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Are vision specific Qualify of life questionnaires important in assessing rehabilitation for patients with hemianopia post stroke?

Running Title: Quality of life measurement in hemianopia following stroke

Abstract

Objective: To explore the relationship between disability and functional measures to vision specific quality of life measures for people with hemianopia and stroke.

Methods: Behavioural Inattention test and the Mayo Portland Adaptability Inventory were compared to scores on two vision specific quality of life measures, National Eye Institute Visual Function Questionnaire (NEI VFQ-25) and Veteran Low Vision Visual Function Questionnaire (VA LV VFQ 48).

Setting: Rehabilitation hospitals in Adelaide, South Australia.

Participants: Stroke patients (n=24), with homonymous hemianopia.

Results: Results indicate that the majority of the BIT and MPAI scores were significantly associated with the NEI VFQ-25 and VA LV VFQ 48. Behavioural test scores of the BIT and the MPAI total score correlated with more aspects of the quality of life measures than the other components of the BIT and the MPAI.

Conclusion: BIT and MPAI measure constructs associated with quality of life for people with hemianopia following stroke. Vision specific quality of life questionnaires can compliment the functional instruments by identifying the domains of difficulty, based on the instrument's subscale, which can guide rehabilitation therapist to address the person's deficit.

Keywords; Hemianopia, Rehabilitation, Stroke, Quality of life, Vision.

Introduction

Hemianopia, a visual field deficit, is one of the most common consequences of stroke and is caused by retrochiasmal visual pathway damage.[1] The presenting symptom of hemianopia is associated with poorer recovery after stroke.[2] Visual impairment has been demonstrated to impact on independence and well being following stroke.[3]

Hemianopia needs to be differentiated from visual inattention, or unilateral spatial neglect, which is commonly observed after right hemisphere damage (especially in the posterior parietal region).[4] Unilateral spatial neglect (USN) is described as a "failure to report, respond, or to orient to novel or meaningful stimuli, presented to the side opposite a brain lesion, when this failure cannot be attributed to either sensory or motor defects. [5,p279] This is common in people with right hemisphere damage. People who present with hemianopia following stroke, may or may not present with unilateral spatial neglect depending on the site of lesion, however visual field deficit has been demonstrated to be significantly associated with the presence of visual spatial neglect following stroke.[6] Furthermore, the presence of unilateral spatial neglect is associated with poorer functional outcomes and longer rehabilitation stays.[7]

Despite these demonstrated negative consequences on individuals' wellbeing due to visual loss following stroke, the focus in assessment and intervention in rehabilitation settings generally remain to be on impairment, disability and function. Visual training in homonymous hemianopia post stroke is recognized as an important part of rehabilitation.[8] Health professionals use three approaches including optical devices, compensatory training and visual restitution therapy.[9] The first approach is to use optical devices, such as prism glasses, to displace the visual image.

The second approach is compensatory and aimed at enhancing eye movements and/or head movements. Health professionals, including occupational therapists and

rehabilitation nurses utilise these compensatory strategies to increase awareness of the affected visual side, such as approaching the person from the affected side and placing items of clothing on the affected side.[8] Mobility instructors, associated with vision services, train in compensatory scanning, involving head movement to shift the intact field of vision to cover the affected visual side. This is graded from a static to a dynamic environment.

The third strategy uses visual restitution therapy and aims to enhance neuroplasticity.[10] This method involves the stimulation of the 'borderzone' or 'transition zone' between the area of visual loss and the intact area of vision.[11] The efficacy of these approaches is inconclusive mainly due to a lack of larger scale randomized controlled trials.[12]

Two commonly used assessment measures for people with stroke are the Behavioural Inattention test (BIT)[13] and the Mayo Portland Adaptability Inventory (MPAI).[14] The Behavioural Inattention Test, a measure of disability, was developed to measure the behavioural manifestations of visual neglect in a standardised way. The aim of the BIT developers was to increase the understanding of clinicians of the everyday problems of people with unilateral visual neglect upon which rehabilitation programs can be based. Although developed for the area of visual neglect it is used clinically for people with hemianopia, who experience functional difficulties including reading, due to reduced visual scanning. Additionally the presence or absence of unilateral visual neglect for people with hemianopia needs to be measured, as this impacts negatively on functional outcomes .[15]

The Mayo-Portland Adaptability Inventory (MPAI)[14], a measure of function, was primarily designed to assist in the clinical evaluation of people during the post acute period following acquired brain injury (ABI), including stroke. In rehabilitation

programs in Australia it is commonly used as an outcome measure of function in rehabilitation. It assesses the range of physical, cognitive, emotional, behavioural, and social problems that people may encounter after stroke and determines obstacles to community integration which may result directly from ABI.

Both the areas of disability and function are important aspects of people's ability to return home from rehabilitation following neurological visual loss. Vision related Quality of life (QoL) measures is another important area of assessment following stroke.[16] Qulaity of life measurement has traditionally not been included in stroke rehabilitation practice. With the focus on disability and function in assessment for people with stroke with hemianopia, correlation of the QoL to function can help health professionals to gain information upon which their programs can be based. This is justified as quality of life has been shown to be affected following hemianopia.[16,17] This in turn, can help tailor the goals in rehabilitation programs to enhance the person's functioning and well-being. Additionally, with the need to evaluate the effectiveness of visual interventions, the ability to determine if these interventions influence quality of life measures positively would be beneficial.[16]

In the broader field of vision research, vision - specific QoL measures have been developed. These were developed in recognition of when measuring outcomes following rehabilitation in people with visual loss, quality of life should be measured, as opposed to measuring performance of specific activities that were traditionally used.[18] Most health-related quality of life self assessments presume that people have systemic disease, which is often not the case with people with visual loss and thus not appropriate to administer to this population. [18]

The aim of this study was to explore the relationship between disability and functional measures used by rehabilitation teams, to vision specific quality of life

measures. This will provide recommendations as to whether quality of life measures should be incorporated into rehabilitation practices.

Methods

The study designed is a correlational study of a cohort of people with hemianopia following stroke. Stroke patients were recruited from acute hospitals, rehabilitation hospitals and outpatient settings in Adelaide, Australia. Ethics approval was gained at each recruitment site.

The inclusion criteria were to: have had a stroke occurring a minimum of two weeks and a maximum of six months prior to the commencement of assessment; homonymous hemianopia; score of 25 or more on the Mini Mental State Examination (MMSE);[19] have corrected vision of at least 6/18; be over 18 years of age; and be able to give informed consent.

The presence of hemianopia was screened by the research occupational therapist on the ward by direct confrontation.[20] Those identified as having a visual field loss was referred to an ophthalmologist and visual field detailed with an automated perimetry was performed using Medmont Central 100 strategy. The perimetry criteria for a homonymous hemianopia include a right or left homonymous defect seen in both eyes that respect the vertical midline. The visual field defects extend above and below the horizontal midline. Inattention was tested by direct confrontation testing with finger counting by simultaneous presentation of targets in the temporal and nasal visual field and subjects were asked to identify the total number of fingers holding up.

Twenty-four people were included in this study.

The measures used include:

1. **Behavioural Inattention Test (BIT)** [13] – is a standardised measure of visual neglect. It consists of nine behavioural sub-tests reflecting tasks of daily life which include picture scanning, telephone dialling, menu reading, article reading, telling and setting the time, coin sorting, address and sentence copying, map navigation and card sorting. Additionally there are six conventional paper and pencil sub-tests which are line crossing, letter cancellation, star cancellation, figure and shape copying, line bisection and representational drawing. The maximum total score for the behavioural subtest is 81 and conventional sub-tests 146, with a higher score indicating better performance. A total score at or below 67 on the behavioural sub-test suggests everyday perceptual/attentional difficulties. Validity, inter-rater reliability, parallel form reliability and test-retest reliability has been established for the BIT (References).[21-23]

2. **Mayo Portland Adaptability Inventory (MPAI)**[(14)] - consists of three sub-scales: Ability Index, Adjustment Index and Participation Index. The Ability Index covers motor and cognitive abilities including the items of mobility, use of hands, vision, audition, motor speech, communication, attention/concentration, memory, fund of information, novel problem-solving, visuospatial abilities and dizziness. The Adjustment Index covers mood and interpersonal interactions and includes the items: anxiety, depression, irritability, anger, aggression, pain and headache, fatigue, sensitivity to mild symptoms, inappropriate social interaction, impaired self-awareness, family/significant relationships, initiation, social contact, leisure/recreational activities. The Participation Index covers social contacts, initiation, money management and includes the items of initiation, social contact, leisure, recreational activities, self-care, residence, transportation, work/school and money management. Each item is rated from 0-4, with a score of 0 indicating no

problems in this item and a 4 indicating assistance is required due to impairment in this item. The items making up each subscale (that is, Ability Index, Adjustment Index and Participation Index) are summed to achieve a raw score for each subscale and in addition a full scale score for MPAI is calculated by adding the summed scores for each index and subtracting items 22-24 which are used in both the Adjustment and Participation Index. Raw scores are then converted to T-scores for inventories completed by adults with ABI when self-reporting. The MPAI has demonstrated reliability and validity.[13] Maximum scores for total is 88 (following conversion of raw scores to T-scores), for the Ability Subscale is 96, Adjustment Subscale is 81 and Participation Subscale is 91.

3. **NEI VFQ-25 [24] -** is a tool designed to measure general vision-specific quality of life. It consists of 25 vision-targeted questions, including 11 vision-related constructs and one general health rating question. Among the 25 items, 16 rate difficulty with activities, and 9 ask for level of agreement with statements describing the severity of problems associated with visual loss. The questions related to difficulty with activities are rated on a scale of 1 to 6, with response choices including: no difficulty, little difficulty, moderate difficulty, extreme difficulty, stopped doing this because of eyesight, and stopped doing this for other reasons. Questions related to level of agreement with statements, describing role limitations due to vision loss, (for example Question 20, “I stay at home most of the time because of my eyesight”) are rated on a 5 point scale, ranging from agree all the time to agree none of the time for 5 of the items, and from definitely true to definitely false for the remaining eight items. The NEI VFQ-25 produces a numerical value for the subscales of: general health, global vision rating, difficulty with near vision activities, difficulty with distance vision activities, limitations in social functioning due to vision, role limitations due to

vision, dependency on others due to vision, mental health symptoms due to vision, driving difficulties, limitations with peripheral and colour vision and ocular pain. An overall score is calculated by averaging the vision-targeted subscales (maximum = 100), with a higher score indicating less reported difficulty.

4. **VA LV VFQ 48** [25] – is a vision specific quality of life questionnaire designed to measure functional ability of low vision patients and to measure patient centered outcomes of low vision rehabilitation. It consists of a list of 48 activities, including identify money and get around in unfamiliar places, of which difficulty ratings are assigned including: not difficult (score = 1), slightly/moderately difficult (score = 2) , extremely difficult (score = 3), impossible (score = 4) and do not do for non-visual reasons. Response categories are entered onto an excel spreadsheet where an algorithm is calculated with validated Rasch analysis.[(25)] A score is calculated for four domains including: Visual ability (the ability to function in daily life that is modified by visual impairment), Reading, Mobility, Visual Information and Visual motor.

Analysis

The data was stored and analysed with the Statistical Package for Social Sciences (Version 12; SPSS Inc., Chicago, IL, USA). Statistical analyses determined the association between the continuous measures of abilities on the BIT/MPAI and measures of quality of life, NEI VFQ-25 and VA LV VFQ 48. Assumptions of linearality were assessed by scatter-plots. All relationships appeared monotonic. The use of Pearson's correlation coefficient (r value) or Spearman Rho (r_s) was determined according to the assumptions and conditions required for each statistic as described by Morgan et al. (2007). [26] Assumptions for r value include: the two

variables have a linear relationship and data is normally distributed and r_s include: data is not normally distributed. P was set at less than .05.

Results

Of the twenty four people with stroke recruited, twelve participants had right sided strokes, 11 left and one bilateral. Majority were described as Posterior Circulation Infarction(n=22), one Partial Anterior Circulation Infarction and one Total Anterior Circulation Infarction according to the Oxfordshire Community Stroke Project Classification. [27] Mean age of participants was 65 (SD 16.30) years, thirteen were males (54.2%), and the median time since stroke was 29.0 days (interquartile range = 20.3- 61.0). There were 12 patients with a left homonymous hemianopia (9 complete, 3 incomplete). There were 12 right homonymous hemianopia patients (6 complete, 6 incomplete).

Summary scores for the measures are detailed in Table 1. Mean BIT scores on the behavioural subtest were 72.1, indicate that the people with stroke recruited did not have everyday perceptual and attention difficulties. Low mean scores on the MPAI demonstrate high levels of reported abilities. Insert Table 1

Table 2 presents the results of the associations between the BIT/MPAI and NEI VFQ-25 and VA LV VFQ 48, respectively.

Insert Table 2

The Conventional tests of the BIT were significantly associated with NEI VFQ-25 near activity and colour vision scores. The BIT behavioural test scores, compared to the conventional scores, were more significantly correlated to the NEI VFQ-25. There were statistically significant association in the subscale of vision specific social functioning, role difficulties dependency and the total score. These

statistically significant associations were in a positive direction with higher scores on the BIT Behavioural test scores (indicating better performance) being correlated with a higher score (indicating less reported difficulty) reported on the NEI VFQ-25. Both BIT scores were not significantly associated with peripheral vision on the NEI VFQ-25.

Conventional test scores and behavioural test scores of the BIT were significantly associated to all, except one, aspect of the VAL LV VFQ 48. These were in a negative direction with higher scores on the BIT test score summary being correlated with a lower number of (or less difficulty) reported on the VAL LV VFQ 48.

All of the MPAI total scores were significantly associated with all the scores of the NEI VFQ-25 and the VAL LV VFQ 48. Results of the comparison between scores on the MPAI and the quality of life measures demonstrate that the majority of the components of NEI VFQ-25 and VAL LV VFQ 48 were significantly associated with the Ability subscale and Adjustment subscale scores of the MPAI. These were in a negative direction with the NEI VFQ-25, with higher scores on the MPAI (rated as a more severe problem) being correlated with a lower scores on the NEI VFQ-25 (indicating more reported difficulty). These were in a positive direction with VA LV VFQ 48 with higher scores on the MPAI (rated as a more severe problem) being correlated with a higher number of (or more difficulty) reported on the VA LV VFQ 48. The results indicate that less of the participation subscale scores of the MPAI were significantly associated with NEI VFQ-25 scores than the Ability and Adjustment scales, however all were associated with the VA LV VFQ 48.

Discussion

This is the beginning step in establishing an association between disability and function measures in rehabilitation to measures of quality of life. Behavioural test scores of the BIT and the MPAI total scores were associated with quality of life to a greater degree than the Conventional test score summary. For the BIT the Behavioural tests consist of activities including scanning pictures of real environments and identifying objects, telephone dialling, menu/article reading and map navigation. In contrast, the Conventional are pen and paper tasks. These tasks all relate to a persons ability to be able to function in their environment and would be expected to be related to quality of life.

In the MPAI the total score, which incorporates scores from the Ability, Adjustment and Participation subscales, measured quality of life to a greater degree than any of the individual scales.

In this study, a more significant association was noted using the VA LV VFQ48 compared to the NEI VFQ-25 against the functional measures on BIT and MPAI. The VA LV VFQ48 was designed for people with low vision for rehabilitation purposes compared to the NEI VFQ-25 that assesses general vision. Therefore, the better correlation can be justified and this will guide researchers on the correct instrument when assessing vision specific quality of life changes based on the underlying clinical condition. The advantage of the subscales for each of the questionnaires point to specific area of vision specific difficulties that can guide therapist on the client's rehabilitation need. This is demonstrated with the BIT behavioural scores correlating to the subscales of vision specific social functioning and role difficulties of the NEI VFQ-25. Furthermore, the association between the

near activities of the NEI VFQ-25 and the Conventional tests of the BIT is expected since these tasks involve near vision.

The limitation of this study is the small sample size. A larger sample size will determine more specific information including if these results are valid for people who have suffered more severe strokes and thus have a lower level of functioning. Selection bias towards higher functioning patients due to the inclusion criteria of MMSE score and mobility needs to be considered. Further limitations include the selection of tools not being specifically designed for homonymous hemianopia following stroke. Even though the BIT is normed to individuals with neglect as opposed to a visual field deficit, it is used clinically for people with homonymous hemianopia. Our sample did not present with neglect however the constructs were related to constructs of quality of life. However, these were the only related tools upon which to compare.

Conclusions

This research indicates that the assessments used in rehabilitation, that is the BIT and the MPAI, have an association to vision specific quality of life for clients with neurological visual loss following stroke. The VA LV VFQ 48 is a better correlate than NEI VFQ-25 because it is an instrument designed to assess rehabilitation for non-reversible visual loss, such as field defect post stroke. Therefore it is important to choose the correct tool for outcome measure. The vision specific quality of life questionnaires can compliment the functional instruments identifying the domains of difficulty, based on the instrument's subscale, which can guide the rehabilitation therapist to address the person's deficit.

As our overall population are living longer with potentially more disability and likely stroke, the concept of assuring our patients intervention will focus on the quality of their lives will be even more vital. The correlating of functional assessments and quality of life questionnaires will always improve therapists' ability to construct best goals and therefore indicate most appropriate interventions. Additionally, with the need to evaluate the effectiveness of visual interventions the use of quality of life measures as outcomes would add more information.

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