

# Using Iconicity to Evaluate Symbol Use

Gareth Evans<sup>1</sup>, Lisa Bowick<sup>1</sup>, Marianne Johnson<sup>1</sup> and Paul Blenkhorn<sup>1</sup>

<sup>1</sup> University of Manchester, Manchester, UK

<sup>2</sup> ENESAD-CNERTA, Dijon, France

# Motivation of Work (1)

- Use of AAC-based approaches in provider-patient medical consultations where there is little or no common language between provider and patient
  - Our work focuses on Somali people with asthma in the UK
    - Many Somalis in the UK have very little or not English
    - Many Somalis in the UK are illiterate in both English and Somali
  - In our work concerned with evaluating paper-based (symbols and text) and computer-based (symbols, speech and text) approaches to this issue

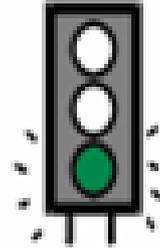
## Motivation of the Work (2)

- There is some degree of reliance on the use of pictographic symbols
  - Especially in the paper-based approach where speech does not support interpretation
- Therefore the symbols used should be both iconic and transparent
  - The English speaking healthcare professional and the Somali patient should understand the symbols in the same way
- Unlike more standard use of symbols in AAC, the Somalis will have little time to familiarise themselves with the symbols

# Symbol Testing and Evaluation (1)

- Guessability (Symbol Comprehension Tests)
  - Cairney and Sless (1982), Hanson and Hartzema (1995), Yovetich and Young (1998)
  - Participant is presented with the symbol and has to guess the meaning
- Translucency Testing
  - Bloomberg *et al* (1990), Fuller (1997), Huer (2000)
  - Participant is presented with the symbol and referent and asked to rate their match on a 7-point scale
- Transparency Tests
  - Musselwhite and Ruscello (1984), Mizuko (1987)
  - Participant is presented with a small number (4-6) of symbols and a referent for one of the symbols and asked to state which symbol matches the referent

# Symbol Testing and Evaluation (2)



- Guessability
  - No context and thus can lead to seemingly incorrect but valid interpretations
- Translucency
  - Based on an opinion, different ethnic groups may use the scale in different ways
- Transparency
  - Provides some context – the act of symbol selection involves not only selecting a symbol but rejecting the rest
    - Therefore the set of distracters is important

# Iconicity Test (Haupt and Alant 2003)

- Present participants presented with a communication grid (36 PCS symbols (US))
- Symbols linked to a particular theme
  - Making a bed and tidying a room
- A referent corresponding to each symbol is read out and the participant marks the symbol that he/she thinks matches the referent
- A clean communication grid is used for each referent
- The order in which referents are read out is varied between participants

# Iconicity Test (2)

- Haupt and Alant conducted their iconicity test with 94 Zulu children aged between 10 and 11
- Iconicity scores
  - 2.8% of symbols (1/36) iconic according to a strict criterion (i.e. > 75% selections in response to referent)
  - 11.1% of symbols (4/36) iconic according to lenient criterion (i.e. > 50% selections in response to referent)
- Haupt and Alant also consider 'distinctiveness' – see later
- Haupt and Alant speculate that the poor performance of their children in the test indicate that there is some cultural difference in the perception of symbols between their participants and the US symbols used

# Issues

- A simple pilot study was conducted to replicate Haupt and Alant's work with a very different group (older, better educated, English speakers)
- We wanted to address the following questions
  - Is the test so difficult that even well-educated, older participants would still perform poorly?
  - Would the test show differences in the results between different groups?
    - We had radically different performance between Somalis and English-speaking nurses on Translucency and Guessability tests that we needed a third test to make sense of the results. Would iconicity be a suitable test?
  - Would alternative forms of analysis gain a greater insight into the symbols?

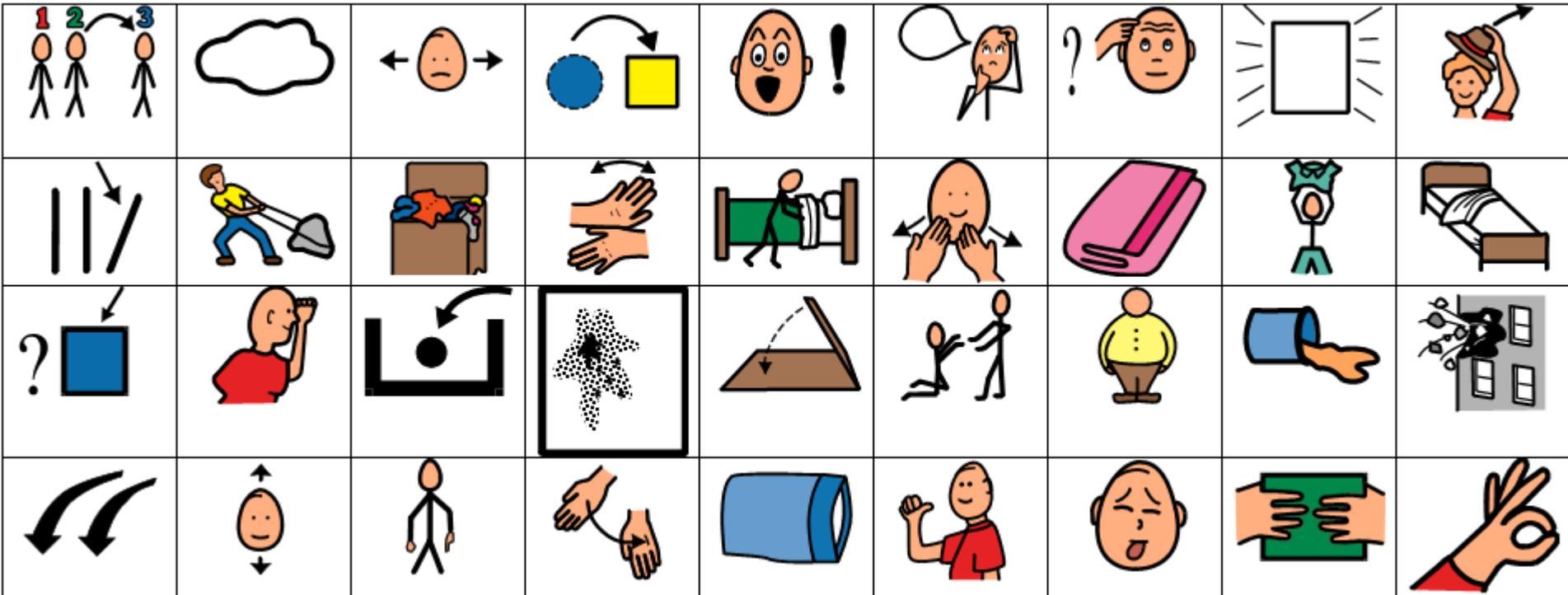
# Participants

- 10 participants
  - all educated to at least first degree level in universities from Western Europe, New Zealand and the USA
  - 6 males and 4 females
  - Average age = 29.8 years, (SD = 10.3)
  - No experience of AAC symbols or sign language

# Method

- General procedure
  - Participants have a communication grid with 36 symbols
  - A referent is read out that corresponds to one of the symbols
  - The participant marks the symbol that corresponds to the referent
  - The participant moves to a clean grid and the process is restarted
- 4 practice trials on a grid consisting largely of nouns
- 36 trials, one for each referent on a version consistent with Haupt and Alant's grid
  - The order of the symbols is randomised between participants

# Grid



No.	Symbol	Referent	Eg.	No.	Symbol	Referent	Eg.	No.	Symbol	Referent	Eg.
1		What is next?	1	13		It is finished	1	25		Puff it up	1
2		It is nice and soft	4	14		Let us make the bed	10	26		What a mess	0
3		No	8	15		Thank you	5	27		It looks like a bomb went off	9
4		You need to change them	3	16		The blanket	8	28		Let us do it again	3
5		Whoops	6	17		Let us put on	10	29		Yes	7
6		We forgot	4	18		The sheets	5	30		Put it here	0
7		What do you think?	6	19		Where is it?	3	31		You are welcome	0
8		It is nice and clean	6	20		Look at this	7	32		The pillow case	9
9		Let us take it off	2	21		Tuck it in	2	33		Let me	4
10		It is crooked	8	22		It is dirty	8	34		It looks bad	4
11		You need to pull	10	23		Fold it back	6	35		Hold this please	7
12		Put it in the tub	0	24		Help me please	8	36		It looks good	6

# Symbols with labels and results

# Summary of Results

- Overall symbol selection in response to referent 50.3% (cf Haupt and Alant 18.9%) (range of participant performance 42% to 56%)
- Iconicity

Criteria	Strict (iconicity $\geq 75\%$ )	Lemient (iconicity $\geq 50\%$ )
Our Results Symbol Numbers	3, 10, 11, 14, 16, 17, 22, 24, 27, 32	3, 5, 7, 8, 10, 11, 14, 15, 16, 17, 18, 20, 22, 23, 24, 27, 29, 32, 35, 36
Haupt and Alant's Results Symbol Numbers	11	11, 12, 14, 25



11 – you need to pull



12 – put it in the tub



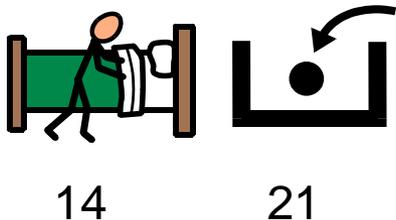
14 - let us make the bed



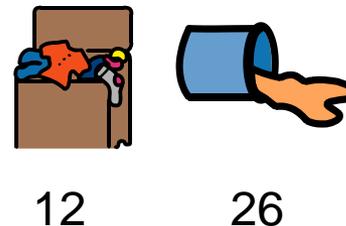
25 - puff it up

# Distinctiveness (1)

- Distinctiveness is a measure that is orthogonal to iconicity, it is a measure of the degree to which a symbol is selected only in response to its referents and not other referents
- For example
  - Symbol 14 is classed as iconic (10/10 in response to the referent ‘let us make the bed”), but it is also selected another 19 times (including 8 times for ‘tuck it in’, Symbol 21).
  - Symbol 12 is not iconic (0/10 in response to the referent ‘put it in the tub’) but is selected 11 times (including 9 times for ‘what a mess’, Symbol 26)
- Calculated by Haupt and Alant as distinctive if only one referent accounts for more than 20% of the responses for that symbol



ICCHP 2006

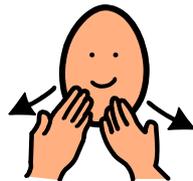


# Distinctiveness (2)

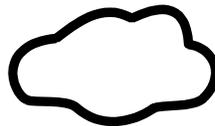
	Iconicity $\geq 50\%$		Iconicity $\geq 25\%$		Haupt and Alant Iconicity $\geq 25\%$	
	Dist	Indist	Dist	Indist	Dist	Indist
<b>More Iconic</b>	3 5 8 10 11 18 20 22 23 27 29 32	7 14 15 16 17 24 35 36	2 3 5 8 10 11 18 19 20 22 23 27 28 29 32 33	4 6 7 14 15 16 17 24 34 35 36	5 12 16 25 27 35	4 7 13 15 20 26 28 31
<b>Less Iconic</b>	2 12 13 19 25 28 33	1 4 6 9 21 26 30 31 34	12 13 25	1 9 21 26 30 31	11 14	1 2 3 6 8 9 10 17 18 19 21 22 23 24 29 30 34 36



5 - Whoops!



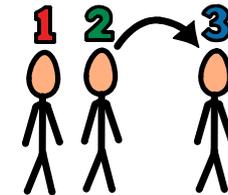
15 - Thank you



2 - It is nice and soft



11 - you need to pull



1 - what is next?

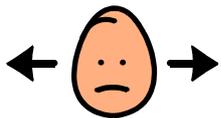
# Further Analysis

- Frequency of selection against correctness

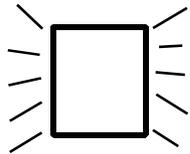
		Frequency of Selection		
		High	Mid	Low
<b>C</b> <b>o</b> <b>r</b> <b>r</b> <b>e</b> <b>c</b> <b>t</b> <b>n</b> <b>e</b> <b>s</b> <b>s</b>	<b>Correct (&gt;75%)</b>		<b>10 11 20 22 27 29 32</b>	<b>2 8 18 23 25</b>
	<b>Partially Correct (≤ 75%, ≥50%)</b>	<b>17 24</b>	<b>3 5 35</b>	<b>19 28</b>
	<b>Incorrect (&lt;50%)</b>	<b>7 14 15 16 21 33 36</b>	<b>4 6 9 12 34</b>	<b>1 13 26 30 31</b>

# Differences between distinctiveness and frequency analysis

- Symbols 3, 8 and 10 are all deemed to be iconic and distinctive, yet in frequency analysis they fall into different categories
  - 10 is optimum (mid frequency and correct)
  - 8 is less frequently selected (less iconic), but is correct
  - 3 is selected an appropriate number of times, but is only partially correct



3 - No



8 – It is nice  
and clean



10 – It is crooked

# Conclusions

- Our participants perform differently
  - Unsurprising? Older, better educated, culturally attuned
  - The test can show differences between groups
- Particular symbols can be identified as being suitable with little or no training
  - Frequency and correctness analysis can determine good symbols

# What followed

- Iconicity testing was used to compare the relative performance of English-speaking nurses and Somalis in relation to a different set of symbols
- English-speaking nursing students outperformed Somalis
- The results were compared with previous tests
  - Guessability – where Somalis scored very poorly compared with the English Speakers
  - Translucency – where Somalis had a much greater tendency to score symbols more highly than their English-speaking counterparts
- Iconicity showed good differentiation between the groups
  - Low translucency scores tended to predict poor iconicity scores

# References

- Bloomberg, K., Karlan, G. R., Lloyd, L. L.: The comparative translucency of initial lexical items represented in five graphic symbol systems and sets. *Journal of Speech and Hearing Research*, Vol. 33 (1990), 717-725
- Cairney, S., Sless, D.: Communication effectiveness of symbolic safety signs with different user groups. *Applied Ergonomics*, Vol. 13 (1982), 91-97
- Fuller, D. R.: Initial study into the effects of translucency and complexity on the learning of Blissymbols by children and adults with normal cognitive abilities. *Augmentative and Alternative Communication*, Vol. 7, (1997), 30-39
- Hanson, E. C., Hartzema, A.: Evaluating pictograms as an aid for counselling elderly and low-literate patients. *Journal of Pharmaceutical Marketing and Management*, Vol. 9, No. 3 (1995), 51-55
- Haupt, L., Alant, E.: The iconicity of picture communication symbols for rural Zulu children. *South African Journal of Communication Disorders*, Vol. 49 (2003), 40-49
- Huer, M. B.: Examining perceptions of graphic symbols across cultures: preliminary study of the impact of culture/ethnicity. *Augmentative and Alternative Communication*, Vol. 16 (2000), 180-185
- Mizuko, M.: Transparency and ease of learning of symbols represented by Blissymbols, PCS and Picsyms. *Augmentative and Alternative Communication*, Vol. 3 (1987), 129-136
- Musselwhite, C. R., Ruscello, D. M.: Transparency of three communication symbol systems. *Journal of Speech and Hearing Research*, Vol. 27, (1984), 436-443
- Yovetich, W. S., Young, T. A.: The Effects of Representativeness and Concreteness on the "Guessability" of Blissymbols. *Augmentative and Alternative Communication*, Vol. 4, (1988) 35-39.