Agenda

- Describe the BAYLEY scales.
- Demonstrate the administration and scoring of items.
- Explain how to use the tables in the manual to convert raw scores to standard scores.
- Discuss interpretation and use of BAYLEY-III results.

What is the Bayley?

- individually administered instrument
- assesses developmental functioning
  - infants & young children
  - between 1 month and 42 months of age
Primary Purposes of Bayley-III

- identify children with developmental delay
- provide information for intervention planning

Bayley-III Applications

- Well-suited for multidisciplinary and arena assessment teams
  - Cognitive, Language, and Motor Scales can be administered independently
- Assist practitioner in intervention planning
- Chart a child's progress after initiation of an intervention program

Involvement of parent/caregiver is advantageous
- facilitate testing
- provide parents further insight

Research tool
Who Uses the Bayley?

Professionals with different areas of specialization who are familiar with
- assessment procedures for young children
- basic measurement/assessment principles
- child development
For example, early interventionists, SLPs, OTs, PTs, Pediatric Nurse Practitioners, Psychologists

Five Distinct Scales

Five major areas of development
- Cognitive
- Communication
- Physical
- Social/Emotional
- Adaptive
Bayley-III Structure

Bayley Subtests
- Cognitive*
- Receptive Communication
- Expressive Communication
- Fine Motor
- Gross Motor
- Social-Emotional*

Bayley Composites
- Language
- Motor

* Composite score equivalents available

ABAS-II Structure

Bayley Subtests
- Communication
- Symmetrical Activities
- Self-Initiation
- Initiation
- Self
- Community Use
- Home Living
- Health and Safety
- Self-care
- More

Bayley Composites
- Social
- Practical

Cognitive Scale

The Cognitive Scale is comprised of 91 items that assess:
- Sensorimotor development
- Exploration and manipulation
- Object relatedness
- Concept formation
- Memory
Play and Cognitive Development

- Play promotes cognitive growth (e.g., Piaget, 1952).
- Vygotsky (1978) - play contributes to child's ability to understand and develop symbols.

Cognitive Development

- **6 Months**: Plays with single object - banging it
- **9 months**: Relational acts emerge (e.g., placing spoon in cup; placing lid on pot)
- **2 years**: Symbolic play (e.g., pretend to drink from a cup)
- **36 months**: Symbolic play more complex (e.g., pretend to call someone on make-believe telephone)

Language Scale

- Language Scale composed of:
  - receptive communication
  - expressive communication
- Some Bayley-II (BSID-II) Mental Scale Items moved to the Language scale
  - identified by content experts as measuring primarily language skills
- Additional items adapted from the PLS-4
Receptive Communication

49 items that assess:
• pre-verbal behaviors
• vocabulary development
  – as being able to identify objects & pictures that are referenced
• vocabulary related to morphological development
  – such as pronouns and prepositions
• understanding of morphological markers
  – such as plural -s, tense markings (-ing, -ed), and the possessive -'s
• items that measure children’s social referencing and verbal comprehension

Expressive Communication

48 items that assess:
• pre-verbal communication:
  – babbling, gesturing
  – joint referencing & turn taking
• Vocabulary development:
  – naming objects, pictures,
  – naming attributes (e.g., color and size)
• morpho-syntactic development
  – using two-word utterances
  – plurals, and verb tense

Motor Scale

• Motor Scale composed of:
  • Fine motor subtests
  • Gross motor subtests
• Some items from the BSID-II Motor Scale and Mental Scale moved to fine or gross motor skills
• New items added:
  • expand the coverage across age
  • provide greater content coverage (e.g., increased focus on quality of movement)
Fine Motor
Comprised of 66 items:
- prehension
- perceptual-motor integration
- motor planning and speed
- visual tracking
- reaching
- object grasping
- object manipulation
- functional hand skills
- responses to tactile information

Gross Motor
Comprised of 72 items:
- Movement of the limbs and torso
- Static positioning (e.g., sitting, standing)
- Dynamic movement, including locomotion & coordination
- Balance
- Motor planning

Social-Emotional Scale
Is Greenspan Social-Emotional Growth Chart with scaled scores. Assesses
- self-regulation and interest in the world
- communicating needs
- engaging others and establishing relationships
- using emotions in an interactive purposeful manner
- using emotional signals or gestures to solve problems
Adaptive Behavior Scale

Caregiver information from Adaptive Behavior Assessment System-Second Edition

Skill areas include:

- communication
- community use
- self-care
- pre-academics
- social
- motor
- health & safety
- leisure
- self-direction
- home living
- motor

Adaptive Behavior Scale

The scores for all skill areas combine to form the General Adaptive Composite (GAC), an overall measure of the child’s adaptive development.

Bayley-III Standardization

- Ages 16 days to 42 months 15 days
- Standardization Sample n = 1,700
- Social-Emotional Scale n = 456
- Adaptive Behavior Scale n = 1350
- National sample stratified by:
  - age, sex, race/ethnicity
  - parent education level, geographic region
- Validity studies with clinical groups
- Comparison studies with major tests
Average Reliability

<table>
<thead>
<tr>
<th>Domain</th>
<th>Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive</td>
<td>.91</td>
</tr>
<tr>
<td>Language</td>
<td>.93</td>
</tr>
<tr>
<td>Motor</td>
<td>.92</td>
</tr>
<tr>
<td>Social-Emotional</td>
<td>.90</td>
</tr>
<tr>
<td>GAC</td>
<td>.97</td>
</tr>
</tbody>
</table>
Calculating Age

Chronological age must be calculated to determine the start points for subtest administration:

- record the date of testing
- record the child's date of birth
- record the child's age
- convert years, months, and days to age in months and days
Adjustment for Prematurity

Two Stage Process:

- subtract child's date of birth from the expected date of birth
  - enter number of months and days in the row labeled Adjustment for Prematurity
- subtract adjustment for prematurity from child’s age to obtain the Adjusted Age

Start Points

Using chart on cover page of Record Form:

Locate the letter in the Start Point column that corresponds with the child's age in months and days

- adjusted age, if applicable
Reversal Rule

The reversal rule for Cognitive, Language, & Motor scales is identical:

- score of 1 on the first three consecutive items at age-specific start point to go forward (i.e., achieve the basal).
- if a score of 0 on any of the first three items, go back to the start point for the previous age.

Reversal Rule

- reversal rule applies to new start point. Continue to apply rule until child passes first three items at start point of any age.
- administer items in a forward direction until discontinue criterion is met.
- do not re-administer any items.

Discontinue Rule

- Stop administration when child has received scores of 0 for five consecutive items
  - i.e., the ceiling has been achieved
- Previously administered and failed items that resulted in applying reverse rule count toward the discontinue rule.
Timing

- Some items require stopwatch timing
  - when required, a stopwatch will be listed as one of the materials
- Score only what the child accomplishes within the time limit.
  - however, allow child to complete a task (e.g., puzzles) if nearing completion but the time limit already reached

Multiple Responses

Some items require multiple responses:
- for those items, check boxes are provided to indicate when child responded correctly
- be sure to read the scoring criteria to determine when child should receive a score of 1 for that item

Left and Right Administration

Items that require administration on the left and the right side are referring to the child’s left and right.
- for some items, you need to indicate when the child was successful on administrations to the left and to the right
- be sure to read scoring criteria to determine if the child receives a score of 1 for that item
Trials

- Administration directions contain:
  - number of times an item may be administered
  - or the number of trials that may be presented

- For series items it is important that you administer all trials. Scoring criteria for items later in the series are more stringent.

Series Items

Several items have the same administration directions, but require varying levels of performance to meet the scoring criteria.

- Items were selected as part of a series when the administration directions for those items are parallel

For items that are part of a series:

- only items in the series that fall between the child’s start point and discontinue point are scored.

Subtest and Item Order

- Within each subtest, follow the item administration order

- Items within each subtest are grouped by difficulty
  - child should experience success at beginning of each subtest

- The examiner can determine the order in which to administer the subtests
  - e.g., begin testing with Fine Motor subtest

- But -- administer Receptive Communication subtest prior to Expressive Communication subtest.
Positioning

Level supine
The child is lying on his or her back on a level (flat) surface. The child may be on a firm level surface such as a padded exam table or on a mat on the floor.

Elevated Supine
The child is in the supine position with his or her head and trunk fully supported and slightly elevated.
Holding/Positioning Equipment

The child may be supported in an infant carrier/seat, on a wedge, or with other equipment and elevated (semi-reclined) to about 15°–25° upright.

Cradled

The child is supine, held snugly with the adult's arm and trunk.

Holding/Positioning Equipment

The child is supported in an infant carrier/seat or other positioning equipment with head and trunk fully supported. The equipment is elevated to a near-upright position (approximately 60°-70°).
Seated

- Child is seated at a table surface.
- Seating should be correct fit to table height.
- May sit in an adult’s lap facing table surface.
- Should demonstrate good sitting stability for seated activities.
- Stability can be provided through external positioning assistance typically used by child.

Supported sitting

The child is sitting upright in the caregiver’s lap:
- with his or her head and trunk supported against the caregiver’s trunk
- with the caregiver providing additional support as needed using his or her arms and hands

Social sitting

- Can choose from a variety of options
  - sitting in chairs or on the floor
  - side by side or facing each other
  - with or without a table surface
  - may both face forward, child in caregiver’s lap
  - may sit in similar or different sized chairs
- Any mutually agreeable sitting arrangement is acceptable.
Floor sitting

- Child is sitting on the floor
  - the surface should be cushioned or padded, yet firm and stable.

- Child may sit with his or her legs bent (ring or tailor sitting), straight (long leg sitting) or in a variation of these.

Prone

The child is lying on his or her stomach.

Standing

The child is standing, either alone or with support, as indicated in the item directions.
Supported at shoulder

The child is placed in a vertical position at adult’s shoulder.

- place your hands under child’s armpits and spread your fingers across child’s back to support him or her
- hold child facing you with his or her head resting on your shoulder

Upright

Child should be lifted in a vertical position with his or her feet on the exam surface.

- place your hands under child’s armpits
- spread your fingers around child’s trunk to support him or her

Item Administration
Age and Start Point

<table>
<thead>
<tr>
<th>Age</th>
<th>Start Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>3 29</td>
</tr>
<tr>
<td>2003</td>
<td>2 0 3</td>
</tr>
</tbody>
</table>

Bayley Scales of Infant and Toddler Development - Third Edition
Gloria Maccow, Ph.D., Assessment Training Consultant

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Typical Cognitive Development

12-24 months

Play
- Relational acts (e.g., placing a spoon in a cup; putting a lid on a pot).
- By 2 years, incorporate symbolic or pretend play—pretend to drink from a cup, put dolls to bed.

Information Processing
- Child searches for object that has been completely hidden from view.
- By 2 years, child is able to find a hidden toy even after it has been displaced from the original point of disappearance.

Language Scale

RC Start Point I = Item 8
EC Start Point I = Item 7
Typical Language Development 12-24 months

Receptive Communication
- Respond to words and short phrases (e.g., simple questions and commands in familiar contexts)
- Receptive vocabulary about 50 words
- Assess comprehension without contextual cues

Typical Language Development 12-24 months

Expressive Communication
- First words (animals, food, toys) appear around 1 year of age.
- Between 1 and 2, explosion in number of words child understands and produces.
- When vocabulary reaches 50-100 words, child begins to produce two-word combinations. Almost all 2-year olds produce two-word combinations.
- Gestures appear shortly before first birthday - e.g., lip-smacking to indicate hunger, waving bye-bye when leaving.

Start Point and Item

Motor Scale
FM Start Point I = Item 22
GM Start Point = Item 35
Typical Motor Development
12-24 months

1 to 1 ½ years
creeps up stairs, walks (10-20 min), makes lines on paper with crayon.

1 ½ to 2 years
runs, kicks a ball, builds 6 cube tower.

Age 2
Walks well, goes up and down steps alone, runs, seats self on chair, becoming independent in toileting, uses spoon and fork, imitates circular stroke, turns pages singly, kicks ball, attempts to dress self, builds tower of six cubes.

Social-Emotional & Adaptive Behavior Questionnaire

- complete the basic information on the cover page
- identify the appropriate start and stop points for the sections and skill areas within the Questionnaire
Completing Cover Page of Questionnaire

- Record all pertinent demographic information available about the child.
- Calculate the child’s chronological age, adjusting for prematurity as necessary.
- Record any general observations and notes in the Comments area on page 15 of the Questionnaire.

Calculating Age

- Follows the same guidelines as those used to calculate age on the Bayley-III Record Form, including the adjustment for prematurity.
- For the Questionnaire, only the age in months is needed to determine stop points and calculate scaled scores.
  - Do not round days of age upward to the nearest month.

Start Points & Stop Points

Social-Emotional Scale

- regardless of the child’s age, start with Item 1
- caregiver should complete each item in the Social-Emotional Scale until he or she reaches the child’s age-appropriate stop point, noted within the section
Start Points & Stop Points

Adaptive Behavior Scale

*must be completed in its entirety* by caregiver, with exception of three skill areas for children ages birth-11 months. Skill areas not relevant for this age group are Functional Pre-Academics, Home Living, and Community Use.

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Completing the Caregiver Report

- Designed to facilitate communicating to parent or caregiver the child’s performance on the Bayley-III.
- Contains a description of assessment, including types of items typically measured within each subtest.
- Includes additional information to assist caregiver in understanding children’s development and interpreting Bayley-III scores.

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SCORING

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Calculating Total Raw Scores

Total Raw Scores for Subtests in Record Form - Cog, Com, Motor
- for each subtest, count total number of items for which child receives credit (i.e., 1 point)
- along with the number of unadministered items preceding the basal.

Scaled Scores
- Are available for all subtests
- Are derived from the subtest total raw scores
- Range from 1-19, with a mean of 10 and a standard deviation (SD) of 3.

Calculating Scaled Scores
- Transfer all total raw scores to the Summary Scores table found on the cover page of the Record Form.
- For the Cognitive Scale and Language and Motor subtests, use Table A.1 to determine scaled scores.
- To determine the scaled score for Social-Emotional Scale, use Table A.2.
- To determine scaled scores for Adaptive Behavior skill areas, use Table A.3.
Composite Scores

- Derived from various sums of subtest scaled scores.
- Generated for the Language Scale, Motor Scale, and the Adaptive Behavior Scale (the GAC score).
- Scaled to a metric with a mean of 100 and a SD of 15, and range from 40-160.
- Composite score equivalents are available for the Cognitive and Social-Emotional scales.

Composite Scores

- For Cognitive & Social-Emotional composite score equivalents, use Table A.5
- For Receptive Communication & Expressive Communication subtests:
  - sum the scaled scores and,
  - record the total in the box marked Sum directly below the scaled scores.
- Repeat for Motor scaled scores, then for Adaptive Behavior scaled scores.

Composite Scores

- Use Table A.4 to look up the composite score that matches the sum of scaled scores for Language and Motor Scales.
- For the GAC, use Table A.6.
Percentile Ranks

- Available for all five scales
- Indicates percentage of individuals in standardization sample, at a given age, who obtained scores less than or equal to a given scaled score or composite score
- Percentile ranks range from 1 to 99, with 50 as the mean and median.

Determining Percentile Ranks and Confidence Intervals

Tables A.5–A.8 are used to determine the percentile ranks and confidence intervals (at the 90% or 95% confidence level) for Cognitive, Language, Motor, Social-Emotional, and GAC scales.

Completing Summary Pages

The summary pages contain space to record the child’s:
- subtest total raw scores & scaled scores
- composite scores
- percentile ranks
- confidence intervals
- plot the child’s performance graphically
- perform discrepancy comparisons
Plotting Profiles of Scores

To facilitate interpretation:

- the scaled scores and the composite equivalent/composite scores can be plotted on page 2 of the Record Form

Adaptive Behavior Scale subtest/skill area scores and the GAC can be plotted on the charts on page 14 of the Questionnaire.
Discrepancy Comparisons

Calculate discrepancies between subtest scaled scores to determine:
- whether differences between subtests are statistically significant (critical values) and,
- how frequently discrepancy occurred in standardization sample (base rate)

Discrepancy Comparisons

Comparisons can be made between any pair of subtests:
- Cognitive
- Receptive Communication
- Expressive Communication
- Fine Motor
- Gross Motor
- Social-Emotional
Discrepancy Comparisons

Total Raw Scores Social-Emotional & Adaptive Behavior

Sum the behavior frequencies

- 0, 1, 2, 3, 4, or 5 for the Social-Emotional items
- 0, 1, 2, or 3 for Adaptive Behavior items
- record total in the box marked Total raw score
- the Sensory Processing score from the Social-Emotional Scale is calculated by summing the behavior frequencies for Items 1-8

Sensory Processing Total Raw Score

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Adaptive Behavior Skill Area

Total Raw Score

Plotting Social-Emotional Growth

The Social-Emotional Growth Chart allows the practitioner and caregiver to see a visual representation of how the child is progressing according to milestones.

Supplemental Analysis for Social-Emotional Scale

Items 1-8 of the Social-Emotional Scale assess sensory processing capacities:
- e.g., sensitivity to colors/sounds/touch/movement called: Total Sensory Processing Score
Supplemental Analysis for Social-Emotional Scale

- Table B.5 allows conversion of Total Sensory Processing Score to the age-appropriate category:
  - Full Mastery, Emerging Mastery, or Possible Challenges.
- Record it in the Supplemental Analysis table by checking the correct box.
- Note Highest Stage Mastered.

Table B.5

<table>
<thead>
<tr>
<th>Supplemental Analysis</th>
<th>Possible Challenges</th>
<th>Sensory Motor</th>
<th>Full Mastery</th>
<th>Possible Challenges Occurs at Birth or All the Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Sensory Processing Score</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

Interpreting General Adaptive Composite

- Strong unified single factor of adaptive skills
- Based on information from all relevant skill areas
General Adaptive Composite

May not accurately reflect overall adaptive functioning if skill area scaled scores vary considerably

- determine the level of score variability (e.g., scatter)
- calculate the difference between smallest and largest skill area scaled score
- examine Skill Area Scatter within Composites

Discrepancy Analyses for Adaptive Behavior Scale

Discrepancy comparisons for the Adaptive Behavior Scale domains (Conceptual, Social, and Practical):

- based on the ABAS-II standardization sample;
- can be calculated on the Supplemental Analysis table on page 14 of the Questionnaire.

Adaptive Behavior Scale Discrepancy Comparisons
Developmental Age Equivalents

- Represent the average age in months at which a given total raw score is typical.

Developmental Age

- There are times when calculating a specific developmental age is required, e.g., when testing severely delayed children outside the typical age range for the Bayley-III.
- Use Table B.7 to determine Developmental Age.

Scoring Assistant

Generate Sample Score Report
INTERPRETATION

Legislative Requirements

- Education of the Handicapped Act Amendments (1986)
- Individuals with Disabilities Education Improvement Act of 2004 (IDEA)
  - five domains: cognitive, communication, physical, social-emotional, and adaptive behavior
  - requires early assessment and intervention

Diagnosing Developmental Delay

Several different criteria used:
- 25% delay in functioning when compared to his or her same age peers
- standard deviation units below the mean of a reference group
- performing a certain number of months below chronological age
Diagnosing Developmental Delay

Bayley-III provides relevant normative and developmental age level information to aid diagnosis of delay.

Assumptions Underlying Bayley-III Interpretation

• The examiner determines whether or not test is appropriate instrument for answering the referral question.
• Any change or adaptation of standard administration procedures necessitates caution in use of quantitative data such as norms or other derived score information.

Assumptions Underlying Bayley-III Interpretation

Proper interpretation of Bayley-III results requires:
• familiarity with measurement concepts
• selection of test scores appropriate for the purpose
### Descriptive Classifications

<table>
<thead>
<tr>
<th>Composite or Composite Score Equivalent</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>130 and above</td>
<td>Very Superior</td>
</tr>
<tr>
<td>120-129</td>
<td>Superior</td>
</tr>
<tr>
<td>110-119</td>
<td>High Average</td>
</tr>
<tr>
<td>90-109</td>
<td>Average</td>
</tr>
<tr>
<td>80-89</td>
<td>Low Average</td>
</tr>
<tr>
<td>70-79</td>
<td>Borderline</td>
</tr>
<tr>
<td>69 and below</td>
<td>Extremely Low</td>
</tr>
</tbody>
</table>

### Caregiver Report

- Introduces the Bayley-III
- Helps caregivers understand their child’s performance
- Gives recommendations to promote development
- Two forms:
  - informational pamphlet
  - generated from Scoring Assistant:
    - will include plot of child’s composite scores

### Growth Scores

- Table B.6
- Growth Charts
Next Steps

- Study materials
- Read and re-read administration instructions
- Practice administration with colleague
- Practice with infant/toddler
- Practice scoring and interpretation

Contact Information

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