	R^2 change	*p*	β	R^2 change	*p*	β	R^2 change	*p*	β	R^2 change	*p*
Step 1															
Age	0.04	–	.68	0.19	–	.22	−0.08	–	.43	**− 0.21**	–	.04	0.24	–	.08
Sex	−0.05	–	.54	−0.07	–	.84	−0.05	–	.63	0.07	–	.52	**− 0.26**	–	.05
Mar	0.11	–	.25	0.03	–	.52	0.11	–	.29	−0.05	–	.67	−0.07	.08	.62
Step 2															
HS	0.06	–	.48	−0.02	–	.94	0.05	–	.64	**0.15**	–	.15	−0.04	–	.78
Drug	−0.08	–	.40	0.15	–	.76	−0.15	–	.15	−0.02	–	.86	0.02	–	.88
GP	0.05	–	.57	0.10	–	.61	−0.02	–	.88	0.03	–	.76	−0.08	–	.57
Com	−0.01	–	.93	0.14	–	.57	−0.09	–	.41	−0.12	.05	.33	−0.03	–	.82
Step 3															
Dep	−0.10	–	.33	0.16	–	.54	−0.06	–	.61	**− 0.28**	–	.01	**− 0.27**	–	.05
Anx	−0.09	–	.86	0.04	–	.69	0.04	–	.69	**0.31**	–	.03	**− 0.30**	–	.05
Stress	−0.20	–	.04	**− 0.45**	.16	.00	−0.04	–	.72	0.16	.05	.23	**− 0.40**	–	.00
Step 4															
B log	−0.09	–	.41	0.06	–	.47	−0.11	–	.37	−0.09	–	.39	0.06	–	.66
W log	**− 0.38**	–	.00	**− 0.54**	–	.00	**− 0.24**	–	.03	−0.09	–	.42	−0.22	–	.11
MET	**0.24**	.20	.01	−0.19	.29	.27	0.12	.05	.26	**0.24**	.05	.03	**− 0.32**	.10	.02

Note. VF-14 = Visual functioning-14 total score; REC = recreational activities, READ = reading and fine work, IADL = intermediate activities of daily living, Mar = married/partnered, HS = health status, Drug = number of prescription medications taken, GP = number of times visited a general practitioner in last 12 months, Com = number of co-morbid conditions, Dep = depression, Anx = anxiety, B log = better eye logMAR score, W log = worse eye logMAR score and MET = Melbourne Edge Test.

[#] Current drivers only.

8.30% of the variance, while the MET score accounted for a further 14.80% of the unique variance for driving difficulties, $\beta = -0.32$, $F(2, 45) = 5.09$, $p < .010$.

Discussion

The present study had two principle aims in relation to vision-related functioning in older individuals with cataracts: (1) determine whether there are a number of clinically meaningful subscales within the VF-14 that may assist in exploring how cataracts affect older individuals' ability in everyday vision-related tasks and (2) determine whether demographic, health, vision and psychological variables are predictive of vision-related functioning.

Some findings suggest it may be inappropriate to consider disability as a unidimensional construct and that there may be a number of disability domains that differ in content and complexity (Thomas, Rockwood, & McDowell, 1998). Hence, it was anticipated that PCA conducted on the VF-14 items would reveal subscales differing in content. Three theoretically meaningful factors converged and comprised recreational activities, reading and fine-work and IADL. As well, a driving subscale was derived from three VF-14 items for the subsample of current drivers, with Cronbach's $\alpha = .74$.

Researchers have explored alternative definitions and ways of operationalizing disability (Nagi, 1989; Stewart & Painter, 1997; Wolinsky & Johnson, 1991). Similar to the present study, Steinberg and colleagues (Steinberg *et al.*, 1994) conducted a factor analysis on the VF-14 for 107 individuals with cataracts waiting to undergo surgery. The analysis yielded a driving factor and two factors similar to reading and fine-work, and recognizing faces; however, the largest factor comprised recreational and IADL items. Differences in the subscales may be because Steinberg *et al.* only used data from individuals who engaged in all 14 activities, who differed from the total sample by being significantly younger and male, working as well as having better visual acuity and less medical co-morbidity. However, no clinically meaningful factors were generated when Steinberg *et al.* replicated the PCA with the entire sample.

These findings indicate that considering vision-related disability as a number of separate factors, rather than one large domain, may be a useful way of investigating the impact of cataracst. For instance, difficulties in carrying out recreational activities has been associated with greater levels of depression compared with other domains of disability, including activities of daily living and work capacity in older individuals with rheumatic and ocular conditions (Katz & Yelin, 2001). However, information may be lost in surveys which have a total disability index that summarizes an individual's capabilities across a number of subscales and these aggregates may not be appropriate from both clinical and research perspectives (Meenan, Mason, Anderson, Guccione, & Kazis, 1992; Steinberg *et al.*, 1994).

We found that when the group was categorized into those with normal or moderate to severe levels of vision-related disability, only measures of visual acuity discriminated between the groups. No differences were evident for any of the demographic, heath status or psychological variables. Demographic, health status and psychological functioning variables lacked predictive ability for vision-related disability when the VF-14 scales were considered as a single score.

A different picture emerges when we examined predictors for the four vision-related disability factors. Both stress and visual acuity were associated with recreational activity

difficulties, accounting for 13.8% and 29.9% of the variance, respectively. This is in keeping with a study that included 51 individuals with age-related macular disease, which reported that individuals who limited their participation in valued recreational activities had worse visual acuity and greater levels of depression than those who continued with their recreational activities (Rovner & Casten, 2002). Further, a regression model demonstrated that activity loss mediated the relationship between visual acuity and depression that occurs in ocular conditions; largely to the extent that valued activities are relinquished because of vision loss (Rovner & Casten, 2002). Individuals with chronic health conditions consistently indicate that of all the limitations they may face as a consequence of a medical condition, difficulties with recreational and social activities are of greatest concern (Katz & Yelin, 2001; Stewart & Painter, 1997; Verbrugge, 1990).

Visual acuity was predictive of reading and fine handiwork and driving ability, accounting for 6.0% and 10.2% of the variance, respectively. That is, individuals with poor visual acuity were likely to have difficulties with reading and driving. Previous studies have shown that poor visual acuity may be associated with reduced driving, driving cessation and greater involvement in motor vehicle accidents (Friedman *et al.*, 2002; Owsley *et al.*, 2002; Owsley, Stalvey, Wells, Sloane, & McGwin, 2001). We found also that sex was predictive of driving difficulties, accounting for 8.3% of the variance and supporting research which indicates older women are more likely to stop driving than same-age men (Gilhotra, Mitchell, Ivers, & Cumming, 2001; Hakamies-Blomqvist, 1994).

Health status, visual acuity and depression were significant predictors of IADL, accounting for 4.8, 5.2 and 5.2% of the variance, respectively. This is in keeping with previous findings that poorer health and visual acuity (Haymes *et al.*, 2002; Steinberg *et al.*, 1994) and higher levels of depression are associated with more difficulties with vision-related disability in ocular disease patients (Rovner & Casten, 2001, 2002; Rovner *et al.*, 2002). For instance, one study of 151 individuals with advanced age-related macular disease (mean age = 80 years) whose vision was 20/60 or worse in their better eye, found that visual acuity, health and depression significantly predicted IADL (Brody *et al.*, 2001). Further, 32.5% ($N = 49$) of the participants met the criteria for a depressive disorder, twice the rate observed in community-dwelling elderly. The authors concluded that depression might be a significant problem for the elderly with ocular conditions; further research on psychopharmacological and psychotherapeutic interventions for depressed individuals with eye disorders is warranted to improve depression and, subsequently, physical functioning.

Previous studies have found that poor edge contrast sensitivity and reduced depth perception are stronger risk factors for falls in older people than standard tests of visual acuity (Lord & Dayhew, 2001; Nevitt, Cummings, Kidd, & Black, 1989). This study provides complementary findings, in that we found that edge contrast sensitivity was the strongest visual predictor of the activities of daily living and driving domains. Visual acuity in the worse eye was the strongest visual predictor of total VF-14 scores, recreational activities and reading and fine handiwork domains. The ability to accurately judge distances and perceive spatial relationships is important for many activities of daily living and good vision in both eyes is necessary for these tasks (Lord & Dayhew, 2001). This finding indicates that maximizing vision in both eyes with interventions such as cataract surgery is important for reducing vision-related disability in older people.

There are limitations to this study that must be considered when interpreting the findings. Firstly, the study lacks a control group free from ocular disease; however, this was rectified by comparing scores with age-matched norms for surveys such as the DASS. Despite our recruitment method of contacting all patients on waiting lists from three major hospitals and ensuring that the sample's education level was similar to other population-based studies of older Australian adults, individuals who participated may differ from non-participants in terms of physical and mental health or daytime commitments. The cross-sectional nature of the data also precludes analysis of potential dynamic interrelationships amongst the key measures and limits conclusions regarding cause and effect relationships between the variables. However, data from participants in this study after having cataract surgery is currently being examined to gain a better understanding of the interrelationships between vision, demographic, health, psychological and vision-related functioning variables.

Conclusions

Visual acuity, stress, depression and, to a smaller extent, health status appear to be important influences on the severity of vision-related disability in ocular conditions. Visual acuity is predictive of only some variance for vision-related disability and factors such as psychological functioning, health and demographic variables may come into play. The findings indicate that a range of demographic, health and psychological factors may act as buffers or exacerbate potential disablement processes associated with cataracts (Jette & Keysor, 2003; Nagi, 1989; Rovner & Casten, 2002). Hence, interventions targeted at improving general health or negative affect may reduce vision-related disability and ultimately improve the quality of life of older individuals with cataracts awaiting surgery.

References

Affleck, G., Tennen, M. H., Pfeifer, C., & Fifield, J. (1987). Appraisals of control and predictabilty in adapting to a chronic disease. *Journal of Personality and Social Pyschology*, *53*, 273–279.

Alonso, J., Espallargues, M., Anderson, T. F., Cassard, S. D., Dunn, E., Bernthpetersen, P., *et al*. (1997). International applicability of the vf-14 – an index of visual function in patients with cataracts. *Ophthalmology*, *104*(5), 799–807.

Antony, M. M., Bieling, P. J., Cox, B. J., Enns, M. W., & Swinson, R. P. (1998). Psychometric Properties of the 42-item and 21-item versions of the depression anxiety stress scales (DASS) in clinical groups and a community sample. *Psychological Assessment*, *10*, 176–181.

Beck, A. T., Epstein, N., Brown, G., & Steer, R. A. (1988). An inventory for measuring clinical anxiety: Psychometric properties. *Journal of Consulting and Clinical Psychology*, *56*, 893–897.

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry*, *4*, 561–571.

Billig, N., Stockton, P., & Cohenmansfield, J. (1996). Cognitive and affective changes after cataract surgery in an elderly population. *American Journal of Geriatric Psychiatry*, *4*(1), 29–38.

Boisjoly, H., Gresset, J., Charest, M., Fontaine, N., Brunette, I., Lefrancois, M., *et al.* (2002). The VF-14 index of visual function in recipients of a corneal graft: A 2-year follow-up study. *American Journal of Ophthalmology*, *134*(2), 166–171.

Boisjoly, H., Gresset, J., Fontaine, N., Charest, M., Brunette, I., LeFrancois, M., *et al.* (1999). The VF-14 index of functional visual impairment in candidates for a corneal graft. *American Journal of Ophthalmology*, *128*(1), 38–44.

Brody, B., Gamst, A., Williams, R., Smith, A., Lau, P., Dolnak, D., *et al.* (2001). Depression, visual acuity, comorbidity, and disability associated with age-related macular degeneration. *Ophthalmology*, *108*(10), 1893–1900.

Cassard, S. D., Patrick, D. L., Damiano, A. M., Legro, M. W., Tielsch, J. M., Dienerwest, M., *et al.* (1995). Reproducibility and responsiveness of the vf-14 – an index of functional impairment in patients with cataracts. *Archives of Ophthalmology*, *113*(12), 1508–1513.

Castells, X., Alonso, J., Ribo, C., Casado, A., Buil, J. A., Badia, M., *et al.* (1999). Comparison of the results of first and second cataract eye surgery. *Ophthalmology*, *106*(4), 676–682.

Coleman, A. L., Stone, K., Ewing, S. K., Nevitt, M., Cummings, S., Cauley, J. A., *et al.* (2004). Higher risk of multiple falls among elderly women who lose visual acuity. *Ophthalmology*, *111*(5), 857–862.

Dahlin-Ivanoff, S., Klepp, K. I., & Sjostrand, J. (1998). Development of a health education programme for elderly with age-related macular degeneration – a focus group study. *Patient Education and Counseling*, *34*(1 Special Issue SI), 63–73.

Dahlin-Ivanoff, S., Sonn, U., & Vensson, E. (2001). Development of an ADL instrument targeting elderly persons with age-related macular degeneration. *Disability and Rehabilitation*, *23*(2), 69–79.

Elliott, D. B., Patla, A. E., Furniss, M., & Adkin, A. (2000). Improvements in clinical and functional vision and quality of life after second eye cataract surgery. *Optometry and Vision Science*, *77*(1), 13–24.

Fagerstrom, R. (1994). Correlation between depression and vision in aged patients before and after cataract operations. *Psychological Reports*, *75*(1 Part 1), 115–125.

Friedman, D. S., Tielsch, J. M., Vitale, S., Bass, E. B., Schein, O. D., & Steinberg, E. P. (2002). VF-14 item specific responses in patients undergoing first eye cataract surgery: Can the length of the VF-14 be reduced? *British Journal of Ophthalmology*, *86*(8), 885–891.

Gilhotra, J. S., Mitchell, P., Ivers, R., & Cumming, R. G. (2001). Impaired vision and other factors associated with driving cessation in the elderly: The blue mountains eye study. *Clinical and Experimental Ophthalmology*, *29*(3), 104–107.

Hakamiesblomqvist, L. (1994). Aging and fatal accidents in male and female drivers. *Journals of Gerontology*, *49*(6), S286–S290.

Haymes, S. A., Johnston, A. W., & Heyes, A. D. (2002). Relationship between vision impairment and ability to perform activities of daily living. *Ophthalmic and Physiological Optics*, *22*(2), 79–91.

Ivers, R. Q., Mitchell, P., & Cumming, R. G. (2000). Visual function tests, eye disease and symptoms of visual disability: A population-based assessment. *Clinical and Experimental Ophthalmology*, *28*(1), 41–47.

Jang, Y. R., Mortimer, J. A., Haley, W. E., Small, B. J., Chisolm, T. E. H., & Graves, A. B. (2003). The role of vision and hearing in physical, social, and emotional functioning among older adults. *Research on Aging*, *25*(2), 172–191.

Jette, A. M., & Keysor, J. J. (2003). Disability models: Implications for arthritis exercise and physical activity interventions. *Arthritis Care and Research*, *49*(1), 114–120.

Kamel, H. K., Guro-Razuman, S., & Shareeff, M. (2000). The activities of daily vision scale: A useful tool to assess fall risk in older adults with vision impairment. *Journal of the American Geriatrics Society*, *48*(11), 1474–1477.

Katz, P., & Yelin, E. (2001). Activity loss and the onset of depressive symptoms: Do some activities matter more than others. *Arthritis and Rheumatism*, *44*, 1194–1202.

Linder, M., Chang, T. S., Scott, I. U., Hay, D., Chambers, K., Sibley, L. M., *et al.* (1999). Validity of the visual function index (VF-14) in patients with retinal disease. *Archives of Ophthalmology*, *117*(12), 1611–1616.

Lord, S. R., & Dayhew, J. (2001). Visual risk factors for falls. *Journal of the American Geriatrics Society*, *49*, 508–515.

Lovibond, P., & Lovibond, S. (1995). The structure of negative emotional states: Comparison of the depression anxiety stress scales (DASS) with the beck depression and anxiety inventories. *Behaviour Research and Therapy*, *33*, 335–343.

Massof, R. W. (2002). The measurement of vision disability. *Optometry and Vision Science*, *79*(8), 516–552.

Massof, R. W., & Rubin, G. S. (2001). Visual function assessment questionnaires. *Survey of Ophthalmology*, *45*(6), 531–548.

McGwin, G., Scilley, K., Brown, J., & Owsley, C. (2003). Impact of cataract surgery on self-reported visual difficulties – Comparison with a no-surgery reference group. *Journal of Cataract and Refractive Surgery*, *29*(5), 941–948.

Meenan, R., Mason, J., Anderson, J., Guccione, A., & Kazis, L. (1992). AIMS2: The content and properties of a revised and expanded arthritis impact measurement scales health status questionnaire. *Arthritis and Rheumatism*, *35*, 1–10.

Michon, J. J., Lau, J., Chan, W. S., & Ellwein, L. B. (2002). Prevalence of visual impairment, blindness, and cataract surgery in the Hong Kong elderly. *British Journal of Ophthalmology*, *86*(2), 133–139.

Nagi, S. (1989). *A comparison of conceptual frameworks of disability*. Washington, DC: Committee on Secondary Prevention of Disability, Institute of Medicine.

Nevitt, M., Cummings, S., Kidd, S., & Black, D. (1989). Risk factors for recurrent non-syncopal falls. *Journal of the American Medical Association*, *261*, 2663–2668.

Owsley, C., McGwin, G., Sloane, M., Wells, J., Stalvey, B. T., & Gauthreaux, S. (2002). Impact of cataract surgery on motor vehicle crash involvement by older adults. *Jama: Journal of the American Medical Association*, *288*(7), 841–849.

Owsley, C., Stalvey, B. T., Wells, J., Sloane, M. E., & McGwin, G. (2001). Visual risk factors for crash involvement in older drivers with cataract. *Archives of Ophthalmology*, *119*(6), 881–887.

Pager, C. K. (2004). Assessment of visual satisfaction and function after cataract surgery. *Journal of Cataract and Refractive Surgery*, *30*(12), 2510–2516.

Paz, S., Globe, D., Wu, J., Azen, S. P., & Varma, R. (2003). Relationship between self-reported depression and self-reported visual function in Latinos. *Archives of Ophthalmology*, *121*(7), 1021–1027.

Riusala, A., Sarna, S., & Immonen, I. (2003). Visual function index (VF-14) in exudative age-related macular degeneration of long duration. *American Journal of Ophthalmology*, *135*(2), 206–212.

Rochtchina, E., Mukesh, B. N., Wang, J. J., McCarty, C. A., Taylor, H. R., & Mitchell, P. (2003). Projected prevalence of age-related cataract and cataract surgery in Australia for the years 2001 and 2021: Pooled data from two population-based surveys. *Clinical and Experimental Ophthalmology*, *31*(3), 233–236.

Rovner, B. W., & Casten, R. J. (2001). Neuroticism predicts depression and disability in age-related macular degeneration. *Journal of the American Geriatrics Society*, *49*(8), 1097–1100.

Rovner, B. W., & Casten, R. J. (2002). Activity loss and depression in age-related macular degeneration. *American Journal of Geriatric Psychiatry*, *10*(3), 305–310.

Rovner, B. W., Casten, R. J., & Tasman, W. S. (2002). Effect of depression on vision function in age-related macular degeneration. *Archives of Ophthalmology*, *120*(8), 1041–1044.

Rovner, B. W., & Ganguli, M. (1998). Depression and disability associated with impaired vision – the movies project. *Journal of the American Geriatrics Society*, *46*(5), 617–619.

Rovner, B. W., & Shmuelydulitzki, Y. (1997). Screening for depression in low-vision elderly. *International Journal of Geriatric Psychiatry*, *12*(9), 955–959.

Ryan, E. B., Anas, A. P., Beamer, M., & Bajorek, S. (2003). Coping with age-related vision loss in everyday reading activities. *Educational Gerontology*, *29*(1), 37–54.

Steinberg, E. P., Tielsch, J. M., Schein, O. D., Javitt, J. C., Sharkey, P., Cassard, S. D., *et al.* (1994). The vf-14 – an index of functional impairment in patients with cataract. *Archives of Ophthalmology*, *112*(5), 630–638.

Stewart, A., & Painter, P. (1997). Issues in measuring physical functioning and disability in arthritis patients. *Arthritis Care and Research*, *10*, 395–405.

Stifter, E., Sacu, S., & Weghaupt, H. (2004). Functional vision with cataracts of different morphologies: Comparative study. *Journal of Cataract and Refractive Surgery*, *30*(9), 1883–1891.

Stockton, P., Cohen-Mansfield, J., & Billig, N. (2000). Mental status change in older surgical patients – Cognition, depression, and other comorbidity. *American Journal of Geriatric Psychiatry*, *8*(1), 40–46.

Tabachnick, B., & Fidell, L. (1996). *Using multivariate statistics* (Vol. 3). New York: Harper Collins.

Thomas, V., Rockwood, K., & McDowell, I. (1998). Multidimensionality in instrumental and basic activities of daily living. *Journal of Clinical Epidemiology*, *51*, 315–321.

Tsai, S. Y., Cheng, C. Y., Hsu, W. M., Su, T. P. T., Liu, J. H., & Chou, P. (2003). Association between visual impairment and depression in the elderly. *Taiwan i Hsueh Hui Tsa Chih – Journal of the Formosan Medical Association*, *102*(2), 86–90.

Valbuena, M., Bandeen-Roche, K., Rubin, G. S., Munoz, B., & West, S. K. (1999). Self-reported assessment of visual function in a population-based study: The SEE project. *Investigative Ophthalmology and Visual Science*, *40*(2), 280–288.

Verbaken, J., & Johnston, A. (1986). Population norms for edge contrast sensitivity. *American Journal of Optometrics and Physiological Optometry*, *63*, 724–732.

Verbrugge, L. M. (1990). The iceberg of disability. In S. Stahl (Ed.), *The Legacy of Longevity: Health and Health Care in Later Life* (pp. 55–75). California: Sage.

West, C. G., Gildengorin, G., Haegerstrom-Portnoy, G., Schneck, M. E., Lott, L., & Brabyn, J. A. (2002). Is vision function related to physical functional ability in older adults? *Journal of the American Geriatrics Society*, *50*(1), 136–145.

Williams, R. A., Brody, B. L., Thomas, R. G., Kaplan, R. M., & Brown, S. I. (1998). The psychosocial impact of macular degeneration. *Archives of Ophthalmology*, *116*(4), 514–520.

Wilson, M. R., Coleman, A. L., Yu, F., Sasaki, I. F., Bing, E. G., & Kim, M. H. (2002). Depression in patients with glaucoma as measured by self-report surveys. *Ophthalmology*, *109*(5), 1018–1022.

Wolinsky, F. D., & Johnson, R. J. (1991). The use of health services by older adults. *Journal of Gerontology*, *46*(6), S345–S357.

Received 31 March 2004; revised version received 20 February 2005