DOCUMENT RESUME

ED 394 242 EC 304 762

AUTHOR	Huebner, Ruth A.; And Others
TITLE	Wisconsin Sensorimotor Pointing Assessment. Description of Design: Administration Manual. Trace Reprint Series.
INSTITUTION	Wisconsin Univ., Madison. Trace Center.
SPONS AGENCY	Dane County, Madison, WI. Dept. of Human Services.
PUB DATE	95
CONTRACT	70143
NOTE	30p.; For related documents, see EC 304 763-764.
AVAILABLE FROM	Trace Research and Development Center, University of Wisconsin, S-151 Waisman Center, 1500 Highland Avenue, Madison, WI 53705 ($7.50).
PUB TYPE	Guides - Non-Classroom Use (055) -- Tests/Evaluation Instruments (160)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Adults; *Augmentative and Alternative Communication; Children; Communication Aids (for Disabled); *Communication Disorders; Evaluation Methods; *Measures (Individuals); Mental Retardation; Multiple Disabilities; Physical Disabilities; Psychometrics; *Psychomotor Skills; Severe Disabilities; Test Reliability; Test Validity
IDENTIFIERS	*Pointing (Gesture); *Wisconsin Sensorimotor Pointing Assessment

ABSTRACT

This manual describes the Wisconsin Sensorimotor Pointing Assessment (WSPA) for individuals with severe communication deficits complicated by other cognitive or motor disabilities, and provides guidelines for its administration. The WSPA was designed to quantify four categories of sensory and motor abilities necessary for initiating and accurately executing finger-pointing to access alternative and augmentative communication aids. The four categories are: (1) abilities which are basic to normal movement patterns; (2) patterns of movement which are atypical; (3) behavioral responses to sensory input; and (4) observation of behavioral arousal level. The WSPA is a structured observational scale appropriate for use by occupational therapists or other skilled observers for individuals ages seven through adult. The manual provides information on the scale's rationale, background, development, reliability, validity, necessary materials, administration techniques, and scaling. It provides operational definitions, assessment criteria, and scoring guidelines for each of the four categories assessed. The assessment form itself is attached. (Contains 17 references.) (DB)

Trace Reprint Series

Wisconsin Sensorimotor Pointing Assessment Description of Design: Administration Manual

Ruth A. Huebner, Ph.D., OTR
Mary (Jamie) Klund, MS, OTR
Julie Gamradt, MS, CCC-SLP

1995

Trace Center

Trace R & D Center
on Communication, Control
and Computer Access
for Handicapped Individuals

S-151 Waisman Center
University of Wisconsin-Madison
1500 Highland Avenue
Madison, WI 53705
(608) 262-6966

Wisconsin Sensorimotor Pointing Assessment
Description of Design

Administration Manual

Ruth A. Huebner, Ph.D., OTR
Mary (Jamie) Klund, MS, OTR
Julie Gamradt, MS, CCC-SLP

Developed as a special project of
The Communication Development Program
and Dane County Human Services Department
Trace Research and Development Center
Waisman Center
University of Wisconsin - Madison

Acknowledgments

Marcia Bastian, MS, OTR; Kenneth R. Thomas Ed.D.; Members of the Trace Center project; Occupational Therapists in the Autistic Study Group that reviewed earlier portions of this work and offered excellent suggestions for expanding and refining this assessment instrument.

Description

The *Wisconsin Sensorimotor Pointing Assessment* (WSPA) was designed to quantify four categories of sensory and motor abilities necessary for initiating and accurately executing finger-pointing to access alternative and augmentative communication (ACC) aids. The four categories are: (a) abilities which are basic to normal movement patterns, (b) patterns of movement which are atypical, (c) behavioral responses to sensory input, and (d) observation of behavioral arousal level.

This assessment instrument is a structured observational scale designed for individuals with severe communication deficits complicated by other cognitive or motor disabilities. The WSPA would be appropriate for ages 7 years through adult. It is recommended for use by occupational therapists or others who are skilled in observing and quantifying sensory and motor performance.

Rationale

Some individuals who have severe communication impairments, for example, people who have autism, have not learned to communicate effectively using augmentative communication systems, even when provided with the opportunity to use them. It is sometimes hypothesized that sensory and motor deficits explain why such individuals have not been able to effectively use augmentative communication aids.

An assessment tool was needed to document more accurately sensory and motor deficits which could impact on using augmentative communication aids. Such a tool would provide a means of identifying sensorimotor difficulties within assessment and also provide a method of tracking improvements as a part of an intervention program. A search through existing sensorimotor assessments revealed that there was no available instrument that specifically: (a) measured abilities common to using augmentative communication systems, (b) would be appropriate for persons with severe communication disorders, and (c) included a sufficiently detailed scaling to be sensitive to subtle changes within a client's ability. Consequently, the WSPA was developed and used in a special project conducted at the Trace Research and Development Center.

Background

Documentation of motor deficits found in individuals with severe communication disorders, such as seen in autism, is found in current literature (see Huebner, 1992 for a current review). For example, Jones and Prior (1985) found, in their study of 10 children (compared to a matched control group) with autistic disorder, that a significant number of 6-10 year olds were below preschool level in their ability to imitate postures and showed an average of four soft neurological signs, especially choreiform movements, balance disorders, poor thumb-finger opposition, and motor speech deficits. Other studies (e.g. Bauman & Kemper, 1988; Courchesne, Hesselink, Jernigan, & Yeung-Courchesne, 1987; Holroyd, Reiss, & Bryan, 1991; Kohen-Raz, Volkmar, & Cohen, 1992) have demonstrated cerebellar abnormalities with resultant hypotonia; ataxia, poor balance; auditory hypersensitivity; and motor speech deficits (prosody) with hesitant, stammering, or an explosive speech. Irregularities in frontal and parietal lobe interaction have been described

by Horwitz, Rumsey, Grady, & Rapoport (1988) which suggest deficits in integrating the sensory and motor components of attention, planning, and sequencing of skilled actions.

Additional support for the premise that deficient motor skills contribute to an "output" impairment in the use of augmentative communication, gestural communication, and speech comes from neuropsychological research. For example, there is evidence that when bilateral damage to M2 (supplementary motor cortex - ventral to precentral gyrus on medial surface of the cerebrum) occurs, severe deficits in both initiation of movement (akinesia) and speech (mutism) result (Graham, 1990). Basal ganglia disorder has also been implicated as influencing both motor and emotional behavior (Rogers, 1990); basal ganglia may serve as neurological centers which control central pattern generators to initiate and plan whole sequences of motor output (Graham, 1990).

Description of the Scale

The *Wisconsin Sensorimotor Pointing Assessment* (WSPA) focuses on assessment of four aspects of sensory and motor performance: (a) abilities which are basic to normal movement patterns, (b) patterns of movement which are atypical, c) behavioral responses to sensory input, and (d) observation of behavioral arousal level. The WSPA was designed to identify sensory and motor deficits potentially preventing the successful use of an augmentative communication aid. Identification of skill deficits could then guide the development of appropriate intervention strategies. In addition, the WSPA was designed to provide a measurement of sensorimotor function which might be sensitive to changes that may occur in conjunction with an intervention program. Consequently, the assessment items measure the specific motor components necessary for initiating and accurately executing finger pointing, since accurate self-initiated finger pointing is needed to use most common augmentative communication aids.

Sensory sensitivity and arousal level are considered by many rehabilitation professionals to be integrally linked with both functional ability and motoric output. Consequently, this sensorimotor assessment includes measures of motor and sensory abilities, and arousal level.

Development of the WSPA

The WSPA is intended to provide useful information in a variety of assessment and therapeutic contexts. The WSPA is designed to document and describe sensorimotor abilities as they relate to accessing an augmentative communication display through hand pointing. This assessment would be useful in situations where deficits in sensorimotor skills are thought to be impacting on an individual's ability to use an augmentative communication aid. In addition, within an intervention program, it would provide documentation pertaining to changes in sensorimotor skills.

Hypotheses that guided the development of this sensorimotor motor evaluation included: (a) That neurological deficits are observable in motor and sensory performance; thus, the presence of significant delays or abnormal motor or sensory responses may be indicative of underlying neurological disorder, (b) That some persons may have underlying neurological deficits as seen in sensorimotor deficiency, which mask their ability to express their understanding and interact with others in typical ways, (c) That appropriate sensorimotor interventions may assist individuals by

enhancing normal movements and (d) That changes in sensorimotor performance can be documented through appropriate assessment.

Assessment items were developed through several processes. The test items were selected based on an analysis of the multiple components necessary to sustain the body position and visual attention necessary to push keys on a keyboard. An initial draft of potential items was developed by the first author, incorporating or modifying test items from diverse disciplines including neuropsychology, neurology, pediatrics, and occupational therapy. Several new items were developed for this assessment. This initial draft was reviewed by two experts in the field of communicative disorders who offered suggestions which were incorporated into a second major draft. This second draft was tested by several occupational therapist and shared with educators and members of the project support team who offered additional input for a third draft. This third draft was critically reviewed and operational definitions were refined by the first and second authors; scaling was also expanded to improve sensitivity to change.

Reliability and Validity

A test of interrater reliability was performed by the first and second author independently scoring clients (N=5) while the first author administered the assessment. Interrater reliability ranged from .75 to .86 with an average of .79. Differences in rating were discussed by the two raters, and a clarification of definitions and criteria were made based on this discussion. This version of the WSPA reflects the changes, such as more specific definitions and a broader range in the scaling, that were made to improve interrater reliability. See Huebner, Gamradt, and Klund (1995) for a more detailed discussion of the instrument development, including a description of the clients who participated in the reliability and validity testing.

A test of criterion validity (agreement between 2 measures) was performed. Three project staff who had worked closely with clients (N=7) for six months, but who were unaware of the client's ratings on the WSPA, completed the criterion validity testing. These three professionals independently rank-ordered the seven clients based on their clinical estimation of each client's sensory and motor impairments. The three ranks for each client were averaged across raters; the resultant rank ordering was compared to the rank-order based on the total WSPA score. Except for one client, the rank ordering of clients by staff was identical to the rank order achieved when using the WSPA, placing the rater/assessment agreement at .85. Thus the WSPA was able to rank order the client's sensory and motor deficits to match the clinical "hunches" that other staff held.

Materials and Techniques

Many of the observations made on the WSPA should be made by professionals skilled in observing sensory and motor performance. This instrument would most reliably and accurately be used by occupational or physical therapists. It is recommended that two therapists work together to learn the assessment and clarify the rating scale.

Those who have severe communication disorders may have varying communication abilities, behavioral and emotional problems, and a wide range of sensory and motor abilities. Given these

observations, standardized assessment procedures were deemed less important than observing and scoring precisely defined sensory and motor abilities. The approach and philosophy of assessment which is employed in the WSPA reflects the conceptualization of Caplan (1987). Caplan asserts that persons with severe disabilities are difficult to assess using standardized commands; to elicit the best performance of an individual, he recommends flexible test procedures. Using this framework, the WSPA includes a: (a) detailed scoring criteria, (b) operational definitions for each assessment item, (c) suggestions for eliciting the desired response, (d) flexible order of test administration, and (e) ability to retest an item.

Early administrations of the WSPA at the Trace Center were videotaped so that post-assessment scoring could also be performed, and qualitative observations could be made. Observation of videotapes may be helpful to make post-assessment observations of hand preference, visual tracking and visual attention, evidence of primitive reflexes, athetosis or chorea, tremor, associated movements, initiation of movement, speech and quality of movement, purposeful movement, drooling, facial expression, speech prosody, sensory sensitivity, and arousal. Videotaping of clients during eating was also used to augment the assessment and provided useful observations of oral motor skills, especially for clients who had drooling, oral dyskinesia, or upper extremity coordination difficulties.

Some assessment procedures require physical contact with the individual; these tasks include: (a) elicitation of visual tracking, (b) handling of the upper body to measure muscle tone, strength and cocontraction, (c) measuring significant limitations in range of motion with a goniometer, (d) taking dynamometer readings of hand grasp, (e) lifting a 2.5 pound weight over the head for 15 seconds, and (f) checking for influence of primitive reflexes through head and arm posturing. For some tasks, the individual should sit on a stool, unsupported but with feet on the floor, for a least five minutes; in addition, balance on the stool will be gently challenged by the evaluator. It will be crucial that the examiner carefully protect the individual from falling during this balance assessment.

Several pointing assessment tasks can be utilized to determine if the individual is able to isolate and initiate finger pointing and accurately point. These items can also determine how large of an area the individual can point to. For these assessment tasks, a standard touch tone speaker phone, a dice cup, and a variety of augmentative communication devices or other touch activated electronic devices are needed.

In an effort to clarify typical sensorimotor capabilities, some items could be queried of the caregiver if there is inconsistent observation. Items such as best sitting posture, hand preference, interference of abnormalities of motor behavior, sensory responses, and information on whether or not the test performance reflects the individual's typical performance would be appropriate questions on which to seek additional caregiver input.

The sensory assessment portion is generally completed as the assessment progresses. Since the individual will be handled during the assessment, response to touch pressure and proprioception is observed and rated. Light touch can be delivered by a puff of air to the cheek, arm, and hand, and ringing a bell during the assessment may elicit auditory startle. The individual's response to the room lighting and a flashlight can be observed. In addition, a gauge of arousal level based on observation of autonomic nervous system responses is made at three intervals throughout the evaluation since arousal is likely to change with the interaction inherent in assessment.

Scaling

On all scales, the indication of 0 equals normal performance. High scores either positive or negative are indicative of impairment; for some items normal performance falls on a continuum with hyper- or hypo- responsiveness outside of normal responsiveness. Criteria for scoring each scale are included in the assessment design. Four summary scores are also calculated, one for abilities basic to motor development, one for abnormalities in motor performance, one for the sensory and arousal scale, and a total summary score for the entire assessment are calculated. To calculate the summary scores, the valence (positive or negative signs) are disregarded and the totals are derived from summing the absolute value of numbers, thus the higher the number the more motor or sensory deficits are noted. Data can be analyzed for each assessment item, for subsection scales, and for the total assessment score.

Copyrights

Operational Definitions and Assessment Criteria

Abilities Basic to Normal Movement

Hand Preference: Since hand dominance is difficult to discern in those with neurological deficits for a variety of reasons (e.g. client is left handed because their right hand has paralysis), hand preference is assessed. Hand preference is defined as the hand used most often (more than 75% of the time) for unilateral tasks such as eating, combing hair, or reaching for single objects. It can be observed during assessment; if hand dominance is within a borderline range the caregiver should be queried about what hand the client uses for eating, combing hair, picking up small items.

Scoring:

0 = Established hand preference - used 75% or more of time
1 = Emerging, a hand used more than 60% but not 75% of time
2 = Mixed hand preference

Visual Tracking: An object of interest to the individual, for example a favorite item, should be used; for reliable testing visual attention must be engaged. The object should be passed 12 to 15 inches in an arc in front of the individual's face at rate of 2 seconds per pass and moved in horizontal, vertical, and diagonal directions. Right/left differences, such as inadequate tracking of one eye or deviations, should be observed and documented.

Scoring:

0 = smooth visual tracking
1 = slight difficulty
2 = tracking through an arch from midline to periphery
3 = intermittent but observable tracking for brief period
4 = eye contact with object without visual tracking
5 = no eye contact or visual tracking

Eye contact is quantified on two parameters related to centrality of eye contact and duration of eye contact. Separate observations of eye contact with people and objects are made. Criteria for centrality are: central or direct middle focus (0); occasional (1 or 2 times during evaluation) but typically peripheral (1); peripheral or eye contact with part of eye except pupil (2) or absent (3). Criteria for duration are: sustained (30 seconds or more) as typical response (0); sustained for 30 seconds or more 1 time during the evaluation (1); fleeting (less than 30 seconds) (2), or absent (3). Typical position of the eyes during fine motor tasks should be described.

Muscle Tone: A measurement of muscle tone with appropriate norms is described by Dunn (1981) and modified here. With the shoulders flexed to 90 degrees and the forearm supinated (hand up), the examiner pushes against the palm while extending the elbow. Elbow extension typically is measured with 0 degrees being normal extension. For this item, the elbow with the most alteration in available motion should be used; however, a check for previous injury (such as

arm fracture) should be made with the caregiver before rating the individual. Sometimes high muscle tone is thought to exist since the person "feels tight" when they are moved. This may not be increased muscle tone, but perhaps tension or resistance to movement; it will be important to differentiate this and note this tendency.

Scoring on a low to high tone continuum:

- 2 = 20 or more degrees of hyperextension
- 1 = 10 degrees of hyperextension
  0 = None of the other conditions
+ 1 = 10 degrees of limitation of motion (LOM) of flexion
+ 2 = 20 degrees of limitation of motion (LOM) of flexion

Other observations may include range of motion differences at the wrist and fingers (Hertzig, 1982) with hyperextension being indicative of low tone and limited motion indicative of high tone.

Upper extremity range of motion: A functional range of motion evaluation is performed as described by Pedretti and Zoltan (1990). This procedure involves passively moving the individual's upper extremities through a normal range of motion.

Scoring should be made if limitations of motion, which cannot be explained by the presence of a pre-existing injury such as a wrist fracture, occur at any joint in either upper extremity:

0 = normal
1 = mild limitations of 10-20 degrees of motion
2 = limitations of 20-35 degrees
3 = limitations of more than 35 degrees

Evaluation of normal and mild limitation in range of motion should be made through estimation, but goniometric measurements should determine the extent of limitations if any. If significant limitations of motion exist in several joints, a complete range of motion evaluation should be performed to clarify the extent of contracture.

Hand Grasp Strength: Three strength measurements on each hand (with elbow flexed to 90 degrees and midrange forearm pronation - supination) should be taken using a bulb or Jamar dynamometer. The average of these measurements should be recorded.

Scoring:

0 = grip of 25 lbs or more
1 = grip of 20 - 24 lbs
2 = grip of 15 - 19 lbs
3 = grip of 10 - 14 lbs
4 = grip of 5 - 9 lbs
5 = grip 4 lbs or below

Endurance: A 15 second test of endurance, defined as the number of repetition of lifting a 2.5 lb wrist weight over the head (must have hand clear the top of the head) with preferred or offered hand is used.

Scoring:

0 = 5 lifts
1 = 4 lifts
2 = 3 lifts
3 = 2 lifts
4 = 1 lift
5 = 0 lifts

Proximal Stability: Sitting balance and neck and shoulder-girdle cocontraction ability should be measured.

Sitting balance upright should be tested using a stool. While doing other tests, the individual should sit in a stool for a least 5 minutes.

Scoring:

0 = head over pelvis or slightly slumped postured
1 = maintains upright posture for 3 minutes then begins to slump or hold head up
2 = marked slumping or holding up head with hand/s
3 = unable to maintain, or showing distressed, or dismounts due to stress

Sitting balance challenged should be tested while the client sits on the stool with his or her feet flat on the floor. Encourage the individual to avoid holding on with his/her hands or legs. The evaluator should attempt to gently push the individual (2 times in each direction - total of 8 challenges) side to side and forward and backward with enough force to challenge balance, but not push the individual off the stool.

Scoring:

0 = maintains balance on all but one trial
1 = maintains balance on at least 75% (6 pushes) of trials
2 = maintains balance on at least 50% (4 pushes) of trials
3 = loss of balance or holding on more than 50 % of trials
4 = consistent loss of balance, distress, or dismounts

Cocontraction is the ability to contract both agonist and antagonist muscle groups to provide stability at a joint. It is tested at the neck and shoulder girdle. To test neck cocontraction, the examiner applies a gentle downward pressure on the top of the head with a line of force parallel to the neck; this pressure usually results in neck and head alignment. While continuing to apply this gentle downward pressure, the examiner instructs the individual to "hold steady", and attempts to move the head forward and backward with gentle to firmer pressure to match the individual's ability. Five repetitions in each of four directions are performed (forward/backward, and side to side). The shoulders are tested by holding the individual's hands while the shoulder is flexed to 45

degrees and the elbows flexed to 90 degrees. The examiner holds over the individual's wrist, and instructs the individual to "hold steady" and then pushes and pulls alternatively for five trials. The individual must be actively holding and this item may need to be retested to get an accurate count. Scoring equals the number (0 - 5) of unsuccessful holds.

Wall push-offs and Scapular winging: The individual is asked to stand with his feet 18 inches from the wall, leaning into the wall with hands on either side of the head, palms parallel to the chin. The individual is shown how to and encouraged as needed to perform wall push-offs (modified push-ups). Observation of wall-push offs and scapular winging are made.

Scoring:

0 = 4 push-offs in 15 seconds, little scapular winging
1 = 2-3 push-offs and/or raised medial border of scapula
2 = Does push-off but able to clearly palpate under the medial border of the scapula
3 = No push-offs, able to palpate under the medial border of the scapula
4 = extreme scapular winging or unable to support weight

Isolation of index or middle finger pointing: Several pointing assessment tasks can be utilized to determine if the individual is able to isolate finger pointing with the index or middle finger, initiate pointing to a target, and accurately point. These items will also determine how large of an area the individual can point to. Some specific tasks that could be used are: (a) use of a standard touch tone speaker phone, (b) use of an augmentative communication device or other touch activated electronic device or, (c) other tasks such as emptying and refilling a dice cup or picking up small finger foods can be used to assess finger dexterity, if isolation of finger pointing is not achieved. Although this task was not used for the Trace Center project, for younger children isolation of finger pointing could be motivated by sprinkling chocolate or other edible sprinkles over the table, demonstrate how these can be picked up with just index finger touch pressure, and encourage the individual to eat the sprinkles (Chocolate Sprinkles Test). Several opportunities to attempt these tasks should given as necessary at different points in the evaluation.

Score all items that apply to the individual:

0 = independent and consistent index finger pointing
1 = inconsistent pointing
1 = points with several fingers
1 = pointing with ring or little finger
1 = abnormal posture of fingers
1 = able to point briefly when assisted into pattern
1 = hyperextension at PIP joint when pointing
1 = finger joint instability; DIP or PIP collapse when pushing down
1 = pincer grasp only, no other pointing
2 = unable to point index finger, needs total assistance

This score is the sum of all the observations above. For example, if an individual is inconsistent in pointing, points with abnormal posture of the fingers and hyperextension of the PIP joint, this individual would receive a total score of 3.

The wrist position that is typically seen during pointing or reaching attempts should be noted.

Scoring:

0 = neutral or slight flexion or extension of wrist
1 = excessive extension (more than 45 degrees) of wrist
2 = excessive flexion (more than 10 degrees) of wrist

Target Area: Scored as no limitation if the individual is able to reach or point anywhere within arm length. If limited, the approximate target area should be measured on the basis of data obtained during the various pointing assessments. This should equal the table top area that represents the individual's maximum reaching capabilities, expressed in square inches.

Pointing Accuracy: During the various pointing assessments, a sample of 5 sequential attempts during the individual's best performance should be used to calculate pointing accuracy. Pointing accuracy is defined as hitting the target directly without faltering, missing, hesitating, or other variations. The individual must be trying to hit a specific target such as the green dots or specific letters on the keyboard.

Scoring:

0 = accurate pointing on all 5 attempts
1 = accurate pointing on 4 attempts
2 = accurate pointing and 3 attempts
3 = accurate pointing on 2 attempts
4 = accurate pointing on 1 attempt.
5 = absence of pointing accuracy
NA = not scorable due to absent pointing ability

If isolation of index or middle finger pointing is observed, the Trace **Green Dot Test** can be administered as a refined test of pointing accuracy. The client is asked to hit each of six green dots placed on six keys (four corners - not function keys - and upper and lower middle key) of a standard computer keyboard, one at a time and in any order. The client continues to strike keys for 15 seconds and the number of correct hits in that time period should be recorded. The test should be repeated once and the highest number of hits on one test procedure should be recorded.

Summary Score: The results of all of the abilities basic to normal movements which are assessed in Part I are summed. The positive or negative signs of the scores are ignored; only the absolute values added. The higher the number, the more restrictions in normal motor abilities were noted.

Abnormalities in Movement

Evidence of influence of primitive reflex patterns: The asymmetrical tonic neck reflex (ATNR) is elicited by changes in head position. If present, head rotation to either side will result in some flexion of the arm on the skull side with extension of the arm on the face side. The symmetrical tonic neck reflex (STNR) is elicited by flexion or extension of the neck. Flexion of the neck would result in flexion of both upper extremities, while extension of the head would

result in extension of both upper extremities. Extensor thrust refers to a pattern of total body extension that can be elicited in several ways. The extensor thrust reflex can be seen when applying pressure to the back of the head; if present neck, upper body, sometimes trunk, hip and leg extension can be observed. It is exceedingly rare to find any of these reflexes present in a full blown form; this severity of interference by primitive reflexes is usually associated with severe motor disorders such as cerebral palsy. In this assessment, the individual should be asked and assisted if necessary to extend both arm forward to 90 degrees of flexion at the shoulder with extended elbows; then the head should be rotated to the right, left, flexed, extended, and pressure applied to the back of the head. Observations of joint changes should be made. Observation of these reflexes can also be made during functional activities and can be observed during review of the videotape.

Scoring:

0 = no evidence of primitive reflex
1 = probable observation of primitive reflex interference
2 = definite evidence of changes in range of motion or muscle tone during test postures or functional tasks

Involuntary Movements (Athetosis, Chorea, or Dyskinesia): These movement disorders are all involuntary movements. *Athetosis* refers to a slow, sinuous, writhing movements that occur most frequently in the hands. *Chorea* refers to a variety of jerky movements which may appear to be well coordinated but are involuntary and purposeless. *Dyskinesia* refers to slow persistent movements that may occur around the mouth and tongue (Kolb & Whishaw, 1990). No attempt should be made to differentiate these three movement disorders for this assessment. Observation of movement during assessment and functional tasks both in-vivo and on videotape should be used for rating.

Scoring:

0 = no evidence of involuntary movement
1 = probable observation of involuntary movement
2 = definite evidence of involuntary movement

Tremor: Two types of tremor can be observed. *Intention tremor* is an oscillation of the hand that increases as the hand nears the target of an arm movement. The movement usually is initiated adequately, but the smaller the target or more precise the movement the greater the tremor (Graham, 1990). Intention tremors are often associated with overshooting the target. *Resting tremor* is oscillation of the hands that diminishes during voluntary hand movement. Both types of tremor are observed during the assessment especially during functional tasks such as pointing accurately. The type of tremor and hand affected should be noted.

Scoring of severity of tremor:

0 = no evidence of tremor
1 = occasional observation of tremor
2 = definite evidence of tremor

Associated Movements or Synkinesis: This refers to movements of an uninvolved body part which are associated with effort laden movements. Associated movements proceed caudo-cranially so that hand movements elicit tongue synkinesis, but tongue movement does not elicit hand synkinesis (Levine, 1987). Movements can also be contralateral where movements of one extremity result in associated or overflow movements in the other extremity. Observed during assessment in oral musculature or in the hands, rated when noted.

Scoring:

0 = no evidence of synkinesis
1 = synkinesis on 1 - 2 tasks
2 = synkinesis on 25% - 50% of tasks
3 = synkinesis on more than 50 % of tasks

Initiation of Movement: *Akinesia* refers to an absence of spontaneous movement (Kolb & Whishaw, 1990). Persons with akinesia may need verbal or gestural prompts to initiate a task, but rarely initiate without prompts. *Impulsivity* refers to initiating of a task before the task demands are understood or when inappropriate. Examples of impulsive behavior might be blurting out responses or beginning a task without understanding. Akinesia and impulsivity are both viewed as a deficits in inhibition or initiation. A normal response would be to initiate a task as soon as the task demands are clear; akinesia is observed if multiple prompts or assists are necessary to begin a task that is within the individuals capability.

Scoring:

+ 2 = Impulsivity that consistently interferes with assessment
+ 1 = Occasional impulsive responses
0 = normal initiation of movement.
- 1 = occasional need for prompts
- 2 = consistent evidence of akinesia that interferes with assessment

Speed of Movement and Initiation: *Bradykinesia* refers to slow and deliberate movements in response to task. There is evidence that bradykinesia may be related to slow reaction time rather than slowness in the movement itself (Graham, 1990). *Hyperkinesia* refers to excessive movement which may appear purposeless and can be difficult to distinguish if it is involuntary or voluntary. Hyperkinetic movement may be described restlessness or other behaviors that might look impulsive such as poking at the examiner or grabbing test materials.

Scoring:

+ 2 = hyperkinisea that consistently interferes with assessment
+ 1 = hyperkinisea observed occasionally
0 = normal speed of movement.
- 1 = slow speed observed occasionally
- 2 = consistent evidence of bradykinesia that interferes with assessment

Purposeful Movement: This item refers to the apparent goal directiveness of movement. Activity can be purposeful or seemingly random. This item requires some judgment on the part of

the examiner. For example, self-stimulating movement such as head banging or twirling of objects would be considered as having no purpose, although there probably is a purpose or at least some internal reward. At the opposite end of the continuum would be responses that may be purposeful if performed once, but when repeated excessively they become perseverative. Responses for this item are observed and feedback from the caregiver regarding typical behavior is elicited.

Scoring:

+ 3 = severe perservation which markedly interferes with assessment
+ 2 = moderate perservation which can interfere, but is not obligatory
+ 1 = perservative actions observed which can be redirected toward a goal
0 = normal responses
- 1 = purposeless motion observed which can be redirected toward a goal
- 2 = moderate self stimulation which can interfere but is not obligatory
- 3 = severe self stimulation which markedly interferes with assessment

Fine Motor Apraxia or Dyspraxia: Apraxia is generally used to describe missing or inappropriate actions that cannot be explained by impairment of strength, mobility, sensation, or coordination. There is great confusion in the literature regarding the types of apraxia with many types being described such as ideomotor or ideational, but little common agreement on the definition of such terms (Kolb & Whishaw, 1990). Underlying any definition of apraxia (inability to motor plan), or dyspraxia (deficit capacity to motor plan) is the assumption that the person has the elementary sensory and motor functions necessary for performance, but is unable because of motor planning deficits. Duffy and Duffy (1990) describe 3 parameters to consider when assessing limb apraxia. The first parameter is object or no object which means an object is available for handling or the task is demonstrated without props. The second parameter is simple versus complex, with simple tasks having 3 or fewer components and complex tasks having 4 to 6 components. Lastly, segmented where one step is imitated at a time, or sequenced where the task is completed all at once. Thus the continuum of fine motor praxis would span tasks from combing hair when given a comb and shown how to use it to the activities of a mime who might demonstrate how to build a house without props. It is assumed that most adults could demonstrate a 4-6 part task without props. The simple scale developed for this instrument reflects a few of the critical steps that are suggested by Duffy and Duffy (1990), and the task demands are ranked from simple to complex. Scoring (see assessment form) equals the highest level of task demands that the person is able to accomplish. Do not score on speed of performance, but on level of highest mastery. A touch tone phone and 5 dice in a cup are used for this evaluation.

Drooling: The presence of drooling may reflect poor oral motor or sensory control, or may reflect overall low muscle tone.

Scoring:

0 = no drooling noted
1 = drooling noted 1-3 times or consistent wet lips
2 = drooling on less than 50 % of tasks
3 = drooling on 50% or more, but not all tasks
4 = drooling during the entire evaluation

Facial Expression: The amount of movement or animation in the face may be reflective of overall motor abilities, but flat faces may also be associated with mood disorders. It will be important to observe facial expression carefully, since the complexity of facial musculature and its assumed reflection of mood, may be indicative of disorders or sensitive to changes.

Scoring:

+ 2 = obvious and prominent facial grimacing
+ 1 = some tending to have a distorted facial expression
0 = normal animation consistent with situation context
- 1 = some tendency to have a flat facial expression
- 2 = obvious and prominent flat facial expression

Speech Prosody: Prosody refers to the loudness and pitch of language or vocalizations. *Aprosody* refers to lack of variation in loudness or pitch. *Hyperprosody* refers to exaggerated variations, very high pitch, or excessive loudness (Graham, 1990). Observe throughout evaluation during language or vocalizations.

Scoring:

+ 2 = obvious or prominent hyperprosody
+ 1 = some tendency toward exaggerated prosody
0 = normal voice pitch, loudness, and variation in tone
- 1 = some tendency toward discussed prosody
- 2 = obvious and prominent aprosody

Summary Score: The total of all the scores on abnormalities of movement (Part I) is obtained by summing the absolute value of scores, while disregarding the valance of scores. The higher the score, the more abnormalities of movement were observed.

Sensory Assessment

This section includes two assessments, one of overall arousal level, and the second of responses to sensory stimuli. Sensory stimulation with a flashlight, puff of air, and bell are administered. The individual should be told of the impending sensory stimuli except for the bell ringing. After the bell is rung, the stimuli should be shown to and explained to the individual. ** Items on the assessment form are cues to remind the examiner to score these items.

Arousal Level: Before any assessment is initiated, about half way through the assessment, and at the end of the assessment a rating of arousal should be made. Low levels of arousal can be observed by sleepiness, constricted pupils, passivity, and low levels of motion. Higher levels of arousal can be observed with sweating, pupils dilated, fight/flight patterns, and agitation. The arousal score is added using the absolute numeric values. An individual's arousal level may be labile: changing rapidly within the assessment period. This ability should be noted and described.

Auditory: Twice during the evaluation, after several items have been administered and before the last several items, a standard hand held bell should be rung outside of the individual's visual field. Additional observation of responses to auditory information can be made through the assessment. Observation of excessive startle reactions, crying or protesting or covering the ears may be indicative of hyper-responsiveness. The individual should be shown the bell and reassured immediately following the bell ringing.

Scoring:

+ 2 = marked startle response or protest
+ 1 = possible startle response or discomfort
0 = normal response, recognizes and may look toward sound
- 1 = very little response
- 2 = marked lack of response to bell or other loud noises

Visual: Observation of the individual's response to the room lighting. Twice during the evaluation a flashlight should be shined into the eyes. This will normally cause brief discomfort; this assessment should be performed midway and at the end of the assessment. Some behaviors suggestive of hypersensitivity to light include squinting, pulling a hat over eyes, or covering eyes to block normal lighting.

Scoring:

+ 2 = marked discomfort to normal light or to the flashlight
+ 1 = some discomfort to normal lighting/more discomfort to the flashlight
0 = no discomfort or signs of hypersensitivity to normal light, quickly adjusts to flashlight
- 1 = no discomfort at all to flashlight
- 2 = markedly unresponsive to visual stimuli and no response to flashlight

Light Touch: Observation of the individual's response to a puff of air, produced by a air cleaner designed for phonographic records, is applied to the face, hand, or arm at several interviews during the evaluation. Signs of discomfort may include crying or protesting, rubbing the site of stimulation, pulling the body part away. increased arousal as the evaluation progresses, or trying to flee the situation.

Scoring:

+ 2 = marked discomfort to stimuli
+ 1 = some occasional or moderate discomfort
0 = normal response, recognition but not discomfort
- 1 = no response
- 2 = marked and obvious limitation in responsiveness to any light touch

Touch Pressure/Proprioception: During the handling portion of the evaluation, and during any other tasks where movement is imposed on the individual by another person, responses to pressure and proprioception can be observed. Responses suggestive of hypersensitivity include pulling arm or body part away, getting up and leaving the situation, protesting, increased arousal

as the evaluation progresses, or aggressiveness. Responses suggestive of hyposensitivity include continued limp arm posture, or no response.

Scoring:

+ 2 = marked hypersensitivity
+ 1 = occasional responses which suggest hypersensitivity
0 = normal, recognition without discomfort
- 1 = somewhat limp and unresponsive or seeks additional stimuli
- 2 = no response to any movement throughout the evaluation, or may protest when stimulation stops

Summary Scores: The total score is added without including the positive or negative signs. The higher the number, the more abnormal the sensory responses to stimuli. If responses are consistently positive or negative, the numeric valence should be indicated. Mixed patterns of responses should also be indicated. Labile responses which change rapidly from hyper to hypo sensitivity should be noted.

Total Assessment Score: The sum of all three summary scores should be calculated. Lower scores are indicative of more normal performance; conversely, higher scores are associated with more sensorimotor abnormalities.

WISCONSIN SENSORIMOTOR POINTING ASSESSMENT

Name: _____

Summary Scores:

Part I:	_____	Delays in normal
Part II:	_____	Abnormalities
Part III:	_____	Sensory/Arousal
	_____	**Total Assessment Score** (add Part I-III)

Date of Birth: _____ Age: _____ Date of Assessment:

Place of Assessment: _____

Evaluator: _____

Medical Diagnosis/es:

_____

_____

Psychiatric Diagnosis:

Axis I: _____

Axis II: _____

Other Axis: _____

Current Medications: _____

_____

Behavioral Observations During Assessment: (Note attention, affect, eye contact, cooperation, etc.)

_____

_____

_____

WISCONSIN SENSORIMOTOR POINTING ASSESSMENT
Part I
Abilities Basic to Normal Movement

** Rate arousal scale

Hand Preference: 0 = Established (75%): Right Left
1 = Emerging >60%<75%): Right Left
2 = Mixed: Describe:

Score_____

Note: Have client sit on a stool and stay on that stool for at least 5 minutes through the evaluation for rating sitting balance etc.

Visual Tracking:

Horizontal: **0** **1** **2** **3** **4** **5**

Vertical: **0** **1** **2** **3** **4** **5**

Diagonal: **0** **1** **2** **3** **4** **5**
smooth unable

R/L Differences: (If significantly different, score each eye separately):

Eye Contact with people:

Central **0** Occassional **1** Peripheral **2** Absent **3**

Sustained **0** Fleeting **1** Absent **2**
(>= 30 sec) (< 30 sec)

Eye Contact with objects:

Central **0** Occassional **1** Peripheral **2** Absent **3**

Sustained **0** Fleeting **1** Absent **2**
(>= 30 sec) (< 30 sec)

Typical Position of Eyes during fine motor tasks:

Total Score _____

** Apply light touch stimuli and note reaction

Muscle Tone: **-2** **-1** **0** **+1** **+2**
20° hyper 10° hyper 10° LOM 20° LOM

Tendency to fix or hold a position; a more spontaneous perhaps emotional response: **yes no**

Describe observations: Score_____

** Ring Bell and note reaction

Upper Extremity Range of Motion:

Describe limitations of motion:

Passive: **0**	**1**	**2**	**3**	Score_____
normal	10-20°	21-35°	>35°	

Hand Grasp Strength: bulb dynamometer

Based on the average of three tests:

R:	**0**	**1**	**2**	**3**	**4**	**5**
L:	**0**	**1**	**2**	**3**	**4**	**5**
	25 lb	20-24	15-19	10-14	5-9	<5lbs

Total Score_____

Endurance: # of repetitions in 15 secs. - lifting 2.5 lb. weight over head:

R:	**0**	**1**	**2**	**3**	**4**	**5**
L:	**0**	**1**	**2**	**3**	**4**	**5**
# of lifts	5	4	3	2	1	0

Total Score_____

** Ring Bell and note reaction

Proximal Stability: Neck, Trunk, Shoulder-Girdle Stability

Sitting Balance: 5 minutes on stool, then challenged 8x's

Upright:	**0**	**1**	**2**	**3**	
	upright			dismounts	
Challenged:	**0**	**1**	**2**	**3**	**4**
	7 of 8	5-6	4	1-3	unable

Cocontraction:

Neck: **0 1 2 3 4 5**

Shoulder Girdle: **0 1 2 3 4 5**
# of unsuccessful holds

Wall Push-Offs or Scapular Winging:

0 1 2 3 4 Total Score_____

** Rate arousal level
** Flashlight stimuli and note response

Isolation of index finger pointing: Score all appropriate "1" observations.

0 = independent and consistent index finger pointing
1 = inconsistent pointing
1 = points with several fingers
1 = pointing with ring or little finger
1 = abnormal posture of fingers
1 = able to point briefly when assisted into pattern
1 = hyperextension at PIP joint when pointing
1 = finger joint instability; PIP or DIP collapses when pushing down.
1 = pincer grasp only, no other pointing
2 = unable to point

Wrist Position: Neutral **0** Extension **1** Flexion **2**
Total Score (add all points)_____

Target Area: Area (measured) in which arm placement is demonstrated.
No limitation If limited Square inches_____

Pointing Accuracy: Scored on 5 attempts during pointing tasks:

0 = accurate pointing on all five attempts
1 = accurate pointing on 4 attempts
2 = accurate pointing and 3 attempts
3 = accurate pointing on 2 attempts
1 = accurate pointing on 1 attempts
5 = absent pointing

Score_____

Green Dot Test Score: (*score not recorded in summary)* Unable_____(#/15 secs)

Summary Score Part I _____

** Apply light touch stimuli and note reaction

Part II
Abnormalities in Movement

Evidence of influence of primitive reflex patterns:

ATNR:	**0**	**1**	**2**	
STNR	**0**	**1**	**2**	
Extensor Thrust:	**0**	**1**	**2**	Total Score_____

Involuntary Movements:

Oral:	**0**	**1**	**2**	
Fingers:	**0**	**1**	**2**	
Upper Extremity:	**0**	**1**	**2**	Total Score_____

Tremor:

Intention:	**R L**	Severity:	**0**	**1**	**2**	
Resting:	**R L**	Severity:	**0**	**1**	**2**	Total Score_____

Associated Movements or Synkinesis:

Oral Musculature:

0 = no evidence of synkinesis
1 = synkinesis on 1 - 2 tasks
2 = synkinesis on 50% of tasks
3 = synkinesis on more than 50 % of tasks

Fingers:

0 = no evidence of synkinesis
1 = synkinesis on 1 - 2 tasks
2 = synkinesis on 50% of tasks
3 = synkinesis on more than 50 % of tasks Total Score_____

Initiation of Movement:

-2	**-1**	**0**	**+1**	**+2**
Akinesia		Normal		Impulsive

Score_____

Speed of Movement or Initiation:

-2	**-1**	**0**	**+1**	**+2**
Bradykinesia		Normal		Hyperkinesia

Score_____

Purposeful Movement:

-3	-2	-1	0	+1	+2	+3
Self-stimulation			Normal			Perseveration

Score_____

Fine Motor Apraxia or Dyspraxia: (begin with first task and progress up the scale)

With Objects/Simple/Segmented: **5** (comb hair - give comb - can demonstrate)
Without objects/Simple/Segmented: **4** (show me how you drink? - ask)
With Objects/Simple/Sequenced: **3** (refill dice cup 1 at a time - demo then give to client)
With Objects/Complex/Segmented: **2** (dial 5 digits on phone - imitating one number at a time)
With Objects/Complex/Sequenced: **1** (dial 4 digit number from memory - after demo)
Without Objects/Complex/Sequenced: **0** (show me how you would put your shirt on? - ask)

Observations:

Total Score_____

** Rate arousal level
** Flashlight stimuli and note response

Drooling:

0 = no drooling noted
1 = drooling noted 1-3 times or consistent wet lips
2 = drooling on less than 50 % of tasks
3 = drooling on 50% or more, but not all tasks
4 = drooling during the entire evaluation

Score_____

Facial Expression:

-2	-1	0	+1	+2
Flat		Normal		Grimacing

Score_____

Speech Prosody:

-2	-1	0	+1	+2
Aprosody		Norm l		Hyperprosody

Score_____

Summary Score Part II _____

Part III
Sensory Assessment

Arousal Scale:

Initial:	-2	-1	0	+1	+2
Midway:	-2	-1	0	+1	+2
Final:	-2 pupils constricted sleepy/passive	-1	0 normal	+1	+2 sweating pupils dilated fight/flight

Arousal Total Score_____

Responses to Stimuli:

	Hypo-reactive		Normal	Hyper-reactive	
Auditory:	-2	-1	0	+1	+2
Visual:	-2	-1	0	+1	+2
Light Touch:	-2	-1	0	+1	+2
Touch Pressure/ Proprioception:	-2	-1	0	+1	+2

Other as salient: Taste, smell

Consistent Score: Positive Negative

Mixed Scores:

Labile Performance: yes Describe:

Sensory Stimuli Total Score: _____

Summary Score Part III_____

References

Bauman, M. L., & Kemper, T. L. (1988). Limbic and cerebellar abnormalities: Consistent findings in infantile autism. *Journal of Neuropathology and Experimental Neurology, 47*, 369.

Caplan, B. (1987). Neuropsychological assessment in rehabilitation. In B. Caplan (Ed.). Rehabilitation Psychology Desk Reference, (pp. 247-280). Rockville, MD: Aspen. Courchesne.

Courchesne, E., Hesselink, J. R., Jernigan, T. L., & Yeung-Courchesne, R. (1987). Abnormal neuroanatomy in a nonretarded person with autism: Unusual findings with magnetic resonance imaging. *Archives of Neurology, 44*, 335-341.

Duffy, J. R. & Duffy, R. J. (1990). The assessment of limb apraxia: The limb apraxia test. In G. R. Hammond, Cerebral control of speech and limb movements (pp. 503-531). North-Holland: Elsevier Science.

Dunn, W. (1981). A guide to testing clinical observations in kindergartners. Maryland: American Occupational Therapy Association.

Graham, R. B. (1990). Physiological psychology. Belmont, CA: Wadsworth.

Hertzig, M. E. (1982). Stability and change in nonfocal neurologic signs. *Journal of the American Academy of Child Psychiatry, 21*, 231-236.

Holroyd, S., Reiss, A. L., & Bryan, R. N. (1991). Autistic features in Joubert syndrome: A genetic disorder with agenesis of the cerebellar vermis. *Biological Psychiatry, 29*, 287-294.

Horwitz, B., Rumsey, J. M., Grady, C. L., & Rapoport, S. I. (1988). The cerebral metabolic landscape in autism. *Achieves of Neurology, 45*, 749-755.

Huebner, R. A. (1992). Autistic disorder: A neuropsychological enigma. *The American Journal of Occupational Therapy, 46* (6), 487-501.

Huebner, R.A., Gamradt, J., & Klund, M. (1995). *Wisconsin Sensorimotor Pointing Assessment: Initial Assessment.* Manuscript in review.

Jones, V. & Prior, M. (1985). Motor imitation abilities and neurological signs in autistic children. *Journal of Autism and Developmental Disorders, 15* (1), 37-46.

Kohen-Raz, R., Volkmar, F. R., & Cohen, D. J. (1992). Postural control in children with autism. *Journal of Autism and Developmental Disabilities, 22*, 419-432.

Kolb, B. & Whishaw, I. Q. (1990). Fundamental of human neuropsychology (3rd ed.). New York: W. H. Freeman.

Levine, M. D. (1987). Developmental Variation and learning disorders. Cambridge: Educators Publishing Service.

Pedretti, L. W. & Zoltan, B. (1990). Occupational Therapy practice skills for physical dysfunction. St Louis: C. V. Mosby.

Rogers, D. (1990). Psychiatric consequences of basal ganglia disease. *Seminars in Neurology, 10*, 262-267.

Partial funding for this work was provided under Contract # 70143 from the Dane County (Wisconsin) Department of Human Services.