**Method**

Children were recruited from the FIRST WORDS Project.

- **Step One: Brief Parent Report**
  - CSBS DP Infant-Toddler Checklist

- **Step Two: Face-to-Face Evaluation**
  - CSBS DP Behavior Sample of child interacting with caregiver and clinician

**CSBS Developmental Profile: Behavior Sample**

- Warm-up
- Communicative Temptations (Wind-up toy, Balloon, Bubbles, Jar, and Toys in Bag)
- Sharing Books
- Symbolic Play (feeding set)
- Language Comprehension (object names, person names, and body parts)
- Constructive Play (stacking blocks)
- Caregiver Perception Form (caregiver rates how typical child’s behavior is during sample)

**CSBS Developmental Profile**

*Measurement Parameters for Checklist, CQ & BS*

**Social Composite**

- Emotion and Eye Gaze
  - Gaze shifts, shared affect, gaze follow
- Communication
  - Behavior regulation, social interaction, joint attention
- Gestures
  - Conventional & distal gestures

**Speech Composite**

- Sounds
- Words

**Symbolic Composite**

- Understanding
- Object Use

**Study 1:** The purpose of this study was to identify early skills in the second year of life that predict later language outcomes.

**Theories of language development**

- Early identification and prognosis
  - Suggest appropriate targets for early intervention
Participant Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Early (N=129)</th>
<th>Late (N=184)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSBS DP Age</td>
<td>14.2 mos</td>
<td>20.1 mos</td>
</tr>
<tr>
<td>Mullen Age</td>
<td>37.8 mos</td>
<td>38.0 mos</td>
</tr>
<tr>
<td>Nonverbal DQ</td>
<td>109.5 (21.7)</td>
<td>106.9 (23.5)</td>
</tr>
<tr>
<td>Receptive T</td>
<td>51.9 (11.6)</td>
<td>51.6 (13.6)</td>
</tr>
<tr>
<td>Expressive T</td>
<td>53.8 (12.5)</td>
<td>52.8 (13.8)</td>
</tr>
<tr>
<td>Gender (%male)</td>
<td>56%</td>
<td>60%</td>
</tr>
</tbody>
</table>

Research Question

Which predictor in the second year of life has the strongest relationship with language outcome at three years of age?

Comprehension

- Predicted both receptive and expressive language outcome both early and late in the second year
- Correlations:

<table>
<thead>
<tr>
<th></th>
<th>Early (14 months)</th>
<th>Late (20 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receptive Language</td>
<td>.40 ***</td>
<td>.45 ***</td>
</tr>
<tr>
<td>Expressive Language</td>
<td>.65 ***</td>
<td>.62 ***</td>
</tr>
</tbody>
</table>

Gaze follow and language outcomes

Research Question

What other skills add significantly to the prediction of language outcome over and above comprehension?
Communicative functions and language outcomes

Gestures and language outcomes

Sounds and language outcomes

Words and language outcomes

Use of objects and language outcomes

Research Question

How well can we predict language outcome when we use ALL the predictors?
All predictors and language outcomes

**Early in second year**
(mean age 14.20 months)

<table>
<thead>
<tr>
<th>Prelinguistic skill</th>
<th>Receptive Language</th>
<th>Expressive Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gaze follow</td>
<td>***</td>
<td>**</td>
</tr>
<tr>
<td>Behavior regulation</td>
<td>***</td>
<td>*</td>
</tr>
<tr>
<td>Initiating joint attention</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Gaze follow</td>
<td>***</td>
<td>**</td>
</tr>
<tr>
<td>Sounds</td>
<td>*</td>
<td>**</td>
</tr>
<tr>
<td>Words</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Word combinations</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Actions with objects</td>
<td>*</td>
<td>**</td>
</tr>
</tbody>
</table>

**Late in second year**
(mean age 20.13 months)

<table>
<thead>
<tr>
<th>Prelinguistic skill</th>
<th>Receptive Language</th>
<th>Expressive Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gaze follow</td>
<td>***</td>
<td>**</td>
</tr>
<tr>
<td>Behavior regulation</td>
<td>***</td>
<td>*</td>
</tr>
<tr>
<td>Initiating joint attention</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Gaze follow</td>
<td>***</td>
<td>**</td>
</tr>
<tr>
<td>Sounds</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Words</td>
<td>**</td>
<td>***</td>
</tr>
<tr>
<td>Word combinations</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Actions with objects</td>
<td>*</td>
<td>**</td>
</tr>
</tbody>
</table>

**Conclusions**

- Comprehension throughout the second year of life is an important predictor of later language outcome, both receptive and expressive
- All of the other predictors, except for word combinations, add important significant information regarding language outcome at three years beyond comprehension
- Greater accuracy in predicting language outcomes for toddlers can be achieved by including a collection of predictors as part of a test battery

**Clinical Implications**

- Most early language tests measure only words, but there are many prelinguistic skills one can measure in the second year to predict language outcome
  - These include:
    - Comprehension
    - Gaze-point follow
    - Communicative functions: behavior regulation, joint attention
    - Gestures
    - Sounds
    - Use of objects

- Measuring these skills can give us important information about prognosis for language outcomes
- This information is invaluable for identifying delays and earlier access to intervention
- No need to “wait and see” for the child to develop words!
Study 2: Participant Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Typical</th>
<th>SLI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Size</td>
<td>23</td>
<td>24</td>
</tr>
<tr>
<td>CSBS DP Age</td>
<td>19 - 23</td>
<td>19 - 23</td>
</tr>
<tr>
<td>Mean</td>
<td>21.3 months</td>
<td>21.0 months</td>
</tr>
<tr>
<td>CELF-P Age</td>
<td>51.0 months</td>
<td>50.5 months</td>
</tr>
<tr>
<td>Total SS</td>
<td>113.8</td>
<td>80.5</td>
</tr>
</tbody>
</table>

ALLI
Assessment of Language Learning Indicators
(Morgan, Allen, & Wetherby, 2003)

- Communicative Gestures
- Language Comprehension
- Speech Complexity
- Language Production
- Book Sharing

Research Question
Are there differences in gesture use in the second year of life in children with and without specific language impairment?

Communicative Gestures
- Deictic
  - Give
  - Reach
  - Show
  - Point
- Representational
  - Early
  - Wave
  - Clap
  - Head shake
  - Late
  - Depictive/Sign
  - Head nod

Group differences in deictic gestures

Group differences in representational gestures

Wetherby, Morgan, Watt, Shumway & Woods, 2004
Research Question

Are there differences in language comprehension in the second year of life in children with and without specific language impairment?

Situational versus Decontextualized Comprehension

Situational Comprehension
- Offer to assist child
- Requests to do to other
  - Show
  - Feed
  - Kiss
- Request to carry out a motor action
  - Give
  - Sit/pour

Decontextualized Comprehension
- Request to locate/identify
  - “Can you find the cup?”
  - “Do you see the dog?”
  - “Give me the spoon”
  - “Show me your eyes”

Percentage of comprehension

Group differences in speech complexity

- Consonants
- Syllable shape

Wetherby, Morgan, Watt, Shumway & Woods, 2004
Research Question

Are there differences in language production in the second year of life in children with and without specific language impairment?

Group differences in word production

Group differences in vocabulary

Group differences in utterance length

Research Question

Are there differences while sharing books in the second year of life in children with and without specific language impairment?

Pointing during book sharing
Talk during book sharing

![Bar chart showing talk during book sharing]

Conclusions

- Children with SLI showed significantly poorer prelinguistic skills than children with typical language in the following areas:
  - Pointing and use of representational gestures
  - Situational and decontextualized comprehension
  - Inventory of consonants and syllable shape
  - Vocabulary production
  - Naming and describing while looking at books

Clinical Implications

- SLPs should evaluate these prelinguistic skills in the second year of life to detect children at risk for SLI.
- Many prelinguistic skills can be observed during book sharing making this a useful evaluation context.
- These prelinguistic skills should be considered as possible early intervention targets.

Study 3: Prelinguistic Skills of Children with Autism Spectrum Disorders

- Intervention beginning prior to age 3 has a greater impact than later intervention.
- Average age of diagnosis in the United States is not until 3 to 4 years of age.
- Explore the characteristics of ASD in the first years of life.
  - Improve early identification
  - Provide appropriate targets for intervention

Participant Characteristics

<table>
<thead>
<tr>
<th></th>
<th>TD</th>
<th>DD</th>
<th>ASD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Size</td>
<td>35</td>
<td>21</td>
<td>35</td>
</tr>
<tr>
<td>CSBS DP Age</td>
<td>20.0 months</td>
<td>18.8 months</td>
<td>20.2 months</td>
</tr>
<tr>
<td>Follow-up Age</td>
<td>36.7 months</td>
<td>35.9 months</td>
<td>37.0 months</td>
</tr>
<tr>
<td>Mullen V DQ</td>
<td>106.0 (14.0)</td>
<td>80.1 (22.9)</td>
<td>75.9 (30.8)</td>
</tr>
<tr>
<td>Mullen NV DQ</td>
<td>111.1 (14.6)</td>
<td>84.4 (20.1)</td>
<td>85.3 (24.3)</td>
</tr>
</tbody>
</table>

Research Question

Are there differences in prelinguistic skills in the second year of life among children with autism spectrum disorders, developmental delay, and typical development?
Research Question

Are there differences in specific items of the social composite among children with autism spectrum disorders, developmental delay, and typical development?
Social Composite Items

Group Differences

<table>
<thead>
<tr>
<th>Emotion and Eye Gaze</th>
<th>ASD v TD</th>
<th>ASD v DD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gaze Shifts</td>
<td>***</td>
<td>-</td>
</tr>
<tr>
<td>Shared Positive Affect</td>
<td>***</td>
<td>-</td>
</tr>
<tr>
<td>Gaze Follow</td>
<td>***</td>
<td>-</td>
</tr>
</tbody>
</table>

Communicative Functions

<table>
<thead>
<tr>
<th></th>
<th>ASD v TD</th>
<th>ASD v DD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavior Regulation</td>
<td>***</td>
<td>-</td>
</tr>
<tr>
<td>Social Interaction</td>
<td>***</td>
<td>-</td>
</tr>
<tr>
<td>Joint Attention</td>
<td>***</td>
<td>-</td>
</tr>
</tbody>
</table>

Gestures

<table>
<thead>
<tr>
<th></th>
<th>ASD v TD</th>
<th>ASD v DD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional Gestures</td>
<td>***</td>
<td>-</td>
</tr>
<tr>
<td>Distal Gestures</td>
<td>***</td>
<td>-</td>
</tr>
</tbody>
</table>

*p<.001, **p<.01, *p<.05

Conclusions

- Children with ASD differed significantly from both DD and TD in the second year of life in the following areas:
  - Gaze shifts
  - Shared positive affect
  - Joint attention
- Prelinguistic skills were low but not necessarily absent in children with ASD

Clinical Implications

- Identify children with ASD in the second year of life
  - SLP plays an important role
  - Critical to evaluate prelinguistic skills, particularly gaze shifts, shared affect, and joint attention
- Enable children to access intervention earlier
  - Importance of measuring social communication outcomes in intervention with very young children

Research Question

Do prelinguistic skills measured between 18 and 24 months in children with ASD predict receptive and expressive language outcomes at 3 years?

Participant Characteristics

<table>
<thead>
<tr>
<th></th>
<th>ASD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Size</td>
<td>31</td>
</tr>
<tr>
<td>CSBS DP Age</td>
<td>21.5 months</td>
</tr>
<tr>
<td>BS Total SS</td>
<td>76.0 (14.3)</td>
</tr>
<tr>
<td>Follow-up Age</td>
<td>36.2 months</td>
</tr>
<tr>
<td>Mullen Y DQ</td>
<td>69.6 (33.6)</td>
</tr>
<tr>
<td>Mullen NV DQ</td>
<td>81.7 (25.8)</td>
</tr>
<tr>
<td>NV DQ &gt;80</td>
<td>48%</td>
</tr>
</tbody>
</table>

CSBS DP Composites and Language Outcomes

n=31
Conclusions

The following predictors measured from 18 to 24 months in children with ASD show large correlations with receptive and expressive language outcomes at 3 years:
- Gaze / Point follow
- Initiating Joint Attention
- Conventional and Distal Gestures
- Inventory of Sounds
- Inventory of Words
- Understanding
- Play

Systematic Observation of Red Flags (SORF) for ASD in Young Children (Wetherby & Woods, 2002)

- Reciprocal Social Interaction (RSI)
- Unconventional Gestures (UG)
- Unconventional Sounds and Words (USW)
- Repetitive Behaviors and Restricted Interests (RBRI)

(Wetherby & Woods, 2002)
**Research Question**

What percentage of children show RED FLAGS of ASD in the second year of life using the SORF scoring with the CSBS DP?

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**Percentage of Children with ASD (n=30) and DD (n=18) showing the 13 Red Flags**

<table>
<thead>
<tr>
<th>Red Flag</th>
<th>ASD (%)</th>
<th>DD (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of appropriate gaze</td>
<td>80%</td>
<td>22%</td>
</tr>
<tr>
<td>Lack of shared positive affect</td>
<td>87%</td>
<td>33%</td>
</tr>
<tr>
<td>Lack of initiating joint attention</td>
<td>97%</td>
<td>56%</td>
</tr>
<tr>
<td>Lack of response to contextual cues</td>
<td>87%</td>
<td>67%</td>
</tr>
<tr>
<td>Lack of response to name</td>
<td>100%</td>
<td>94%</td>
</tr>
<tr>
<td>Lack of coordination of nonverbal communication</td>
<td>97%</td>
<td>61%</td>
</tr>
<tr>
<td>Lack of pointing</td>
<td>93%</td>
<td>78%</td>
</tr>
<tr>
<td>Lack of showing</td>
<td>97%</td>
<td>61%</td>
</tr>
<tr>
<td>Unusual prosody</td>
<td>47%</td>
<td>0%</td>
</tr>
<tr>
<td>Lack of consonants</td>
<td>87%</td>
<td>77%</td>
</tr>
<tr>
<td>Repetitive movements of body</td>
<td>60%</td>
<td>17%</td>
</tr>
<tr>
<td>Repetitive movements with objects</td>
<td>77%</td>
<td>11%</td>
</tr>
<tr>
<td>Lack of playing with a variety of toys</td>
<td>77%</td>
<td>78%</td>
</tr>
</tbody>
</table>

---

**Conclusions**

- Red flags of ASD in the second year of life are a combination of lack of typical behaviors and presence of atypical behaviors.
- Red flags that are common to children with ASD and DD include a lack of gestures, sounds, words, understanding, and play.
- Red flags that are more specific to ASD are lack of gaze, shared affect, and initiating joint attention, as well as unusual prosody and repetitive behaviors.

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**Clinical Implications**

- A child who shows a lack of gestures, sounds, words, understanding, or play in the second year is at risk for ASD or DD/SLI.
- More precise risk indicators for ASD include: lack of gaze, shared affect, and joint attention.
- Unusual intonation and repetitive behaviors in combination with a lack of appropriate sounds and play should be recognized as high risk indicators of ASD.

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**Session Summary**

- A collection of prelinguistic skills in the second year of life are predictors of language outcomes.
- More precise information on comprehension, gestures, sounds and words is important for identifying children with SLI.
- More precise information on gaze, shared affect, initiating joint attention, intonation, and repetitive behaviors is important for identifying children with ASD.