The BSL Sentence Reproduction Test: Exploring age of acquisition effects in British deaf adults

Kearsy Cormier, Robert Adam, Katherine Rowley, Bencie Woll & Jo Atkinson
DGfS, Frankfurt
7 March 2012

Age of acquisition in Deaf communities

- Critical or sensitive period for language acquisition
  - “Whether and how variation in age of acquisition (AoA) affects ultimate language attainment and processing is a complex question with important theoretical and applied ramifications” (Boudreault & Mayberry, 2006: 608)

- Deaf communities as test case for AoA effects in language acquisition
  - Only ≤5% of American deaf children are native signers (Mitchell & Karchmer, 2004)
  - Most (≥95%) are born to hearing families which do not sign

- Although native signers are not the norm, their linguistic performance can serve as a benchmark for comparisons with other signers

- One way to develop sign language assessment tools

- Can inform research on AoA effects
### BSL Sentence Reproduction Test (BSL-SRT)

- Test of global BSL fluency in adults
- Primary aim: Core assessment test to be used across DCAL
- Based on ASL-SRT (Hauser et al. 2008)
  - ASL-SRT also being used by Karen Emmorey and colleagues
  - DGS version adapted from ASL-SRT by Christian Rathmann and colleagues
- All three research teams have found native signers perform better than non-native signers

### ASL-SRT (Hauser et al. 2008)

- Developed as easy to administer, easy to score test of global ASL fluency
  - Identifies language impairment in children and young adults (Hammill et al. 1994)
  - Distinguishes native English speakers from non-native speakers (Newman et al. 2003)
Method
- 40 ASL sentences, increasing in length and complexity
- Participants instructed to copy sentence exactly as they see it, regardless of whether they use the lexical variants shown
- Score is 1 if reproduction is judged to be exactly the same; otherwise score is 0.

Results
- Significant differences found when comparing scores of adult native signers (N=23) and non-native signers (N=4) (as reported in Hauser et al. 2008)
- Same finding with more participants: native signers (N=42) and non-native signers (N=11) (Hauser, p.c.)
- Later methodological adaptations by Emmorey et al.

Adaptation of stimuli (ASL>BSL)
- Initial rough translation and filming of stimuli from ASL into BSL by deaf native signer fluent in both languages
- Two native BSL signers look through sentences to check/rework them so that:
  - Sentences are linguistically and culturally appropriate for BSL and British Deaf community
  - Sentences contain signs/constructions that would be recognisable to as many BSL users as possible (reduction of variants known/assumed to be specific to particular social groups)
- Another native BSL signer (outside England) reviews sentences and makes suggestions
- A fourth native BSL signer re-orders sentences according to increasing complexity (taking into account phonological, morphological and syntactic complexity)
- Similar procedure used in development of ASL-SRT (Hauser et al. 2008) and adaptation of ASL-SRT into DGS (Rathmann, p.c.)
Considerations in stimulus creation

- **Lexical choice**
  - Aim was to reduce potential use of lexical variant substitutions as much as possible at each level of adaptation
  - Several stages of piloting were needed to identify which variants continued to be problematic to reduce these

- **Non-manuals**
  - ASL-SRT: non-manuals were ignored. Scoring based only on manual reproductions. But, no info about non-manuals in instructions to participants.
  - In creation of BSL stimuli:
    - **Mouth patterns**
      - Model was instructed to use whatever mouth patterns (English mouthing or mouth gestures) were natural for him
    - **Constructed action**
      - Model was instructed to use as little CA as possible; in particular, for eyegaze to be toward camera as much as possible

BSL-SRT: task

- 40 sentences increasing in length & complexity
- Participants watch sentences and repeat exactly same to camera
- Sample easier sentence
  - GIRL WRITE
- Sample more complex sentence
  - DEAF-CLUB CLOSE++ PEOPLE PRO-pl THINK BLAME T-V CAPTION DEAF TEMPT STAY++ HOME WATCH++
  - “Sentence” used loosely
BSL-SRT participants?

- **Dataset**
  - Deaf participants with BSL as preferred language
    - 10 native signers
    - 5 early learners (Age of BSL acquisition: ages 2.5 to 6)
    - 5 late learners (Age of BSL acquisition: ages 11 to 18)

- **Additional measures**
  - Nonverbal IQ via tests of visual-spatial skills
    - Wechsler Abbreviated Scales of Intelligence (WASI)
  - English ability via reading tests
    - General Reading Test II
    - Vernon-Warden Reading Comprehension Test Revised ("Kirklees")

Scoring for ASL/DGS tests

- **Simple scoring system** (Hauser et al. 2008)
  - Any departure from verbatim recall is considered error
  - Native signer raters with minimal training
- In 2010 this was replaced by more flexible scoring with a list of allowed deviations agreed by both Hauser and Emmorey labs (ASL-SRT guidelines)
- DGS scoring system also allows some specific deviations (Rathmann, p.c.)
- The more acceptable deviations to be allowed, the more skills/training is required for raters
Scoring BSL-SRT

- Initially used ASL-SRT guidelines (agreed by Hauser and Emmorey labs) as rough guide
- Each participant was scored independently by at least 3 of the first 4 authors
- Coders met regularly to discuss and resolve disagreements
- One final meeting after all 20 participants were scored to go through any remaining unresolved problems
- Result was BSL-SRT guidelines with limited set of acceptable deviations

Acceptable deviations (ASL-SRT and BSL-SRT)

- Pauses, false starts, self-corrections
- Differences in non-manual features
- Differences in prosody or size of signing, unless meaning is affected
- Differences in English mouthing, unless meaning is greatly affected
- Slight deviations in repetition in any sign, unless meaning is affected
Specific acceptable deviations (BSL-SRT)

- CL: fence with palms facing in toward signer
- MOTORBIKE with symmetrical movement
- NEWSPAPER without forearm rotation
  - (But without repetition was an error)

Scoring BSL-SRT

- Simple ELAN template
  - Score
    - Each sentence gets:
      - 1 for correct (accurate reproduction which may contain acceptable deviations as given in guidelines) or
      - 0 for incorrect (inaccurate reproduction; deviations beyond those considered acceptable)
  - Error type
    - Phonological, morphological, lexical, syntactic
  - Comments
    - Info about what error(s) identified
Results

- Overall, scoring was quite strict
- Difficult test
- Here we focus on accuracy

Native vs non-native

![Bar chart comparing mean raw scores between native and non-native speakers.](chart.png)

- Native (N=10)
- Non-native (N=10)

Mean raw score (out of 40)

*p=0.049

Just significant at 95% confidence interval
Native vs early vs late

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>late</td>
<td>5</td>
</tr>
<tr>
<td>early</td>
<td>5</td>
</tr>
<tr>
<td>native</td>
<td>10</td>
</tr>
</tbody>
</table>

Mean raw score (out of 40)
F(11, 8) = 2.00, p = 0.146
No significant difference at 95% confidence interval

Preliminary results

- Early indications are promising based on small sample
- Test distinguishes between native and non-native signers
- More data is needed:
  - For more robust significance
  - To enable us to see if test will be sensitive enough to distinguish between native, early and late signers
  - To develop cut-off scores
Based on data collected so far, BSL-SRT appears to be usable as a screen for BSL fluency (at least in terms of distinguishing native from non-native signers)

Future directions

• To determine if BSL-SRT can indeed be used as a screen for BSL fluency:
  • More data collection (especially from non-native signers)
  • Items analysis
  • Partialing out reading and visual-spatial skills to more directly look at age of first language acquisition effects
    • Late learners may have English as L1 (Cormier, Schembri, Vinson, Orfanidou, submitted)
  • Error analyses for understanding more about AoA effects in BSL
  • Crosslinguistic comparison across BSL-SRT, ASL-SRT and DGS-SRT for AoA effects across sign languages
References


Acknowledgements

- For assistance in stimulus creation
  - Jordan Fenlon
  - Neil Fox
  - Evelyn McFarland
- Collaborators on ASL-SRT and DGS-SRT
  - Peter Hauser
  - Karen Emmorey
  - Christian Rathmann
- Deaf participants
- Thank you!
Extra slides

BSL-SRT: administering the test

- Stimuli presented via one Quicktime movie (only need Quicktime Player installed)
- Can use video camera (set up behind monitor) or high quality webcam
- 1 hour max (with WASI and reading tests, info sheet, consent, instructions, practice, DCAL background questionnaire)
- 15 minutes (if WASI, reading test scores, and background info already available)
BSL-SRT: scoring

- 1 hour to score 1 participant (40 sentences) as beginner scorer. With experience, 20-30 minutes per participant.

Performance deteriorates with age

![Graph showing performance deterioration with age groups](chart.png)
Performance deteriorates with age

- 2 sentences using less stringent coding criteria (lexical items and order) (Atkinson, Denmark et al., in prep)
- 226 older adults aged 50-89 years
- Significant decrease in accuracy with age $F=2.59$, $P<0.01$
- Strong positive correlation with working memory (digit span)
- $r=0.211$, $p<0.01$
- Task has a high memory load which makes it sensitive to ageing
- It may only be sensitive to native or non-native fluency in signers under 50
- Sentence shadowing rather than repetition will reduce memory load