History & Development of the MDS & CVES

The McCarron-Dial System (MDS) was developed as an empirically based, multifactor assessment battery. Originally introduced to the field of rehabilitation as a vocational evaluation tool, its use has been expanded to include applications in virtually all areas of neurocognitive assessment and treatment (Chan, et al., 1993; Botterbusch, 1982). Expansion of the MDS was necessary to meet the continued demand for appropriate assessment technology to address the growing needs of consumers in traditional rehabilitation settings, clinics and public schools. Also, legislative standards set by federal as well as local governmental agencies (e.g., the Individuals With Disabilities Education Act [IDEA]), have resulted in the need for appropriate assessment tools to facilitate diagnostic and vocational placement decisions for special needs groups (Nelson, Dial & Joyce, 2002). In this regard, the MDS has been adapted for use to assist individuals with a variety of different disabilities, including persons with visual impairment or blindness, and has found wide acceptance in the diagnostic and rehabilitation community of professionals and agencies providing services to these populations (McBroom, Shinden & Elston, 1997); the adaptation of the MDS for specific application to persons with visual impairments or blindness is referred to as the Comprehensive Vocational Evaluation System, or CVES. This manual describes the theoretical background and the application of the MDS in vocational, educational and clinical settings. Also described are recent studies supporting the validity and reliability of the MDS and its expanded components.

The McCarron-Dial System (MDS)

Since its inception 1970, the McCarron-Dial System (MDS) has been expanded and incorporated into many rehabilitation, public school and clinical settings to assess the educational and vocational potential of individuals with neuropsychological, sensory and/or physical disabilities. In this context, disabilities of a neuropsychological origin are presumed to have, as their primary etiology, a pathological deviation of structure or function in the higher brain centers. The disorder may be congenital or acquired; static, transient or progressive; or simply a significant deviation from normal development. Regardless of specific etiology, the primary functional limitations involve one or more of the higher cortical systems which mediate perception, memory, learning, cognition, language, affect and/or complex voluntary motor movement. As such, persons with specific disabilities such as mental retardation, cerebral palsy, brain injury, hearing or vision impairments and learning disabilities have been evaluated using the MDS or special adaptations of the battery such as the CVES (Dial, Chan & Norton, 1990; Dial et al., 1991; Dial, Rubino-Watkins, Marek, Colaluca & Dial, 1998).

The expanded MDS is based on a neuropsychological model which incorporates traditional views of brain function as well as the concepts of Luria (1973). Luria's functional systems theory suggests that the brain is comprised of diverse, but overlapping systems which mediate all behavior including work-related behaviors (Chan et al., 1993); a discussion of Luria's theory as it is applied to the MDS and CVES is presented in the next chapter. A multifactor approach to data gathering was viewed by McCarron and Dial as essential in the evaluation of higher cortical functions which relate to an individual's ability to perform in a variety of independent living, work or educational settings. The process of developing, revising and expanding the MDS continues to date.

The MDS Evaluation Model

The MDS evaluation model consists of gathering information regarding essential cognitive, perceptual-motor and emotional-coping functions through a variety of data collection methods. Sources for these data include historical information, behavioral observations and results from standardized tests. The information gathered form these sources is used to generate hypotheses concerning the meaning of the assessment results which are then formulated using systematic techniques or algorithms. These hypotheses which are ultimately expressed as case findings and recommendations in the evaluation report, are tested through cross-validation of available data and feedback or follow-up to ascertain whether the proposed findings are efficacious. Persons administering the MDS (or its adaptations) are encouraged to incorporate systematic methods or approaches to data gathering, hypotheses formulation and hypotheses testing to increase the likelihood of obtaining positive outcomes for

persons with disabilities who undergo evaluation. The application of the MDS model to the evaluation process is presented in detail in Chapter III.

The MDS Assessment Factors

The MDS data gathering process begins with collecting information that is organized into three major constructs of behavior including Verbal-Spatial-Cognitive, Sensorimotor and Emotional-Coping functioning. The Verbal-Spatial-Cognitive (VSC) factor is defined as a person's ability to utilize language, to process verbal and spatial information, and to acquire new information; it includes measures of cognitive, memory, language, learning and academic functioning. The Sensorimotor domain is usually subdivided into separate sensory (or perceptual) and motor factors. The Sensory (or perceptual) factor is defined as the basic mechanisms of receiving and perceiving information from the environment, while the Motor component involves responding to such information in a purposeful, adaptive manner. The Motor factor involves essential neuromuscular processes that mediate speed and direction of movement, coordination and control of movement, strength and balance or postural control. The Emotional-Coping domain is also subdivided into Emotional and Adaptive Behavior factors. The Emotional area involves identification of social-emotional concerns or behaviors which are considered problematic and may, therefore, interfere with the individual's educational or vocational rehabilitation process. Finally, the Integration-Coping or Adaptive Behavior factor represents the person's understanding and expression of independent living skills. Information concerning an individual's functioning on each of the MDS factors is derived from history, behavioral observations and standardized assessment. These data are then used to describe the person's relative strengths and limitations and to predict vocational competency and independent living levels. In clinical and educational applications, these data are also utilized for diagnostic purposes and for determining appropriate treatment and/or educational recommendations.

The MDS Assessment Battery

The MDS consists of a core battery and numerous auxiliary instruments which may be administered depending on the nature of the evaluation (e.g., vocational, clinical, etc.); the referral questions; and the characteristics of the person being evaluated. The battery makes use of standardized instruments which assess various domains germane to neuropsychological functioning and educational/vocational abilities. The battery is intended to be fluid regarding which instruments are utilized for a particular evaluation. The experienced evaluator or clinician is encouraged to modify the battery based upon the needs of the assessment. In addition to the instruments developed or adapted for use in the MDS, the battery also utilizes information from other commonly available sources (e.g., WAIS-III, WRAT-III, etc.) in order to obtain an overall impression of the person's educational and vocational capacities. The following is a description of the five domains assessed by the MDS (and CVES) and the instruments typically utilized to assess each domain. As stated previously, not all instruments described in the various domains are necessarily utilized for every person; however, the core battery is often appropriate for most individuals.

Verbal-Spatial-Cognitive — Wechsler Adult Intelligence Scale (WAIS-R or WAIS-III) (Wechsler, 1981 & 1997) and the Peabody Picture Vocabulary Test-III (PPVT-III) (Dunn, 1997); or the Cognitive Test for the Blind (CTB) (Nelson, Dial & Joyce, 2002) when evaluating persons with significant visual impairments or blindness.

The Wechsler scales provide a measure of general intellectual functioning derived from verbal and performance tests. The PPVT is a measure of receptive vocabulary; i.e., the ability to associate a vocalized word such as "chair" with a pictorial representation of the word. The CTB measures verbal and non-visual, performance cognitive functions.

Sensory — Bender Visual Motor Gestalt Test (BVMGT) (Bender, 1938); and the Haptic Visual Discrimination Test (HVDT) (McCarron & Dial, 1979, 1988) or the Haptic Sensory Discrimination Test (HSDT) (Dial et al., 1991) for individuals with significant visual impairments.

The BVMGT provides a measure of visual-motor integration skills. Relatively simple designs are reproduced with paper and pencil. The HVDT requires tactile manipulation of objects (obscured from the visual field) to discriminate their particular shape, size, texture or configuration and visual recognition of the objects from a photograph. The HSDT is the adapted version of the HVDT used for evaluating sensory functions of persons with visual impairment or blindness and involves tactile-motor matching skills to identify various shapes, sizes, textures and configurations.

Motor — McCarron Assessment of Neuromuscular Development (MAND) (McCarron, 1976, 1982) or an adaptation of this instrument for persons with visual impairment (e.g., MAND-VI) (Dial et al., 1991).

Both fine and gross motor skills are assessed including the factors of bimanual dexterity, motor coordination and control, balance and muscle power.

Emotional — Observational Emotional Inventory (OEI) (McCarron & Dial, 1986), Observational Emotional Inventory-Revised (OEI-R) (Dial et al., 1991), Emotional Behavioral Checklist (EBC) (Dial et al., 1991) or the Behavioral Checklist for Students (BCS) (Dial, Mezger, Massey & McCarron, 1986).

Situational assessment and interview are used to identify behaviors which may interfere with educational or vocational potential including impulsivity-frustration, anxiety, depression, socialization, self-concept, aggressiveness and reality disorientation.

Integration-Coping — Behavior Rating Scale (BRS) (Dial, 1973), Street Survival Skills Questionnaire (SSSQ) (Linkenhoker & McCarron, 1979, 1993) and/or Survey of Functional Adaptive Behaviors (SFAB) (Dial et al., 1991).

Personal, social and work adjustment behaviors which relate to the individual's ability to function autonomously in the community or work environment are assessed by situational observation, interview and, in the case of the SSSQ, by standardized testing.

The instrumentation described above is interpreted in different ways depending on the nature and goal of the evaluation as well as the training and professional orientation of the evaluator. Results from standardized tests are always interpreted in the context of an individual's history and the information gained from qualitative observation of the person's behavior. These interpretations may emphasize vocational, educational or clinical diagnostic issues.

Vocational Interpretation

In traditional vocational evaluation, the MDS (or CVES) data may be used to predict a person's level of vocational competency and level of independent living; software applications which support the MDS assist in this regard. The individual's profile (including historical and behavioral observation information) is also used to describe relative strengths and/or limitations which may enable the evaluator to better conceptualize a vocational direction. For example, when considering competitive vocational placement in the community, the emotional factor initially predominates as a key to successful placement. If significant deficits in emotional/behavioral areas are observed, successful placement will be jeopardized unless these problems can be remediated or accommodated.

Second to emotional functioning, a person's cognitive abilities are the best predictors of vocational potential for competitive community placement. High scores on the WAIS-III or CTB may support a professional/technical/skilled vocational choice or any occupation where good problem-solving skills and verbal abilities are a must. High scores on the WAIS-III or CTB may suggest that advanced education is a realistic option. Other assessment factors are also important in determining an appropriate vocational goal. For example, in the absence of high overall cognitive abilities, good sensorimotor abilities suggest the possibility of skilled or semi-skilled employment. In cases of language difference, educational-environmental deprivation and/or hearing impairment, relatively higher sensory as contrasted to verbal-cognitive abilities is an optimistic indicator of higher vocational potential than otherwise expected. An examination of the person's sensorimotor profile may assist in resolving this issue. Despite lower cognitive scores, some individuals may demonstrate adequate practical or strong functional abilities that can suggest the potential for competitive employment, perhaps in a semi-skilled or skilled capacity. The SFAB and/or SSSQ also provide important information regarding this area. Information from history and behavioral observations offer additional insights regarding these functions. Prior work history (managerial, supervisory, clerical, administrative, industrial roles) may assist in cross-validating the person's overall ability structure as determined from standardized testing, indicating which transferable skills may be present. Major findings regarding the above information are included in the MDS (or CVES) report summary. In vocational interpretations of the MDS (or CVES), information derived from the primary domains or factors is also supplemented by results of vocational interest tests and other relevant data. Therefore, the MDS may be considered a "core system" around which other specific tracks of information gathering can extend.

Clinical Interpretation

When the goal of the evaluation is to obtain diagnostic and treatment planning information, the MDS (or CVES) battery yields important information that may describe the presence of clinical syndromes or disorders that are, or may become, the focus of attention. When combined with available history, behavioral observations and data from ancillary tests, the battery constitutes a thorough and comprehensive neuropsychological evaluation. Traditional methods of inference (e.g., levels of performance, patterns and relationships among scores, pathognomonic signs, etc.) are applied to the MDS data to formulate interpretations. For example, significant discrepancies between Verbal and Performance IQ, in concert with disparities in right and left sensory integration and motor functions as measured by the HVDT (or HSDT) and MAND, may suggest the presence of neuropsychological dysfunction and indicate whether a lesion is lateralized or diffuse; further comparison between sensory and motor findings, in concert with specific pathognomonic signs and/or particular cognitive patterns, may define specific locations within systems that are dysfunctional. In the absence of adequate historical information, the MDS profile can alert the evaluator to the presence of cerebral dysfunction or outright brain damage that was not previously known or reported (Dial, Chan & Norton, 1990). More importantly, the MDS (or CVES) provides a functional description of the impact that the presence of brain damage may be having, and may continue to have, on a person's life. Primary clinical findings can be supplemented by emotional and integration-coping measures such as the EBC and SFAB when describing individual problem behaviors related to personal-social adjustment difficulties or poor work performance. For example, difficulties getting along in the workplace or inability to maintain competitive employment may be explained by the presence of frontal lobe dysfunction diagnosed during the clinical evaluation. These findings can be useful when interpreted clinically and may lead to recommendations for therapeutic intervention that will improve the person's vocational potential.

Educational Interpretation

Frequently, schools serving children with disabilities require an in-depth and specialized assessment of the child's neuropsychological status in order to formulate educational and/or prevocational training goals. Beyond the more common diagnoses of learning disability, attention-deficit disorder, or emotional-behavioral disorder, specialized knowledge of a child's abilities is needed in order to formulate appropriate goals on individual educational plans (IEP's). By administering the standard MDS clinical battery supplemented with school observation and parent and teacher interview, an overall picture of the child's educational programming needs can be obtained. As stated earlier in this chapter, recent legislation such as IDEA requires that special needs students receive valid individualized assessments appropriate to their needs. The MDS, CVES or P-MAC (an abbreviated children's adaptation of the MDS) can be useful in such instances. Educational assessments with these batteries can also be particularly useful in transition planning for students aging out of a special needs program into community-based services.

Summary

The development of the MDS has extended over a 30-year period, and the system continues to be expanded and cross-validated to meet the needs of providers and recipients of rehabilitation and neuropsychological services. Ongoing research in university and private settings has facilitated this development and has been encouraged by the system's developers. Unlike many assessment batteries or systems, the MDS has evolved as a flexible model of evaluation based on neuropsychological principles which guide the interpretation of assessment data. Luria's functional systems theory as well as findings in traditional neurology are coupled with the empirical observations from vocational evaluation, rehabilitation and education to form the conceptual framework of the system. The MDS describes the functional integrity of higher level brain systems (cognition, language, perception, voluntary movement, affect, etc.) through test performance, history and behavioral observations and correlates the descriptive data profiles with ecological outcomes such as activities of daily living, work and personal-social adjustment. Systematic methods of interpreting data with regard to these functional outcomes permit evaluators from various disciplines and professional backgrounds (vocational evaluation, education, occupational therapy, psychology, etc.) to effectively use the system for a variety of evaluative purposes in their particular settings. Furthermore, the MDS has proven its adaptability by meeting the needs of a changing assessment and rehabilitation environment, including changes in legislative requirements. An organized program to train professionals in the field has facilitated the effective use of the system. Since these training services were made available, over 9000 professionals have attended training programs related to the McCarron-Dial System. At present, the MDS (or component instruments) is actively used in over 2600 rehabilitation, educational and clinical settings throughout the United States, Canada, Ireland, Australia, Denmark, Sweden, West Germany, Korea, Crete and the Republic of China. The next chapter describes the empirical basis for the MDS and CVES with descriptions of validation studies.