

ORIGINAL ARTICLE

Preliminary Investigation of the Responsiveness of the Melbourne Low Vision ADL Index to Low-Vision Rehabilitation

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ABSTRACT: *Purpose.* To conduct a preliminary investigation on the ability of the Melbourne Low Vision ADL Index to detect changes in functional ability as a result of low-vision rehabilitation. *Methods.* Twenty two subjects with age-related macular degeneration (ARMD) who were newly referred to the Kooyong Low Vision Clinic were recruited. The Melbourne Low Vision ADL Index was administered prerehabilitation and postrehabilitation. Changes in scores and effect size statistics were analyzed. *Results.* The median total score for the subjects prerehabilitation was 67, and the median total score postrehabilitation was 76. The difference in prerehabilitation and postrehabilitation scores was statistically significant (Wilcoxon signed rank test = 248.5, $p < 0.001$). The mean change score for the total Melbourne Low Vision ADL Index was 9.3 (SD, 5.6). Thus the overall effect size statistic (mean change score divided by SD of prerehabilitation score) was 0.78. *Conclusions.* This preliminary investigation indicates that the Melbourne Low Vision ADL Index is responsive to a rehabilitation program for patients with ARMD. It has potential to be used as a measure of low-vision rehabilitation outcomes. (Optom Vis Sci 2001;78:373-380)

Key Words: low vision, disability, functional assessment, activities of daily living, outcome measures, responsiveness

For more than a decade, there has been a strong emphasis on accountability for what is done in health programs. Hence the need for “outcome measures,” that is, assessments that measure the results of health programs.

In low-vision rehabilitation, the development of such outcome measures is imperative to demonstrate to government, policy makers, managers, patients, and caretakers the benefits of its programs and to compete for funding. However, the development of outcome measures in low-vision rehabilitation is still in early stages. Relatively few measures, variously described as “functional” measures and “quality-of-life” measures, have been developed over the past decade for use with the vision impaired. They include the Visual Disability Inventory,¹ Activities of Daily Vision Scale,² VF-14,³ Visual Disability Assessment,⁴ Michigan Commission for the Blind Functional Assessment Scale,⁵ Occupational Therapy Functional ADL Assessment,⁶ Functional Independence Measure for Blind Adults,⁷ Functional Assessment Self-Report Inventory,⁸⁻⁹ Functional Status Measure,¹⁰ Functional Vision Performance Test,¹¹ National Eye Institute Visual Function Questionnaire,¹² VCMI,¹³ Daily Living Tasks Dependent on Vision,¹⁴ the reading

Vision-Related Quality of Life scale,¹⁵ Low Vision Quality-of-Life Questionnaire,¹⁶ and the LoVIS functional test battery.¹⁷ Most are self-report measures,^{1-4, 8, 9, 12-16} some are observed performance measures,^{6, 10-11, 17} and two^{5, 7} make use of both methods. However, these instruments have not gained wide acceptance in the low-vision rehabilitation field.

It would seem likely that part of the reason that these measures have not gained acceptance in low-vision rehabilitation is because, although most developers of these measures suggest that they might be useful as outcome measures, very few have substantiated the claim with research. The utility of an outcome measure is usually determined by researching its *responsiveness*, that is, its ability to detect small but clinically important changes as the result of some intervention.^{18, 19} However, clear methods for evaluating responsiveness are lacking.²⁰ This is perhaps why research on the responsiveness of outcome measures in low-vision rehabilitation is deficient.

Indeed, responsiveness has been investigated for only four of the measures in this area: the Activities of Daily Vision Scale (ADVS),^{2, 21} the VF-14,^{3, 22, 23} the National Eye Institute Visual

Function Questionnaire (NEI-VFQ),²³ and recently, the Low Vision Quality-of-Life Questionnaire (LVQOL).¹⁶ However, the first two questionnaires were developed to measure the outcomes of surgical intervention for patients with cataract. Although both measures have been used for other groups of patients,^{24–28} the content of these measures is not necessarily valid for measuring the outcomes of low-vision rehabilitation programs. Alternatively, the NEI-VFQ was designed to measure the vision disability and health-related quality of life of the general low-vision population.¹² However, Scott et al.²³ found that after a low-vision rehabilitation program, the scores for subjects improved on only four of the 13 NEI-VFQ subscales. Although the improvement in score on the four subscales was statistically significant, the absolute increases in scores were small to moderate. Similarly, the LVQOL was designed to measure the vision-related quality of life of the general low-vision population, and results indicate a moderate improvement in absolute score after low-vision rehabilitation.¹⁶

We recently described a new measure of performance of activities of daily living (ADL's) and instrumental activities of daily living (IADL's), the Melbourne Low Vision ADL Index, which we proposed could be useful as one of a battery of assessments to measure the outcomes of low-vision rehabilitation programs. It has been shown to be valid and reliable (Cronbach's alpha coefficient of internal reliability = 0.96, intraclass correlation coefficient of reliability = 0.95, and standard error of measurement = 4.5) for the general low-vision population (Haymes²⁹ and Haymes et al.³⁰). The aim of this study was to extend the investigation of the scale's psychometric properties to determination its responsiveness to low-vision rehabilitation for patients with age-related macular degeneration (ARMD). We chose to investigate patients with ARMD because it is a leading cause of legal blindness in developed Western countries.^{30–34} Furthermore, the number of persons seeking low-vision rehabilitation due to ARMD is likely to increase in the future. This is because there is a high prevalence of ARMD among persons over 75 years of age (37% according to the findings of Klein et al.³⁵), and this sector of the population is rapidly increasing.³⁶ Indeed, the Australian Bureau of Statistics and the U.S. Census Bureau estimate that the proportion of the population aged over 65 years will almost double to reach approximately 20 to 24% by the year 2050 (Population Projections available at <http://www-statistics.gov.au/> and <http://www.census.gov/>. Accessed January 12, 2000).

METHODS

Subjects

Twenty five subjects with ARMD who were newly referred to the Vision Australia Foundation Kooyong Low Vision Clinic were recruited for the study. The criteria for inclusion were that subjects were over 60 years of age, had stable vision impairment during the previous 12 months (which was initially established by routine questioning at the intake interview), and had the ability to speak and read English. Subjects were excluded if they had total blindness, physical impairment (unable to be mobile without the assistance of a person, support cane, or wheelchair and screened for diseases causing physical disability using general medical history and medications), cognitive impairment (screened for diseases

causing cognitive disability using general medical history and medications), or significant hearing impairment (unable to manage a simple conversation in a quiet room). All people who were newly referred to the clinic and presenting for their intake interview and who met the inclusion criteria were invited by the clinic interviewer to participate in the study.

Informed consent to participate was obtained from all subjects, and the research was approved by the University of Melbourne Human Research Ethics Committee. The study was conducted in accordance with the tenets of the Declaration of Helsinki.

Visual Acuity Measure

Binocular distance visual acuity was measured using a Bailey-Lovie logarithm of the minimum angle of resolution (logMAR) chart³⁷ and scored using the per-letter method, which has been shown to have greater reliability than the per-line method.^{38–40}

Outcome Measure

The Melbourne Low Vision ADL Index (MLVAI) is a desk-based clinical assessment of ADL performance (Haymes S, unpublished data). An original copy is given in Haymes' thesis,²⁹ which is available from the Baillieu Library, The University of Melbourne, Vic 3010, Australia and can be viewed at <http://www.optometry.unimelb.edu/dept/99research/SAHLV/SAHLV.html>. The MLVAI comprises a total of 25 standardized items: 16 observed items on complex IADL's and nine questionnaire items on broad self-care ADL's (Table 1). Each item is rated on a five-level descriptive scale from 0 to 4, based on the independence, speed, and accuracy of performance. Scores for each item are summed to give a total score of a possible 100. It was designed to be administered under standardized conditions. Thus, standardized instructions were given for every item. All but two of the observed items were performed at 25 cm using habitual spectacles; the tasks of recog-

TABLE 1.
Items of the Melbourne Low Vision ADL Index

Observed Items	Questionnaire Items
Reading newspaper print	Eating
Reading newspaper headlines	Bathing
Reading a letter with typed print	Dressing
Using a telephone book	Grooming
Reading an account	Mobility
Reading a medicine label	Housework
Reading packet labels	Shopping
Recognising faces	Preparing meals
Using a telephone	Managing medication
Writing a cheque	
Identifying coins	
Pouring	
Naming colours	
Buttoning a shirt	
Threading a sewing needle	
Telling the time: wrist watch	
Telling the time: wall clock	
Reading a digital display	

nizing faces and telling the time using a wall clock were performed at 1 m. The test was administered under standard illumination conditions of 240 lux as recommended in the *Australian Standard 1680.1*⁴¹ and by the Commission Internationale de l'Éclairage⁴² for moderately difficult indoor tasks.

Low-Vision Rehabilitation Program

The Kooyong Low Vision Clinic rehabilitation program was used to determine the responsiveness of the MLVAI. The rehabilitation program at the Kooyong Low Vision Clinic involved the services of a multidisciplinary team. The team members and the services they provided were as follows:

- a coordinator who manages the initial consultation, takes the relevant history, and refers to other team members, as necessary;
- an ophthalmologist who assesses vision and possible treatment;
- an optometrist who provides functional vision assessment and prescribes spectacles and optical low-vision aids;
- an orthoptist who provides low-vision aids training, lighting assessment, eccentric viewing training, and reading stands;
- an occupational therapist who prescribes nonoptical low-vision aids, makes home modifications such as marking dials and steps, and teaches strategies for managing activities of daily living;
- an orientation and mobility instructor who prescribes mobility aids and teaches sighted guide techniques and strategies for independent travel;
- a welfare officer who provides counseling and information regarding support, pensions, and concessions, access to group activities, and access to the Braille and Talking Book Library;
- vision-impaired peer workers who provide support.

Through these services, one of the main goals of the Kooyong Low Vision Clinic rehabilitation program was to assist clients to maintain independence in daily living skills. The MLVAI is an assessment of such skills.

Procedure

To determine the responsiveness of the MLVAI to this program, all subjects were administered the MLVAI on two occasions. On one occasion, the original version was administered. On the other occasion, an alternative version was administered. The purpose of the alternative version was to minimize the practice effect when a subject repeated the test.⁴³ The alternative version was constructed by making minor alterations to the original version while keeping the alternative items as much like the original items, in terms of structure and intention, as possible. The presentation order of the original and alternative versions of the MLVAI was randomized.

Testing took place in an ophthalmic consulting room at the Kooyong Low Vision Clinic and was conducted by one practitioner who was not involved in the delivery of the rehabilitation program. The first session took place immediately after the subject's initial consultation at the clinic, and on this occasion, one version of the MLVAI was administered, demographics were recorded, and distance visual acuity was measured. Only habitual spectacles were used. The second session took place within 1 week

of the subject completing the rehabilitation program, which was determined by statements in the subject's clinical record that all initial and subsequent plans had been followed up and that no further services were required at that time. During the second session, subjects were administered the other form of the MLVAI and were allowed to use any aids, devices, or strategies they were prescribed during their rehabilitation program. This included spectacles, low-vision aids, a closer working distance, suitable focal illumination, eccentric viewing strategies, black felt-tip pens, line guides, large print numbers for the telephone, needle threaders, pouring aids, and coin holders. They were not allowed to use any aids that were not prescribed as a result of the rehabilitation program. Also, distance visual acuity was remeasured during the second session to ensure that there had been no sudden vision loss. The median duration between the prerehabilitation and the postrehabilitation administration of the MLVAI was 7 weeks, with a range of 3 to 16 weeks.

Analysis

The data were double entered into a Microsoft Excel spreadsheet (version 6.0; Microsoft, Seattle, WA) and analyzed using Minitab for Windows (version 12.0; Minitab, State College, PA) statistical software. The responsiveness of the MLVAI was investigated by analyzing change scores and the effect size statistic. Change score was simply the difference between preintervention and postintervention score. The effect size was a statistic used to translate changes in health measures into standard units. The effect size, and thus the responsiveness of a measure, is directly proportional to the magnitude of the change score and inversely proportional to the baseline variability of the measure. Thus, if the baseline variability of a measure is large, one will need a larger change score to demonstrate responsiveness to intervention. The simplest effect size statistic is given by the mean change in score from preintervention to postintervention divided by the standard deviation of the preintervention score for all subjects.¹⁸ This effect size statistic is related to the *power* of the measure to detect a change when one is present, that is, the sample size required to observe a change in the population.^{18, 19} For example, a large effect size indicates that a relatively small sample is required to observe a true, clinically important change in score as a result of some intervention. Cohen⁴⁴ suggests that effect size statistics of 0.2, 0.5, and 0.8 represent small, medium, and large effect sizes, respectively.

Other measures of responsiveness, such as the receiver operating characteristic method suggested by Deyo and Centor,⁴⁵ can be applied to a sample of subjects who have improved based on some external standard. However, because there is neither a standard nor an objective method for determining improvement in low-vision rehabilitation, this method was not used.

RESULTS

The results presented are for 22 subjects. One subject did not return for the second session due to ill health, and two subjects were excluded due to the development of a macular hemorrhage during the period of the research. The remaining 22 subjects were aged between 63 and 92 years, and 13 of 22 were female. The mean

age was 79.4 (SD, 6.7) years. All but four subjects had the wet form of ARMD. Binocular distance visual acuity ranged from 0.34 to 1.46 logMAR ($6/12^{-2}$ to $6/150^{-3}$). The mean binocular distance visual acuity was 0.72 logMAR ($6/30^{-1}$). The subject characteristics and services provided are given in Table 2.

Responsiveness of the Melbourne Low Vision ADL Index

The total score for the first administration of the MLVAI ranged between 43 and 92 of 100. The mean total score was 67.3 (SD, 11.9). Prerehabilitation scores and change scores for each subject are given in Table 3.

The median total score for the subjects prerehabilitation was 67

with an interquartile range of 61 to 75, and the median total score postrehabilitation was 76 with interquartile range of 72 to 85. There was a statistically significant improvement between prerehabilitation and postrehabilitation scores (Wilcoxon signed rank test, median difference between the scores = 10; 95% confidence interval for the median = 7 to 12; Wilcoxon statistic = 248.5; $p < 0.001$).

The mean change score for the total MLVAI was 9.3 (SD, 5.6). Thus, the overall effect size statistic (mean change score divided by SD of prerehabilitation score) was 0.78. The mean change score, standard deviation, and the effect size statistic for each item of the MLVAI is given in Table 4.

Guyatt et al.¹⁹ suggest that the effect size statistic should be calculated using the standard deviation of the score changes in a

TABLE 2.
Subject characteristics and intervention

Subject	Type of ARMD (poorer eye)	Binocular Visual Acuity (logMAR)	Preintervention Low-Vision Aids	Intervention
1	Wet	1.04	None	Magnifier, transfer to blind pension, talking books, home modifications, support group, large-print numbers for telephone, coin holder, pouring device
2	Wet	0.34	None	Distance and near spectacle change, high addition, focal light, needle threader, black felt pen
3	Dry	0.36	None	Magnifier, focal light, talking books, black felt pen
4	Wet	0.50	None	High addition, focal light
5	Wet	0.70	None	High addition, focal light, black felt pen, large-print watch, needle threader
6	Wet	0.88	Low-power ^a magnifier focal light	Magnifier, CCTV, ^b talking books, identification cane, support group, black pen
7	Wet	0.76	None	Focal light
8	Dry	0.64	10× Binoculars	Magnifiers, tinted spectacles
9	Wet	0.78	None	Magnifier
10	Wet	0.40	None	Magnifier, focal light, needle threader, coin holders
11	Geographic atrophy	0.58	None	Support group, black felt pen, talking watch, needle threader
12	Wet	0.96	Low-power magnifier, focal light	UV shield, support group, black felt pen, large-print numbers for telephone, large-print watch
13	Wet	0.76	None	Magnifiers, UV shield, support group, check typoscope, needle threader
14	Wet	0.84	Low-power magnifier	Magnifier, focal light, home modifications, black felt pen
15	Wet	1.46	None	UV shield, home modifications, talking books, identification cane
16	Wet	0.40	Low-power magnifier	Distance and near spectacle change, high addition, UV shield
17	Wet	0.60	None	High addition, black felt pen
18	Wet	0.96	None	CCTV, black felt pen, check typoscope
19	Wet	0.54	Low-power magnifier	Magnifier, focal light, talking books, black felt pen, needle threader, coin holders
20	Dry	0.54	None	High addition, focal light, typoscope, taxi concession, identification cane
21	Wet	0.60	Low-power magnifier	Magnifier, black felt pen
22	Wet	0.98	Magnifier (+20 D)	Magnifiers, focal light support group, black felt pen, large print numbers for telephone, taxi concession

^a Low-power magnifier $\leq +6$ D.

^b CCTV, closed-circuit television.

TABLE 3.

Prerehabilitation total Melbourne Low Vision ADL Index score and change score for subjects

Subject	Prerehabilitation Melbourne Low Vision ADL Index Score	Change Score ^a
1	54	-5
2	92	2
3	68	17
4	68	14
5	65	9
6	59	7
7	66	9
8	74	11
9	64	12
10	81	3
11	62	11
12	68	2
13	63	11
14	68	15
15	43	15
16	85	6
17	70	5
18	46	11
19	77	10
20	64	18
21	84	8
22	59	14

^a Difference between prerehabilitation and postrehabilitation score.

group of stable subjects as the denominator, rather than the standard deviation of the prerehabilitation scores. That is, it should be the mean change score prerehabilitation and postrehabilitation divided by the standard deviation of the score change in stable patients. It was possible to calculate this using data we previously collected on the reliability of the MLVAI (Haymes²⁹ and Haymes et al.³⁰). In this previous research, the standard deviation of the change in the test-retest score for 122 stable subjects was found to be 6.4. Thus, the effect size statistic of Guyatt et al.¹⁹ for this investigation is 1.45 (9.3/6.4).

DISCUSSION

This preliminary study of 22 subjects with ARMD indicated that there was a statistically significant difference in MLVAI score after rehabilitation at the Kooyong Low Vision Clinic. The mean improvement in total score was 9.3 points (of a total score of 100). It should be emphasized that the aim of this study was to evaluate the responsiveness of the MLVAI to low-vision rehabilitation, not to evaluate the effectiveness of a low-vision rehabilitation program. Therefore, caution should be exercised in attributing any effects to a particular component of the low-vision rehabilitation program used in this study or in generalizing the results to other models of low-vision rehabilitation.

There are only two other studies on the responsiveness of a functional measure to a low-vision rehabilitation program. One

TABLE 4.

Mean change score and effect size for items of the Melbourne Low Vision ADL Index

Item	Description	Mean Change Score	SD of Prerehabilitation Score	Effect Size Statistic
a2	Cheque	0.4	0.9	0.44
a3	Accounting	0.6	1.0	0.60
a4	Wrist watch	0.5	0.8	0.63
a5	Telephone	0.2	0.8	0.25
a6	Telephone book	1.2	1.0	1.20
a7	Newspaper print	0.9	1.5	0.60
a8	Medicine label	1.5	1.3	1.15
a9	Digital clock	0.2	0.7	0.29
a10	Face recognition	0.4	1.3	0.31
a11	Typed letter	1.2	1.2	1.00
a12	Needle threading	0.7	0.7	1.00
a13	News headlines	0.3	1.0	0.30
a14	Pouring	0.5	0.8	0.63
a15	Wall clock	0.5	1.0	0.50
a16	Packet labels	0.3	0.9	0.33
a17	Coin identification	0.6	0.8	0.75
Part (a) total		10.1	11.4	0.89
b1	Shopping	-0.2	0.9	-0.22
b2	Meal preparation	-0.3	0.6	-0.50
b3	Housework	-0.2	0.7	-0.29
b4	Medication	0.2	0.8	0.25
b5	Eating	0.0	0.6	0.00
b6	Dressing	0.0	0.4	0.00
b7	Grooming	0.0	0.6	0.00
b8	Mobility	-0.2	0.6	-0.33
b9	Bathing	0.0	0.5	0.00
Part (b) total		-0.8	3.1	-0.26

study was conducted by Scott et al.²³ at the Bascom Palmer Eye Institute. The other study was conducted by Wolffsohn and Cochrane¹⁶ at the same clinic at which this study was conducted using a different group of subjects. For each of these studies, only changes in the absolute scores of the functional instruments were reported. This makes comparisons difficult because the absolute scores obtained from these instruments are on an ordinal scale, and a change of three points on one scale does not necessarily equate to a change of three points on another scale. However, effect size statistics offer a better method for comparison because changes in score are transformed into standard units. Effect size statistics indicate the sample size require to observe a true change in score, with a higher effect size statistic indicating that a relatively small sample would be required and, thus, greater responsiveness of the instrument to detect a true change in score as a result of some intervention.

The effect size statistics obtained for the MLVAI *total* score (0.78 using the SD of the prerehabilitation scores and 1.45 using the SD of the test-retest difference in stable subjects) are moderate to large compared with Cohen's⁴⁴ suggestions. Furthermore, this indicates that a relatively small sample would be required to observe a true change in score (about <16 paired observations according to Guyatt et al.¹⁹) and suggests that the test is responsive to the low-vision rehabilitation of patients with ARMD.

Although effect size statistics were not reported in the studies by Scott et al.²³ and by Wolffsohn and Cochrane,¹⁶ the effect size statistics may be calculated from the data provided in their papers. The calculated effect size statistics for the data obtained from these studies are 0.34 (6.8/20) for the LVQOL,¹⁶ 0.41 (5.4/13.1) for the VF-14, and 0.57 (8.3/14.5) for the NEI-VFQ near activities scale,²³ compared with 0.78 for the MLVAI. However, it is not possible to know whether the differences in effect size statistics are due to differences in the responsiveness of the instruments or due to differences in the rehabilitation programs. Although Wolffsohn and Cochrane¹⁶ investigated the same rehabilitation program, it is not clear whether the subjects in their study and in this study received the same aspects of the multidisciplinary Kooyong program. Also, Wolffsohn and Cochrane¹⁶ investigated a heterogeneous group, and the responsiveness findings are likely to be lower than those for a homogeneous group, such as that investigated in this study. Therefore, comparisons should be treated with caution until all instruments are administered to the same subjects undergoing the precisely the same rehabilitation program. Another important point is that all of the comparisons were made with self-report quality-of-life instruments. These measure different aspects of visual function to the MLVAI, which is essentially an observed functional performance instrument. The two types of instruments, self-reported quality of life and observed functional performance, may have different responsiveness to change. To our knowledge, there are no studies that have investigated the responsiveness of an observed performance instrument to a low-vision rehabilitation program.

Considering the MLVAI more specifically, the change scores found in this study indicate that after rehabilitation, the observed items in part a of the MLVAI improved more than the basic self-care question items in part b. In particular, the items that provided the highest visual challenge (medicine label, telephone book, typed letter, newspaper print, and needle threading) improved the most for this group of subjects. Also, the effect size statistics indicated that these items of the MLVAI were the most responsive to the Kooyong Low Vision Clinic rehabilitation program. This is not surprising given that a major emphasis of the low-vision rehabilitation program is on the provision of optical magnifiers for such tasks. Most of the subjects investigated in this study were prescribed a magnifier as part of their program and were allowed to use it to do the MLVAI postrehabilitation.

It has been suggested that this study may simply demonstrate the effect of magnification devices on reading efficiency because most subjects used a magnifier and most of the items in part a were reading-related tasks (9 of 16). However, the nature of the reading tasks differed. Some of these practical reading tasks involved simply reading a passage of text, whereas others involved more complex visual search and extraction of relevant information. We consider that the number and nature of reading items in the MLVAI appropriately reflects the most commonly reported problems experienced by people with vision impairment. Indeed, this was one of the criteria for item selection. Also, an improvement in score was demonstrated for the remaining seven items in part a that were not related to reading.

With regard to the basic self-care ADL items in part b, the change scores and effect size statistics indicate that these items add nothing; in fact, they seem to subtract from the responsiveness of the MLVAI. However, this does not mean that these items should

be removed because they have value in increasing the validity and reliability of the MLVAI (Haymes S, unpublished data and Haymes²⁹). Furthermore, these items may have shown greater responsiveness to the program if subjects been allowed a longer time postrehabilitation to consolidate the use of their new devices and strategies. The effects of low-vision rehabilitation may not be immediately evident in more general areas of daily living.

Another point worthy of note is that performances of part b items of the MLVAI were measured using a self-report questionnaire, whereas performances of part a items were measured using observation in a clinical situation. As suggested above, self-report measures may not be as responsive to intervention as observed performance measures. Indeed, studies on vision impairment have shown a discrepancy between self-report questionnaires and observed measures of performance^{46–48} and a discrepancy between performance at home and performance in a clinic.⁴⁹ This is not surprising because self-report performance questionnaires are complicated by a person's insight into their disability, which is very likely influenced by psychological variables.

Future Studies

It should be emphasized that a limitation of this preliminary study was the lack of a control group. Further studies investigating different low-vision rehabilitation programs and different groups of patients compared with a control group are essential. This would provide a better understanding of the minimum change score that constitutes a clinically important change in functional performance and a better understanding of the effectiveness of low-vision rehabilitation. It would also be useful to compare the change in score after the rehabilitation of a group who are considered by expert practitioners to have been successfully rehabilitated with a group who are considered to have been unsuccessful after intervention and a control group who do not receive any intervention. However, because objective criteria for successful low-vision rehabilitation are lacking, it would be clearer to conduct a study on patients with a treatable ocular disease. For example, as in many previous studies, one might investigate patients with cataract. The responsiveness of the MLVAI to cataract surgery could be determined using improved visual acuity as the external criterion for success. A benefit of such a study would be the possibility of comparing, for the same group of patients, the responsiveness of the MLVAI with existing data on the responsiveness of the Activities of Daily Vision Scale²¹ and the VF-14.²² However, such a study on cataract surgery would have less practical meaning in low-vision rehabilitation.

Applications

The MLVAI is responsive to a low-vision rehabilitation program for patients with ARMD. It has potential to be used as a measure of low-vision rehabilitation outcomes. However, we propose that the outcomes of such programs should be assessed using several measures because the goals of such programs are many and varied. The MLVAI is an important outcome measure of the services provided to achieve just one of those main goals: to increase the capacity to perform ADL's. It does not directly measure the

outcome of services provided to achieve numerous other goals, e.g., to increase independence, to smooth the psychological adjustment to vision impairment, to increase emotional well-being, to increase participation in desired activities, to prevent injury, and to provide knowledge about vision impairment. Although increasing capacity to perform ADL's may have an impact on the achievement of these other goals, by itself, it does not capture all of the outcomes of low-vision rehabilitation.

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