

# Neuropsychological Assessment of Adults with Visual Impairment



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# Preface

This manual is designed to give the psychologist a rough overview of the state of neuropsychological testing of adults with visual impairments and to give the psychologist a start in testing this population. Currently, our review found no other book in existence to do this. Dial's manual for the Comprehensive Vocational Evaluation System (CVES) (Dial, Mezger, et al., 1991) comes the closest to this as it includes theory, administration and test norms, but it is focused almost exclusively on testing with the CVES. As good as this system is, and more will be said about this later, it does not encompass the breadth of testing available.

Price, Mount and Coles (1987) noted: "Standard psychological assessment has turned its back on testing the visually handicapped, especially the adults. Many of the earlier efforts of developing specialized testing materials have been abandoned and many that were published have gone out of print" (p. 28). This is even more the case today as the CVES and Mangiameli's (1999, 2003) contributions appear to stand by themselves in terms of specific test batteries aimed at nonverbal abilities for the visually impaired. Few other efforts at developing new single tests for visually-handicapped adults have been put forward in the last 20 years (Miller et al., 2007; Beauvais et al., 2004). In this manual, we will review some of the existing instruments but also present some new techniques developed by the authors. It is hoped these new tests will find a place among the useful and available instruments.

Developing new techniques for adults with visual impairments, as presented here, mainly involves adapting current or past tests to the visually impaired population. However, these adaptations are significantly different from the originals, and require their own standardization and statistical development. It will be found that the research here will fall short of the usual test development and reporting standards (American Educational Research Association, American Psychological Association & National Council on Measurement in Education, 2014). Nevertheless, when so little is available, it was deemed important to present these techniques, in their current state of development, so that others might use and research these techniques. Whatever information is available will be reported and the reader will have to judge the usefulness of these measures.

A further complication is that some items from existing tests for the sighted population have been slightly

adapted to fit the needs of the visually impaired population. Nevertheless, the sighted-population norms are used. These adaptations are very minor. Of course, this is not rigorously defensible, but hopefully as the reader becomes acquainted with the sections dealing with these adjustments; there will be some understanding and agreement as to the justification for doing so. These adjustments are considered minor enough not to change the nature of the item. There has been some controversy in the past about whether or not to use tests developed for the sighted population with the visually impaired population. See, for example, Scholl, Schnur (1976), and Vander Kolk (1980). These concerns notwithstanding, the psychologist faced with testing the visually impaired adult has to decide whether some testing information is more useful than none.

The senior author, John T. Gallagher, has been involved in testing adults with visual impairments in Michigan for 30 years, and is responsible for the design of the new and adapted techniques presented in this manual. Co-author, Katherine A. Burnham, has been responsible for collecting the archival data from the past 20 years, presenting the neuropsychological techniques in understandable fashion, and editing the text. Lyn J. Mangiameli responded positively to a request for further information on his test battery, as it has not been detailed in any publication beyond an abstract. Jack Dial's system has already been presented in several publications. Gallagher is responsible for any shortcomings this book may have.

One of the chapters of this book presents suggestions for further development and research. It should be noted that all the research participants upon which this manual is based were Michigan residents, and the vast majority of them were clients of the Michigan Bureau of Services for Blind Persons. These were individuals who had been blind for at least a year. Therefore, the test results in this book should be of individuals who are past the disorientation phase of the recently blinded.

**Despite its limitations, this book stands alone in the neuropsychological literature.** It is hoped that further developments will make this work obsolete in the coming decade. As it is, it is designed to be more practical than pedantic, and to give the neuropsychologist a starting place in working with the visually impaired.

The first part of this book contains information on the neuropsychological assessment of those with visual

impairments. Following that are the appendices which provide a technical manual, administration guide, record forms, summary forms, and a scaled score conversion table to conduct a neuropsychological assessment battery. The appendices provide instructions on administration of the tests and how to score the record forms. The record forms may be reproduced unlimitedly with the purchase of this book. The tests are intended to be used with manipulatives obtainable through Stoelting, publishers of this book. Finally, the appendices and book also contain information to guide the interpretation of results of the testing.

The structure of the book text roughly follows the sequence of procedures that a neuropsychologist might follow during an examination; that is, starting with observation and interview, assessing various domains such as intelligence, spatial, auditory, executive, motor, and ending with personality and vocational issues. The Guided Clinical Interview and Assessment (Appendix VIII) follows the same order as the order of the material presented in the book, so the book may serve as a reference for the clinician conducting an interview with a client, providing background information to guide the assessment and interpretation.

Gallagher and Weiner (2008) have previously covered the area of vocational assessment and much of Dial, Chan et al.'s (1991) Comprehensive Vocational Evaluation System is dedicated to vocational evaluation of visually impaired persons. The psychologist working with the visually impaired population might also be involved in psychotherapy dealing with psychopathology or adjustment issues, but that is not the focus of this book. The psychologist might also be involved in the rehabilitation of the visually impaired person. Rehabilitation is only touched on here in the sense that the neuropsychological exam should be directed towards assisting rehabilitation staff with the design of the visually impaired person's training. Dodd, (2006) in his book, *"A Psychologist Looks at Blindness"* goes into detail as to how the psychologist might work directly in the rehabilitation process. Finally, this book is intended for the neuropsychological testing of adults 16 and older. Testing issues with children have a great deal of importance, but they are not the focus here.

Assessing the functioning and needs of deaf-blind individuals is not a focus of this book due to limited experience in this area. Dunlap (1984) developed a specific instrument for this population using mainly observation. Many deaf-blind adults can understand American Sign Language formed between their hands, so some sort of verbal assessment can be done. Limited experience suggests that deaf-blind individuals can understand what to do on the Tactual Formboard (see Appendix III) even without language. So, some information can be gathered on tactual-spatial abilities. Some of these individuals can

understand letters or numbers written on the palms, suggesting other avenues of assessment.

The appendices to this book present several new, or adapted, tests specifically designed for the visually impaired adult. These tests, the Tactual Formboard Test, The Auditory Cancellation Test, The Adapted Token Test, The Michigan Non-Visual Mathematics Test and the Pattern of Search Test were developed over a number of years by the senior author at the Michigan Bureau of Services for Blind Persons Training Center. This center serves the entire state of Michigan as a center for training skills of blindness. It also serves as a center for evaluating and guiding visually impaired persons waiting to enter into further academic training, vocational training or the work force.

The majority of the subjects on whom the data were collected for the above-mentioned tests were resident students at the training center. Others were referred for evaluation from around the state by various sources as there were no other options for comprehensive evaluations of adults with visual impairments. These individuals were fairly representative of the state of Michigan population, in terms of demographic characteristics such as county of residence, income bracket, and educational attainment. The age breakdown is similar to what would be expected of the entire visually impaired population of Michigan with two exceptions. The younger age group of 17 to 20-year-olds is over-represented as so many recent high school graduates attend the center, or are referred to help give direction at this transition point in their lives. Elderly individuals are underrepresented as they are more likely to be trained at home without specialized psychological assessments. There were more African-Americans in this group than expected by their percentage of the Michigan Population. Additionally, slightly more men than women were in this group. Individuals with severe mental illness or cognitive deficiencies, who were not likely to profit from the type of instruction at the training center, are also not represented. Persons at the training center who were evaluated, but who had significant mental illness such as schizophrenia, were not involved in the final data collection. The same was true for those with significant disabilities other than blindness. All of the participants were aware that information in their files could be used for statistical and research prognosis. In all cases, the data has been analyzed without the knowledge of who the participants were. The case vignettes, case studies, and report examples in this book have all been modified to hide the identity of the individual. Possible similarities to existing persons is coincidental and unintentional.

The tests mentioned above were developed over almost 30 years. Data presented for the tests in the appendices were collected in the past 20 years. Archival records of people who were referred to the psychologist over that period were examined for appropriateness. From nearly

1,500 records, 526 were selected for the study, based on completeness of record and not having a severe mental health disorder, as described in Chapter 27. The records selected did not all have the full complement of the tests of interest, as these evaluations were given according to the needs of the person, not the needs of the test developer. Accordingly, some bias may be present in terms of who received which tests. The most extreme example would be the Adapted Token Test, as this was usually only given when a question of receptive language ability was present. Some tests included in the appendices were given more routinely such as the Haptic Intelligence Scale subtests (not mentioned above as no adaptations were made to the original instruments). The Rey Auditory Verbal Learning test was given in a newly developed, expanded version, also more routinely.

Despite the shortcomings in terms of test development, these tests are considered to represent a contribution to the field. They are also put forth so that others can use,

and collect data, to make them more useful and acceptable. The status of testing the visually impaired is such that only a few other tests are available. The psychologist who employs these tools needs to apply clinical judgment to make the best use of them. When they are actually used, the examiner will likely see how helpful they can be in evaluating this group of people who have not received much attention from test developers.

The terms “visual impairment” and “blind” are typically used as indicating a level of poor or absent vision which severely impairs visual functioning. These terms are used by some authors in a more specific fashion to indicate no light perception for “blind” and some vision, but meeting the statutory requirement for legal blindness for “visual impairment.” This text will usually lump these two groups together unless otherwise specified by descriptors such as “no useful vision,” “totally blind,” and “some limited vision.”

# Introduction

When a neuropsychologist decides to do an assessment on a person with a visual impairment, the results often fall short of what is needed. That is, verbal intelligence, verbal memory, grip strength, finger tapping, and so forth are usually tested, but for the individual without sight the whole area of spatial abilities goes untouched. The occasional exception is when the assessment includes a Tactual Performance Test (TPT) without the memory phase. This practice ignores the work of Bigler & Tucker (1981) and Mangiameli & Peters (1999) who do offer a way to test memory on the TPT. For the person with visual impairment, who has some remaining vision, there may be some attempts by the clinician to assess visual-spatial functioning such as with performance IQ test items, but the applicability to those with visual impairments is often misguided, and leads to inaccurate results. Niemeier (2010) puts forth methods of neuropsychological assessment for visually impaired persons with traumatic brain injury. However, these recommendations fall short in terms of assessing nonverbal intelligence spatial perception and memory. This article is a good resource regarding testing the visual-perceptual functioning of persons with brain injuries who have vision, but it does not prove to be helpful for brain-injured people with little or no vision.

Visual-spatial testing of individuals with minor visual dysfunctions, such as blurred vision, might seem reasonable. They might be thought as appropriate for visual-spatial testing as often these materials have relatively bold outlines. However, a number of studies suggest that even individuals with visual acuity at 20/40 or 20/60 can show a deficit in visual-spatial tests, especially tests with smaller size and high spatial frequency. See for example, Bertone, Bettinli, and Faubert (2007). It should be noted that this study, and a number of others, indicate that individuals whose visual impairment does not reach the level of statutory blindness can still be disadvantaged by visual materials. Kempen, Krichevsky, and Feldman (1994) found that performance on the Benton Facial Recognition and Visual Form Discrimination tests were both significantly negatively affected by very mild visual difficulty whereas Judgment of Line Orientation was not. This does not mean that these visual materials should be abandoned, but that they should be used with the full knowledge that the subject's vision may not be appropriate to the task, and that the results should be interpreted with that in mind.

Major problems exist in the neuropsychological

evaluation of persons with visual impairments. The diversity of this group is quite substantial. Variables include type and degree of visual impairment, age of onset of the visual impairment, previous visual experiences if any, wide range of intelligence and other abilities, presence of other handicaps and dysfunctions, and personality variables. Studies have found up to 75% of adults with visual impairments have other disabilities or significant co-morbidities (Hill-Briggs et al., 2007). Appropriate instrumentation has always been an issue with this population.

The most significant attempt to address this lack has been that of Dial and his colleagues, (Dial, Chan et al., 1991, Dial, Mezger et al., 1991) who have not only developed instrumentation for persons with visual impairments (tests in the Comprehensive Vocational Evaluation System) but have carried out a body of research regarding its use (Chan et al., 1993). Still, this is not a total solution to the problem and Dial's instruments were standardized 25 years ago. Surveys show that the most common instrument used with the visually impaired population is the verbal scale from the Wechsler Intelligence Tests (Vander Kolk, 1981). As straightforward as testing individuals with visual impairment with verbal instruments might seem, it might also present some problems. (See chapter 2 for attempts to address those problems.) Articles on neuropsychological evaluation of persons with visual impairments demonstrate how little is available, especially in assessing nonverbal abilities (see, for example, Bylsma & Doninger, 2004). Some instruments are put forth for blind subjects simply by eliminating visual items (Busse et al., 2002; Wittich et al., 2010; Ames & LePage, 2011). Various instruments have been developed over the years, specifically for the use with individuals with limited or no sight, but few were fully developed and are generally not available at this point (Taylor & Ward, 1990).

The National Federation of the Blind (NFB.org) indicates there were over six million people in the United States in 2014 who rate their vision as disabling in some way (not all would reach criteria for legal blindness). Of these, over 600,000 are on social security disability for blindness. Twenty percent of the blind population have no vision according to this source.

Legal blindness is usually defined as 20/200 vision in the better eye with correction or 10 degrees or less of visual field. Others may be as impaired but fall outside of this legal definition; such as those whose visual

impairment is caused by neurologic conditions rather than ophthalmologic conditions.

A neuropsychologist should familiarize himself with some of the common causes of visual impairment, as well as the anatomy of the eye, and visual systems in the brain. Pathology of the retina in the eye is a common cause of visual impairment, particularly diabetic retinopathy, retinitis pigmentosa, retinopathy of prematurity and retrolental fibroplasias. Cataracts, glaucoma, macular degeneration, optic nerve atrophy, trauma to the eyes, and optic nerve pathology are other common causes. NIH Medline Plus is a source for definitions of various causes of visual impairment ([medlineplus.gov](http://medlineplus.gov)).

The neuropsychologist should develop a basic familiarity with visual impairments due to brain pathology. Works by Farah (Farah, 1990, 1991, 2003) and others (Efron, 1969; Lueck and Dutton, 2015; Milner & Goodale, 2006), give detailed accounts of visual agnosias, which make up many of these disorders. Of particular interest is simultanagnosia where the individual can only clearly make out one, or part of one object, at a time. This can be part of Balint's syndrome (Rafal, 1997), which also includes optic ataxia, and ocular apraxia. Palinopsia (Gersztenkom & Lee, 2015) is the persistence of visual image, or as one woman so eloquently called it, "a visual echo." It is important to be familiar with these as they can be mistaken by other treatment personnel to be psychogenic problems rather than neurogenic. This is also true of Charles Bonnet Syndrome (Sacks, 2014) which involves visual hallucinations of blind, or partially blind individuals, whose visual brains need to be active.

The neuropsychologist who is working with individuals with visual impairments will also be faced with a large number of other conditions that require attention or understanding. Congenital disorders, including genetic disorders, are common in this group. Individuals with Usher Syndrome, a genetic disorder, will develop both visual and hearing impairments. Other causes, more familiar to the neuropsychologist, will also commonly be seen. These include anoxia to the brain and/or retina, multiple sclerosis and infectious diseases. Anoxia to the brain seems to be particularly damaging to spatial abilities. Various tumors, causing some mass effects, could be involved. These include pituitary tumors, tumors on the optic nerve, occipital lobe tumors, parietal lobe tumors, and so forth. Traumatic brain injury to the frontal lobes can cause crushed optic nerves, leading to problems with vision in addition to other problems such as dysexecutive issues and anosmia. All of these foregoing conditions can cause a variety of visual problems, and there can be significant individual differences even with the same etiology. It can be seen why attempts to develop norms for tests can be challenging.

Due to varying visual abilities, tests for the individuals with partial sight often involve blindfolding them. Still, an

assessment of their functioning with vision is also needed. Caution needs to be used in interpreting the results of tests with visual stimuli given to a person with some vision. It may be that an individual who appears to have sufficient vision for a task is not comparable to others with full vision. For example, the individual with good central acuity and limited visual fields may not be able to perceive a test figure, or a word to be read, in the same way as a fully-sighted person. A person with certain types of visual agnosia may be able to draw an adequate copy of a figure, or be able to trace the outline of the figure, but still not perceive or comprehend the figure which is well within his or her range of knowledge. This does not mean that partially-sighted individuals should not be given visual tests; it simply means that interpretation should proceed very cautiously. It should be recognized that there may be some advantages to understanding the current visual perceptual functioning of the individuals with limited vision. Even with some of the tactual spatial tests that are given to the partially-sighted individual in a blindfolded state, testing the limits can be given, using the same test without the blindfold. This is particularly true about the Haptic Intelligence Scale Subtest Object Assembly where the examiner might be interested in the limits of the person's assembly ability (see Chapter 2).

The authors' experience has been limited with individuals where the onset of blindness was within the last month. More often, the experience with individuals who are adventitiously blind is after they have been in this condition for months to years. The adjustment process to blindness is such that the very recently blinded will be so disoriented as to affect the reliability of their test performance. Still, there are times when immediate knowledge of functioning might be pertinent. For example, a neuropsychological evaluation was performed on a newly-blinded, 23-year-old man who had been in a motor vehicle accident. This accident crushed his optic nerve. He also had Anton Syndrome (McDaniel & McDaniel, 1991), in which he had anosagnosia to blindness. That is, he did not understand that his visual functioning was compromised. He needed to understand he was blind, before he could be released from the hospital, as he could potentially put himself in danger. The results of the evaluation with this individual had to be considered to represent his functioning at that current time, and not necessarily predictive of how he would be doing in a few months, or at the point when his Anton Syndrome might resolve (this case is presented in more detail in Chapter 3).

The individual neuropsychologist faced with testing adults with visual impairments should be an experienced tester. This does not necessarily mean that he or she should be experienced in testing the population who are visually impaired but, rather, in testing in general. Very structured approaches often do not work with this population as that structure would be unaccommodating to

the myriad needs of the person who is blind. The examiner will have to think on his or her feet and be able to judge functioning, and abilities by observation, as much as by test results. Interpretation of results cannot be “cookbooked” as there are so many variables to be considered within the test situation and the individual. The acceptance of less than perfect methods, as suggested in

this manual, is important or nothing will be done. The examiner will need to have a good basis for understanding how various abilities interact and, in addition, know how to break down an individual’s performance in order to understand his or her abilities, how to recommend approaching rehabilitation and training, and how to predict his or her functional outcomes.