

Psychometric Protocols for Psychological, Educational, and Vocational Testing for Persons with Blindness and Visual Impairments

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Psychological, educational, and vocational testing is rarely accommodated or modified for persons with blindness or visual impairments. Reasons for failing to modify testing may include lack of knowledge about the need to modify testing by the test administrator, poor current testing options for this specialized population, and lack of skills to offer appropriate accommodations. In addition to addressing these issues, this article offers a historical framework for testing persons with blindness and visual impairments, necessary traits to be tested, qualifications of persons completing testing, proposed purposes of these evaluations, and then recommendations for further testing development.

Keywords: blindness, visual impairment, psychometric, psychological testing

Across the United States, and indeed internationally, specified efforts are taken to educate, train, and increase independent living skills for persons with blindness and visual impairment. However, adequate testing remains an arduous issue, leaving the Psychologist, Rehabilitation Counselor, or other providers few testing options. Historically, prior, vital initiatives have been taken to advance psychometric protocols for persons with blindness and visual impairment; however, many of these efforts have been paused since the mid-1990s. Potential reasons for the difficulty related to testing this population may be related to lack of knowledge about the need to modify the testing protocol, poor updated current test options for this population, and lack of skills by individual providers to offer appropriate accommodations. As such, this monograph addresses this timely topic. This article will furthermore offer recommendations for further psychometric development to promote vocational placement, educational planning, and independent living skills considerations for this population.

Lack of Professional Knowledge about Need to Modify Testing Protocols

Admittedly, persons completing testing for persons with blindness and visual impairment vary greatly regarding their specific skills and abilities completing

this specialized testing. Some professionals may have great knowledge about testing modifications and needed considerations, which others may simply seek minimal guidance and accept minimal foresight regarding testing modifications. The lack of knowledge may be facilitated by the reality that most probably this population remains a small proportion of a provider's caseload. Or, specialization in knowledge regarding this population may not be financially feasible or profitable by an individual provider. Among the range of tests offered for a generalized rehabilitation population, counselors may similarly be unfamiliar with the tests specialized (i.e., CVES) or modifiable for these persons (i.e., Wide Range Achievement Test). Complicating the lack of knowledge argument, one must consider that blindness or visual impairment often accompanies another disability, injury, or physical impairment, such as head injury, stroke, or diabetes. As such, upon referral, visual impairments may be listed as complimentary disabilities, limiting initial assessment or need for special testing. Moreover, considering the potential for multiple diagnoses, the evaluator must consider the need for prospectively cognitive, physical, and also specialize testing pertaining specifically to vision.

Poor Current Test Options for Specialized Population

Three test options are currently available, with some more and others less preferable than others. First, individuals may utilize generalized testing materials or protocols without accommodations. In this circumstance, current testing materials are used "as is" and not modified. A positive feature of this approach is that ecological validity is assured, considering the materials are not modified and indeed reflective of an everyday environment. A negative feature entails that the referenced norm is not for persons with blindness or visual impairment, perhaps underestimating a person's ability. A second option is utilizing existing testing with accommodations. Accommodations may include reading testing materials aloud that are traditionally read by the person completing the test, enlarged print, or simple exclusion of materials that cannot be utilized by this specialized population. This method again allows the utilization of materials with a broad normed base, but standardization with materials is breached, perhaps limiting generalizability or even interpretation with the original norming group. Lastly, specialized testing for this population may be used, such as the CVES. A benefit of this testing entails use of specialized materials that are visual free, but a disadvantage is the realization that these materials have a limited norming group and the timeliness of the norming time range, with published norming is limited.

Lack of Skills to Offer Accommodations

As few testing options may be available, there may similarly be few test providers with specialized skills. A foundation for this inadequacy may be poor knowledge about blindness by an individual provider. This lack of specialized knowledge may be linked to both the wide reasons related to congenital blindness and blindness acquired across the lifespan. Furthermore, degrees of blindness vary greatly, ranging from complete loss of blindness to variable degrees of acuity and ability to see shades, light, and generalized forms. It is also proposed that lack of skills by many providers may be due to poor funding for specialized training to gain knowledge and skills to test this population by individual providers.

Historical Framework

When addressing the historical framework for testing persons with blindness and visual impairments, one must definitively begin with the history of rehabilitation itself. Unfortunately, and with reality, wars result in physical and psychological trauma for individuals. As a result of this trauma, soldiers return with the need for rehabilitation, including physical and cognitive rehabilitation. After both World War I and II

soldiers returned with the need to attain rehabilitation to both increase their activities of daily living skills and also improve vocational marketability. As a result of these needs, federal and state governments offered training and financial resources to improve quality of life for these returning soldiers. Going into the 1960s, there began a push towards individual advocacy and appreciation for individual contributions to society. While perhaps persons with disabilities were discounted or the advocacy efforts waned in the 1950s these efforts were reinitiated or invented during this decade. With this decade efforts were taken for inclusion, as opposed to exclusion for persons with disabilities. In the 1990's with the advent of the Americans with Disabilities Act public sentiment again began to consider both opportunity and loss of opportunity for persons with disabilities. As the ADA began, so did lawsuits and also concern about whether the ADA would advance or thwart efforts for persons with disabilities to become incorporated into societal frameworks.

Testing Purposes

The purpose of test administration will vary based on the client taking the test. Range of utility for specialized assessment may also vary in relation to the skills of the test administrator. This section will address the potential utility of specialized testing for persons with blindness and visual impairment. Moreover, it is proposed that specialized efforts be taken to develop testing mechanisms for this specialized population, as opposed to simply modifying present testing not normed for this usage.

Educational Planning

One proposed use of specialized testing will be to assist with educational planning. This may include assisting in determining placement of individuals in a new school setting, such as Kindergarten, or even vocational technical placement. The tool may also be valuable in evaluating a continuation of placement, such as when determining an educational course of action if a student is performing poorly. This may also be useful if reduction of placement is needed, such as someone being placed in a lower grade than one may be currently enrolled. Alternative placement, such as changing schools from a traditional education format to a charter or magnet school, may also represent another use of this test.

Vocational Placement

Specialized testing may also serve a purpose regarding vocational placement. Transitional planning represents a valuable feature of vocational rehabilitation during the high school years. This assists in evaluating how

high school students with disabilities may successfully transition into the workforce. Vocational-technical or collegiate placement may also be valuable avenues of use for the test. High school classes traditionally focus on theory and non-applied academics. Utilizing the test could assist with identifying physical-cognitive interactions in a vocational-specific job placement. Unfortunately, many individuals may not benefit from their current placement and may need alternative placement. This test may assist in determining whether someone should maintain their current placement or pursue alternative placement.

Independent Living

As one ages, or as one loses functioning, the ability to successfully interact effectively within one's environment lessens. The question therefore remains whether someone should leave their environment or if modifications could be made within their environment to increase this effective environmental interaction. It may be possible for someone to stay in their current living situation with aides. However, determining if someone is able to live without the continuous use of aides will be vital towards making these decisions. A test examining physical and cognitive dimensions for someone with blindness or visual impairment could prove useful in measuring independent living capabilities. Another alternative to remaining in their current situation may be the use of supervised living within an apartment complex or group housing. In these environments, persons must still perform activities of daily living, which an assessment can assist in deciphering if this may or may not be accomplishable with one's current set of skills. Alternatively, institutional care may be considered. Within institutional care, further consideration must be taken regarding independent living allowances versus circumstances wherein continuous monitoring is needed.

Psychological Testing

Admittedly, few differences may be identified between psychological testing and the prior listing of potential uses. Psychological testing is used, from a basic stance, to evaluate human behavior, meeting criteria outlined previously. Within this dimension, this testing may be used to accompany additional intelligence, competency, or other testing efforts. Along this framework, it would be recommended that this testing not reach or be applied beyond its intended purpose or norming sample. Importantly, this test must complement, not replace other psychological tests.

Administrator Qualifications

The ultimate purpose of testing will be to assist family members, professionals, and others to make decisions regarding persons with blindness and visual impair-

ments. While the test may be far reaching regarding both persons capable of administering it and others participating in its development and use, it must solely be marketed for its application, as opposed to strictly financial gain. For anyone administering the test a minimum knowledge base will be necessary. Persons must not only understand blindness and visual impairment, but also psychometrics. It may be proposed that qualification levels be separated by inherit skills and qualifications of potential administrators. Also, it is recommended that competency levels be designated by previous education, training, and number of tests completed.

When choosing allowed evaluators, it will be imperative to measure the skills of the evaluator to those needed for successful administering of the test. All evaluators must be culturally sensitive regarding race and sexual identity, among others, including vision culture. While blindness represents a sensory deficit, most often it concurrently represents definitive cognitive deficits. As such, the evaluator must be aware of how cognitive deficits affect independent living and social interactions, as well as sensory deficits. Similarly, due to nature of sensory disability, persons with blindness and visual impairments may incur social deficits, limiting their ability to interact with others. Limited social abilities may affect their ability to offer a true sample of behavior during testing, warranting special skills on behalf of the evaluator. Indeed, the number of professional, technical, and additional skills of the evaluator may be not definitive, or perhaps unlimited. Standards, such as those set forth through the American Psychological Association and other agencies, must therefore be upheld regarding tester qualifications.

Future Directions

Accomplishments of Cognitive Test for Blind and Comprehensive Vocational Evaluation System Must be Acknowledged

There are several accomplishments resulting from the development of the *Cognitive Test for the Blind* and the *Comprehensive Vocational Evaluation System*. These assessments were brought to fruition ahead of their time in the context of concurrent assessments. McCarron-Dial spent great efforts to realize this goal not only financially, but also with their allowance of time to develop such tests. The unveiling of these assessments and their contributions were pivotal points within the field of psychometrics, especially regarding the blind and visually impaired population. It allowed for the advancement of special interests in these areas. Additionally, an initial model was resultantly offered as a building block for future research. This enabled future researchers to save valuable time,

funding, and energy by not having to start without a model for guidance, but rather offered a pivotal starting point to develop further protocols. Any further developments in specialized testing must acknowledge the contributions of these leaders and perhaps even build upon their conventions.

Expand Potential Utility

Specialized testing for persons with blindness and visual impairments have traditionally been utilized as tools for assisting with vocational placement. While vocational testing is definitively needed as the primary focus with such assessments, there are certain needs of individuals with blindness or poor vision that are beyond the scope of these assessments in job placement. These individuals, by nature of both employability and disability, must consider educational planning and also independent living accommodations in order to be successful. However, a broader focus will mandate expansion of areas covered by such tests to include cognitive and physical abilities, vocational interests, and other constructs.

Solicitation of Feedback from Blind and Visually Impaired Community

In order to truly be successful in serving this population through development of testing protocols, the complete development process must be consumer driven. A matching to consumer needs must exist between psychometric protocols and ultimate usefulness for a specialized population. This can be accomplished via feedback from the blind and visually impaired community. It is still recognized, however, that such a test may be used by other populations, such as individuals with head injury or stroke, in which vision does not represent a primary diagnosis. These cross-disciplinary evaluations are probable, but must be used with caution, especially if there are limited norming samples.

Establish a Test Development Timeframe

Essentially, the concept that "Rome was not built in a day" applies to these developments. Any venture of developing an assessment specialized for persons with blindness and visual impairment will represent a decade-long involvement and dedication to assure completion. It is predicted that many models will be developed and modified across time in order to account for consumer feedback, ease of use, changes in available technology, labor market conditions, etc. Grants will be needed to pursue this project, and consumers will be warranted to evaluate ecological validity. These venues must be evaluated every 2 years and then a long term, 10-year-framework must be developed for long term planning of such an instrument's launch.

Incorporate Physical Capacities into Testing Protocols

Linking this type of assessment to only intelligence and other cognitive features will limit the utility of the test. The development must include the examination of reaction time, alongside both upper and lower extremity strength, range of motion, and dexterity. Although, this will not be parallel to a Functional Capacity Evaluation. It is noted that while incorporating physical aspect into assessments, an evaluator must achieve balance between the assessment of physical capacities and the avoidance of injury.

Carefully Limit, but Concurrently Expand upon Allowance of Those Administering the Test

While the test may be developed by doctoral-level initiators, including fields of psychology and engineering, it is most probable that the actual evaluators will possess a Bachelor or Master's level of preparation. This will result in a wide and varying range of knowledge and also testing skills. Although individuals assisting with the development will be diverse, it is assured that there will be a need of basic competencies of evaluators to be demonstrated. Across all evaluators, there must be basic knowledge about blindness, human development, and psychometrics.

Test Affordability

A personal critique of the present available testing materials is that only a select few can afford payment for them due to pricing, which limits their use in the broader community. Balance must be achieved across the cost of producing and developing test, financial resources, and potential profitability by both test developers and those utilizing the test. Within the costs accounted for, there must be a contingency related to certifying users of the test and continued competencies regarding modification of the tests in order to ensure proper administration and application.

Psychometric Progression Regarding Knowledge of Blindness and Visual Impairment

The acquisition of knowledge about vision and vision impairment is dynamic and an ongoing learning process, rather than static. This knowledge is made available and facilitated by neuroimaging and also quick dissemination of information. Technology is expected to advance in the future years, particularly regarding Assistive Technology, which will affect the level of adaptability to the community for individuals with vision impairments. Financial resources for testing, as well as accommodations are expected to vary across time and from person to person, as seen in the past.

Surgical advancements may also enable adaptations and increases in functionality for individuals. Changes must be made to testing materials in order to accommodate and meet these ongoing realities.

Timely Test Updates

A new test with traits as outlined previously will offer a more heuristic approach, adding value to the community. The population community must be advised regarding when updates may be expected to any testing advancements. Additionally, trainings and test modifications must be included in any testing updates. It is potentially recommended that updates be publicly disseminated at the 2, 5, 7 and 10 year follow-ups, but may be modified based upon needs of both the community and the test developers.

Alpha and Beta Testing

In this context, differentiation must be made between both the alpha and beta testing. Alpha testing represents a form of acceptance testing by the developers. This is used to identify potential shortcomings or issues that must be resolved prior to formally issuing the test. Alpha testing should be done with both clinical and non-clinical samples, and moreover, in a lab, under supervision by a qualified developer to initiate needed changes based on results. Beta testing refers to the use of the test by real users, or persons, who will formally use the test for its intended purpose. In beta testing, the test will be administered to a limited number of persons, in order for the developers to obtain feedback quickly. This will prevent both failure of the product launch and also reduced risk for applications. After beta testing is completed, the product may be disseminated to the general public.

Physical-Cognitive Interface for Persons with Blindness and Visual Impairment

Past testing has most often focused on single features, rather than addressed both the physical and cognitive features of test takers. Methods to evaluate these interfaces have not been identified or developed by the current authors. These interfaces will affect how persons with impaired vision will interact with their environment. This represents the most difficult experimental feature of testing development to achieve.

Computer Advances and Testing Protocol

The standard of bringing large binders or briefcases to complete testing is an outdated concept, as we progress further with today's technological advances. For convenience, relevance, and functionality, today's testing must incorporate Internet databases for updated norms. Additionally, online manuals will decrease costs and allow consistent updates with limited

additional costs for those using the tests. Although, there will still be a need for physical interfaces, such as those used with haptic assessments. As a long term development, the use of telemedicine and electronic communication to complete testing may even be considered.

Development of the Sensory Motor and Reaction Time Test, or C-Smart

At present the current authors are developing a test designed to address the specialized, aforementioned needs. Specifically, we are developing a test, deemed the Cognitive Sensory Motor and Reaction Time test, which will offer a series of vision-free, or vision reduced testing which will enable a variety of individuals to evaluate mental, physical, and social readiness for persons with blindness and visual impairment regarding job placement, independent living assignment, and also educational engagement. The first author, Dr. Scott Smith, has a background in both educational psychology and rehabilitation counseling, while the second author, Dr. Charles Taylor, has a background in mechanical engineering. Both of the authors are employed at the University of Louisiana at Lafayette, and they are in the process of not only norming the test, but also attaining federal funding for development of the test itself.

The C-Smart within its format will pull many features from current testing protocols, which are typified of current tests, such as *Cognitive Test for the Blind*, *Wide Range Achievement Test*, and also the past *Woodcock Johnson Brief Achievement Test* and *Woodcock Johnson Cognitive Achievement Test*. Within these tests, not only are features replicated, but also assessment of select features have been typified across numerous tests across the last century, such as digit forward, digit backward, reading comprehension, vocabulary, pair cancellation, and assessment of reaction time.

The SMART protocol will be based on the O*NET (Occupational Network) criteria for establishing employability or placeability for individuals into the workforce. Again, the purpose of this testing protocol will be to evaluate real-skills needed to be placed in the workforce, participate in education, or evaluation of living placement. It is proposed within this Network that adaptability to work is based on the following: tasks performed, tools and technology, knowledge, skills, abilities, work activities, work context, education, interests, work styles, and then work values. Many of features are based primarily on cognitive or personality features, such as knowledge, interests, and work values. Others are based on work-specific components: tasks performed, work activities, and work context. Moreover, two components are not only psychophysical, but moreover measureable and quan-

tifiable: skills and abilities. These features are additionally applicable to independent living.

The skill assessment will fall into seven areas:

- **Coordination:** modifying one's own actions in relation to other's actions
- **Monitoring:** monitoring and assessing one's own performance, the performance of others, and also organizational behaviors in order to complete tasks
- **Quality Control Analysis:** conducting tests, alongside inspection of products or services
- **Active Listening:** attending to what others are saying, taking time to understand information, no interrupting, and correctly evaluating when to continue listening and also properly leave
- **Critical Thinking:** use both logic and reasoning to identify both strengths and weaknesses to not only solutions, but also conclusions and then actual approaches to problems
- **Speaking:** talking to others to present information efficiently and effectively
- **Time Management:** Managing both one's own time and evaluating time allotment by others

Moreover, the abilities assessment will fall into 12 areas:

- **Manual Dexterity:** the ability to move individual hands, and hands in concert; grasp objects; perform both fine and gross motor movements
- **Finger Dexterity:** differs from Manual Dexterity in focus of fingers, as opposed to whole upper extremity; includes the ability to grasp, manipulate, and also assemble small objects
- **Problem Sensitivity:** the ability to identify not only when a problem is correctly solved, but also when something wrong occurs; this differs from solving a problem and instead focuses on simply identifying when a problem does occur
- **Near Vision:** the ability to see details within a few feet
- **Oral Comprehension:** the ability to both listen to information and respond to information received
- **Arm-Hand Steadiness:** the ability to keep both hand and arm steady, while moving hand or arm in one position
- **Deductive Reasoning:** ability to apply general rules to specific problems, which can be both physical or cognitive based
- **Information Ordering:** ability to arrange objects or actions in a specified order or pattern
- **Control Precision:** ability to both quickly and repeatedly the controls of a machine to precise or exact positions

- **Oral Expression:** ability to communicate information and ideas through speaking so others will understand spoken expression
- **Speech Recognition:** ability to both identify and understand the speech of another person
- **Written Comprehension:** ability to read and understand information and ideas presented in writing

While considering "what" will be measured, one must consider the reality that visual impairments are very diverse. Blindness and visual impairments may be the result of birth-related problems, stroke, progressive congenital conditions, or accidents, among others. Visual abilities may diverge, ranging from minor loss of visual acuity, wide to restrictive peripheral vision, to complete loss of vision. Functional work abilities may range from the ability to work independently, with supervision, or perhaps unable to work with or without coaching or supervision. Lastly, independent living skills may diverge, ranging from the ability to live independent, live with limited supervision, to institutionalization. As skills and abilities range widely across persons with blindness and visual impairment, any assessment must not only be modifiable for those with great and poor skills, possess great predictive validity, potentially transportable, and then affordable.

It is predicted that this test will become active or publishable between 18 to 24 months. Beyond the allocated 24 months, it is further assessed that an additional two years will be needed to beta test the testing protocols. This monograph offers the initial introduction of this initiative.

Conclusions

The *Zeitgeist* is proper to further consider testing modifications for persons with blindness and visual impairment. Modern technology has enabled persons with blindness and visual impairment to expand not only access to assistive technology, but also career options utilizing technology. Due to these advancements, alongside the availability of funding to evaluate placement options for persons with blindness and visual impairment, Counselors, Psychologists, Engineers and others must advance their knowledge about testing protocols for this specialized population. During this maturation stage, professionals must recognize the diversity of skills and abilities among those with these disabilities, acknowledge the limitations of current testing protocols, seek feedback from the blind and visually impaired community, and then distinguish the need for protocol modifications to meet client needs.

Table 1. Psychomotor Features Affecting Vocational Placement, Education, and Independent Living

Sensory	<p>Quality Control: Identify correct and incorrect features of daily objects</p> <p>Near Vision: Evaluation of functional vision, based on both medical records and also measurement of close vision</p> <p>Deductive Reasoning: Complete finger taps to coordinate with auditory cues</p> <p>Control Precision: Complete finger taps to coordinate with auditory cues</p>
Motor	<p>Manual Dexterity: Identify strength and range of motion</p> <p>Finger Dexterity: Completion of fine motor task to complete work related behaviors</p> <p>Arm-Hand Steadiness: Evaluation of steadiness at below waist, waist, and above waist tasks</p> <p>Information Ordering: Haptic identification of order, quadrant and member</p>
Reaction Time	<p>Problem Sensitivity: Identify correct and incorrect solutions in a basic assembly task, with measurement of time</p> <p>Oral Expression:</p>
Cognitive Processing	<p>Time Management: Completion of an set task to a specific period of time</p> <p>Monitoring: Evaluate quantitative completion of a set task</p> <p>Active listening: Complete digit-forward and digit-backward memory task</p> <p>Critical Thinking: Complete reading comprehension task</p> <p>Speaking: Present verbal responses to linguistic and mathematical problems</p> <p>Time Management: Predict self and other times to complete an assigned task</p> <p>Oral Comprehension: Respond to simple and complex demands for both manual and critical thinking tasks.</p> <p>Speech Recognition:</p>

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