What we know and where to go with graphic symbols

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What is a Symbol?

- Something used to stand for or represent another thing or concept (e.g., real object, picture, line drawing, word, manual sign).

- In communication, anything used to represent thought (e.g., acoustic symbols via speech, letters of the alphabet via writing).

- In some countries (e.g., United Kingdom) the AAC professional jargon limited the use of symbols to refer only to graphic symbols.
What is a graphic symbol?

A two-dimensional visual symbol that represents a referent to convey meaning (e.g., Blissymbol, line drawing, Sigsymbol) (Lloyd et al., 1997, p. 531).
**FIGURE 6.1** Representations of Selected Concrete Referents by Seven Common Aided Symbol Sets and Systems


(Lloyd, et al., 1997, p.52)
Fig. 6.2

Representations of Selected Abstract Referents by Seven Common Aided Symbol Sets and Systems


(Lloyd, et al., 1997, p. 53)
Picture Transparency Test (PTT)

- What do you think this is?
What Do You See?
Psych 101 Figure-Ground
What impacts on symbol learning?

- Iconicity
- Complexity
- Perceptual distinctness
- Size
- Degree of ambiguity (Lloyd, Fuller & Arvidson (1997))

• Importance of experience on learnability
• However, relatively little understanding of
  – Impact of cultural exposure on the identification and use of symbols (Huer, 2000 - adults)
  – Impact of more than one exposure to symbols in facilitating children’s ability to recognize symbols
Objectives of the Presentation

1. How do children’s cultural experience impact on their recognition of PCS symbols?
2. What is the impact of repeated exposure to graphic symbols on symbol recognition?
3. What are the applications to children with severe disabilities and autism?
Objective 1

1. How do children’s cultural experience impact on their recognition of PCS symbols?

Section 1

– How do children from a rural African context recognize PCS symbols? (Study 1)
– How do these responses compare with other urban (more western oriented) children? (Study 2)
Objective 1: Cultural impact ….  

Section 2:
– How accurate do children identify emotions using PCS symbols (Study 3)
– How do these differ between Afrikaans and Sepedi speaking language groups? (Extension study)
Study 1: Haupt & Alant (2002)

How do children from a rural African context recognize PCS symbols? (Haupt & Alant (2002))

- To investigate the iconicity of Picture Communication symbols for rural Zulu-speaking children
  - Show me “…help me please”
Participants:

- Participants: 94 (boys and girls)
- Mean age: 10 years 5 months
- Deep rural – oral language tradition
Making the Bed

1. Let me.
2. Let's take this off.
3. Help me, please.
4. Let's do it again.
5. Got to tuck it in.
6. What a mess!

7. Yes.
8. Let's put on...
9. Need to change them.
10. Finished.
11. Have to make it fat.
12. Looks like a bomb went off.

13. No.
14. Hold this, please.
15. Nice and clean.
16. They're dirty.
17. Nice and soft.
18. Put it in the hamper.

19. Thank you.
20. Let's get the bed made.
21. We forgot.
22. What's next?
23. Put it here.
24. ... the blanket.

25. You're welcome.
26. Look at this.
27. What do you think?
28. It's crooked.
29. Looks good.
30. ... the sheets.

31. Whoops!
32. Where is it?
33. Need to pull it.
34. Have to fold it back.
35. Looks bad.
36. ... the pillowcase.
Task

• Translation of the terms used in PCS
• 36 page booklet
• Each symbol indicated on a separate page
• No labels were included on displays
• Task administered in groups of 10 in their home language, Zulu
Summary of findings

• That rural Zulu children had difficulty in identifying PCS symbols
• That of the 36 PCS symbols in the bed-making overlay:
  • 8 Symbols were 40% correctly identified
  • 12 symbols were 18-20% correctly identified
  • 16 symbols were under 10% correctly identified
Table 6.2 Error patterns in students’ responses on identification of PCS Symbols

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>31. You are welcome</td>
<td>Expression</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. It is finished</td>
<td>Descriptive</td>
<td>X</td>
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<tr>
<td>23. Fold it back</td>
<td>Action-directive</td>
<td></td>
<td>X</td>
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<td>28. Let us do it again</td>
<td>Action-directive</td>
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<tr>
<td>8. It is nice and clean</td>
<td>Descriptive</td>
<td>X</td>
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<tr>
<td>18...the sheets</td>
<td>Noun</td>
<td>X</td>
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<tr>
<td>33. Let me</td>
<td>Action-directive</td>
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<tr>
<td>3. No</td>
<td>Expression</td>
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<td>9. Let us take it off</td>
<td>Action-directive</td>
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<tr>
<td>20. Look at this</td>
<td>Action-directive</td>
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<td>X</td>
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<tr>
<td>19. Where is it?</td>
<td>Question</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2. It is nice and soft</td>
<td>Descriptive</td>
<td>X</td>
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<tr>
<td>4. You need to change them</td>
<td>Action-directive</td>
<td></td>
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<td>X</td>
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<td></td>
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<tr>
<td>21. Tuck it in</td>
<td>Action-directive</td>
<td></td>
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<td></td>
<td>X</td>
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<tr>
<td>36. It looks good</td>
<td>Descriptive</td>
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<td></td>
<td>X</td>
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<tr>
<td>22. It is dirty</td>
<td>Descriptive</td>
<td>X</td>
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<td>30. Put it here</td>
<td>Action-directive</td>
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<tr>
<td>1. What is next?</td>
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<td>Expression</td>
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<tr>
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<td>X</td>
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<td>15. Thank you</td>
<td>Expression</td>
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<td>X</td>
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<td></td>
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<tr>
<td>7. What do you think?</td>
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<td>X</td>
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<td>X</td>
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<tr>
<td>10. It is crooked</td>
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<td></td>
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<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Key:
- 1=Presentation number and label
- 2=Main depicted function of symbol
- 3=Unfamiliar with the visual symbol
- 4=Difficulty with association between symbols on the picture
- 5=Part/whole perception
- 6=Difficulty in understanding indication of directionality
- 3: Unfamiliar with symbol

- You are welcome

- It is finished
- 4: Difficulty with associations between symbols on the picture

- Let me
- Help me please
- Where is it?
- 5: Part-whole perception (more conceptual?)

- Pillow case

- Hold this please
- 6: Difficulty interpreting directionality

- Fold it back
- Let us do it again
- It is crooked
Study 2:
How do these responses compare with other urban (more western oriented) children? (Basson & Alant, 2005)

• to determine to which extent 6 year old Afrikaans speaking children can identify PCS symbols correctly

• to compare findings with Haupt & Alant (2002) which was conducted on Zulu-speaking children
Comparison between two studies – single exposure

Two groups:
- Northern-Sotho group of children aged 6-7 years
- Afrikaans speaking children aged 6
Conclusion

• Single exposure to symbols

- Children between the two groups differed between 0-43% in their correct identification of the PCS symbols
- Socio-cultural differences in the responses between these groups of children
Objective 1…Cultural influences

Section 2:
How do children recognize PCS symbols representing emotions (Visser, Alant & Harty 2008)

Do children identify the same emotions in graphic symbols as expected from PCS symbols?

“happy, sad, afraid and angry”
Method

Participants: 26 four-year old typically developing English speaking children from different preschools in Pretoria East

Task:
- Scenario related to a specific emotion, for example, “Thabo lost his favorite toy, he is sad”
- Instruction: Show me…“sad” etc
• Each emotion as depicted by PCS
• Did the children choose the expected symbols as labeled by PCS in depicting the specific emotions?
<table>
<thead>
<tr>
<th>Happy</th>
<th>Sad</th>
<th>Afraid</th>
<th>Angry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbol 1 (PCS)</td>
<td>Symbol 5 (PCS)</td>
<td>Symbol 9 (PCS)</td>
<td>Symbol 13 (PICSYMS)</td>
</tr>
<tr>
<td>Symbol 2 (PCS)</td>
<td>Symbol 6 (PCS)</td>
<td>Symbol 10 (PCS)</td>
<td>Symbol 14 (Makaton)</td>
</tr>
<tr>
<td>Symbol 3 (PCS)</td>
<td>Symbol 7 (PCS)</td>
<td>Symbol 11 (PCS)</td>
<td>Symbol 15 (PCS)</td>
</tr>
<tr>
<td>Symbol 4 (PCS)</td>
<td>Symbol 8 (PCS)</td>
<td>Symbol 12 (PCS)</td>
<td>Symbol 16 (PCS)</td>
</tr>
</tbody>
</table>
## Variations across emotions

<table>
<thead>
<tr>
<th>Emotion</th>
<th>Average of expected choices per emotion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Happy</td>
<td>97%</td>
</tr>
<tr>
<td>Sad</td>
<td>73%</td>
</tr>
<tr>
<td>Afraid</td>
<td>73%</td>
</tr>
<tr>
<td>Angry</td>
<td>84%</td>
</tr>
</tbody>
</table>
Findings

- That the emotion of “happy” is the easiest to identify

- Angry is the second most distinct

- More confusion/overlap between negative emotions

-- Issue of intensity of emotional experience?
-Study in progress on identification of emotions and intensity of emotions in the recognition of symbols.

-Comparison between two language groups: Sepedi speaking and Afrikaans speaking children (Basson, Dada & Alant- in progress).

-Intensity of emotion experience
<table>
<thead>
<tr>
<th>Happy</th>
<th>Afrikaans</th>
<th></th>
<th>Sepedi</th>
<th></th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Expected</td>
<td>Unexpected</td>
<td>Expected</td>
<td>Unexpected</td>
</tr>
<tr>
<td>3</td>
<td>42</td>
<td>3</td>
<td>20</td>
<td>21</td>
</tr>
<tr>
<td>9</td>
<td>41</td>
<td>4</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>10</td>
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<td>19</td>
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<td>15</td>
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<td>19</td>
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<td>3</td>
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<tr>
<td>24</td>
<td>42</td>
<td>3</td>
<td>24</td>
<td>17</td>
</tr>
<tr>
<td>TOTAL</td>
<td>208</td>
<td>18 (7.9%)</td>
<td>129</td>
<td>124 (49.0%)</td>
</tr>
<tr>
<td></td>
<td>Afrikaans</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>--------</td>
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<tr>
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<td>Expected</td>
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<tr>
<td>Sad</td>
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<td>1</td>
<td>19</td>
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<td>34</td>
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<td>2</td>
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<td>16</td>
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<td>15</td>
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<td>35</td>
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<tr>
<td>TOTAL</td>
<td>146</td>
<td>124 (45.9%)</td>
<td>72</td>
<td>186 (68.8%)</td>
</tr>
</tbody>
</table>
Objective 2: Learnability of symbols over time

- How do children’s ability to correctly identify graphic symbols change over different exposures?
- Deregowski (1973)
Objective 2: Learnability of symbols over time

• What is the impact of one training session on the recognition of PCS symbols? (Basson & Alant, 2005).

• How do the translucency ratings of children change after repeated exposure to the same Bliss symbols (Study 4: Bornman, Alant & du Plooy, in press)
Study 1: What is the impact of one training session on the recognition of PCS symbols

Symbol recognition between experimental and control groups (Basson & Alant, 2005)

- Experimental & control group:
  - Experimental group:
    - pre-test: one exposure
    - one training exposure
    - post test
  - Control group
    - pre-test: one exposure
    - no training (drawing)
    - post test
Findings….learnability

• Pre-test: No difference in correct identification of symbols between groups
• Control group: Significant difference between pre and post test
• Experimental x control group: Significant different between the two on the post –test
• Significant difference between the difference between pre and post test results of the control and experimental groups
Table 4.1: Results of the comparison between difference of experimental group’s post- and pre-test results and the difference between the control group’s post-and pre-test results

<table>
<thead>
<tr>
<th>Experimental group</th>
<th>Control group</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>Mean</td>
<td>Std Deviation</td>
</tr>
<tr>
<td>Std Deviation</td>
<td>Std Deviation</td>
<td></td>
</tr>
<tr>
<td>Difference</td>
<td>Difference</td>
<td></td>
</tr>
<tr>
<td>6.217</td>
<td>0.8636</td>
<td>2.5105</td>
</tr>
</tbody>
</table>
Learnability…

**Study 2: Bornman, Alant, Du Preez (in press)**

How do the translucency ratings of children change after repeated exposure to the same Bliss symbols?

– how do these ratings change on second and third exposure on consecutive days?
Participants…

- 35 Setswana mother tongue speakers with chronological ages between 6,0 – 7,11 years.
- All participants were in Grade 1 and attended the same school with Setswana as language of instruction.
Method and material

• Students were exposed to the same Bliss symbols on three consecutive days
• Materials; the same as those used by Quist & Lloyd (1996).
<table>
<thead>
<tr>
<th>Stairs</th>
<th>A lot</th>
<th>A little bit</th>
<th>Not at all</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>😊</td>
<td>😐</td>
<td>😞</td>
</tr>
<tr>
<td>Crayon</td>
<td>😊</td>
<td>😐</td>
<td>😞</td>
</tr>
<tr>
<td>Boy</td>
<td>😊</td>
<td>😐</td>
<td>😞</td>
</tr>
<tr>
<td>Pillow</td>
<td>😊</td>
<td>😐</td>
<td>😞</td>
</tr>
</tbody>
</table>
Figure 1: Translucency values for all symbols on Day 1 and Day 3
rating: 1 = close resemblance, 2 = not close resemblance
<table>
<thead>
<tr>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Friedman</th>
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<tr>
<td>X</td>
<td>STD</td>
<td>X</td>
<td>STD</td>
</tr>
<tr>
<td>1.4444&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.2918</td>
<td>2.5896&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.3381</td>
</tr>
</tbody>
</table>
Findings

• That children’s perception of graphic symbols change as we expose them more than once to the same images

• That their responses are reliable in that there is a steady increase in translucency ratings

• There seems to be a plato effect after the second exposure – no significant difference between 2 & 3 exposure
Objective 3: Application to Disabilities

– No comparable studies in populations using children with disabilities:
  • Sequential exposure to symbols – impact on recognition
  • Recognition of symbols representing emotions

• What do we know about children with intellectual disabilities and autism and the way they relate to graphic symbols?
Intellectual disabilities

– Inconsistent use of symbols across children with SD: “beginning picture users did not have generalized picture skills”.

– Iconicity of a picture for a particular observer is determined by the observer’s skills and is not intrinsic to the picture (Stephenson, 2007).
– Experience is not required for accurate perception of pictures, it is necessary for understanding the nature of pictures (DeLoache, Pierroutsakos & Uttal, 2003)

– Stephenson (2009) : Iconicity is not helpful to those learning graphic symbols who have little or no comprehension of spoken language
Learnability of symbols in intellectual disability...

• What other factors might impact on learning here? Intention of the communicator (Stephenson, 2009)

• Romski & Sevcik (1996 & 2006): participants learned to use arbitrary symbols where intent of the communication was clear, where use of symbol was modeled and association between word and symbol was explicit

• Pictorial competence & symbolic understanding likely to outweigh the significance of iconicity in this population (DeLoache’s work)
Future research?

• But what about older children with severe disabilities?
  – Do these children derive the same benefits as typically developing children from repeated exposure to symbols?
  – What is the process of gaining before a plato sets in?
Autism

• Recent research; children with autism do not show deficits in identifying emotions on pictures (Castelli, 2005).- higher ASD group.

• Judging trustworthiness?

• Baron-Cohen et al. (1993); found differences in belief-based expression (lower ASD group)

• Lack of “natural attention” to facial expression
• Change-blindness: failure to detect unexpected and implausible events – example of change blindness
Enhanced attention to detail : change-blindness (Smith & Milne, 2009)

- Task: Watch a film which contained mistakes – try and spot the mistakes
- Film created and divided into 20 short clips which documented stages in the process of baking buns
Errors…

• Continuity errors were introduced across cuts or pans in the 18 (80%) of the clips
• Eight of these errors involved the actor (social) and 8 objects (nonsocial)
• Clips were counter balanced: 8 were central (content relevant) and 8 marginal (contextually irrelevant) to the scene
Figure 1 A graph showing the percentage of errors detected by each group across error type.

Smith & Milne (2009, p. 303)
Findings

- Participants with ASD more likely to detect errors that TD – more errors detected centrally, but effect greater for TD.
- No significant association between number of errors detected – and whether person or object related
- TD – significant association between number of errors in central & marginal – more central.
- No false positives with ASD – 3 with TD
Future research..?

- If children with autism detect more detail from pictures – limited inattention blindness: What happens in subsequent exposures?
- Do they show the same learnability/platos?
- Why do we use PCS with children with Autism?
  - More detail?
  - Why not consider the use of Bliss symbols which are less detailed- could be less distracting?
Where to go?

• Impact of socio-cultural issues
  – To what extent can children identify emotions from graphic symbols?
    • How do their responses relate to the intensity of emotions experienced?
  – What is the impact of first exposure to graphic symbols on subsequent symbol exposures?
    • Do all children learn from sequential exposures in the same way?
  – At what point does it become necessary to “teach” symbols?
Where to go …cont

• Application to disabilities
  – Difference between children with severe disabilities without/with language comprehension
  – Children with disabilities with language comprehension: do they show the same patterns as typical children in terms of multiple exposures and emotion?
  – How does the visual perception of children with autism change (change-blindness) over multiple exposures? Intuitive learning.
References

• Bornman, J; Alant, E & du Preez, A. Translucency and Learnability of Blissymbols in Setswana-speaking Children: An Exploration (in press)

• Other references referred to in the presentation can be obtained by request from the presenters.
thank you

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