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ESRC Deafness Cognition and Language Research Centre

## 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  
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## 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  $\leq 5\%$  of American deaf children are native signers (Mitchell & Karchmer, 2004)
  - ◆ Most ( $\geq 95\%$ ) 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



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## 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



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

- ◆ Developed as easy to administer, easy to score test of global ASL fluency
- ◆ Modelled after Test of Adolescent and Adult Language – 3<sup>rd</sup> Edition (TOAL3, Speaking Grammar subtest, Hammill et al. 1994)
  - ◆ Identifies language impairment in children and young adults (Hammill et al. 1994)
  - ◆ Distinguishes native English speakers from non-native speakers (Newman et al. 2003)



## ASL-SRT (Hauser et al. 2008) 5

- ◆ 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) 6

- ◆ 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

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- ◆ **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

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- 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?

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- ◆ 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

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- 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

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- 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)

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- ◆ 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)

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- ◆ 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

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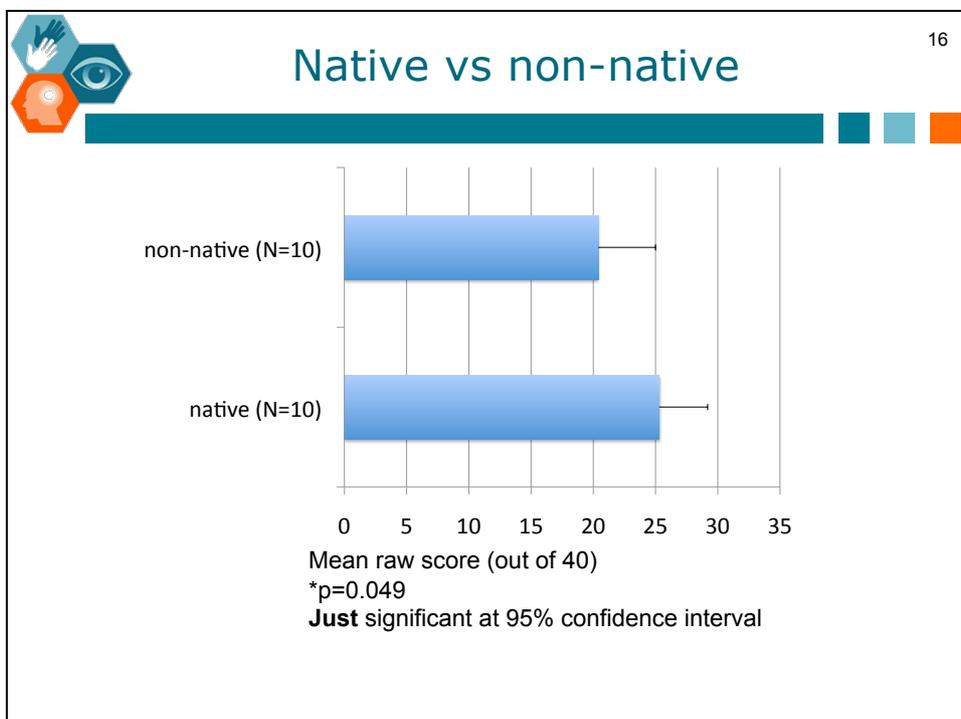
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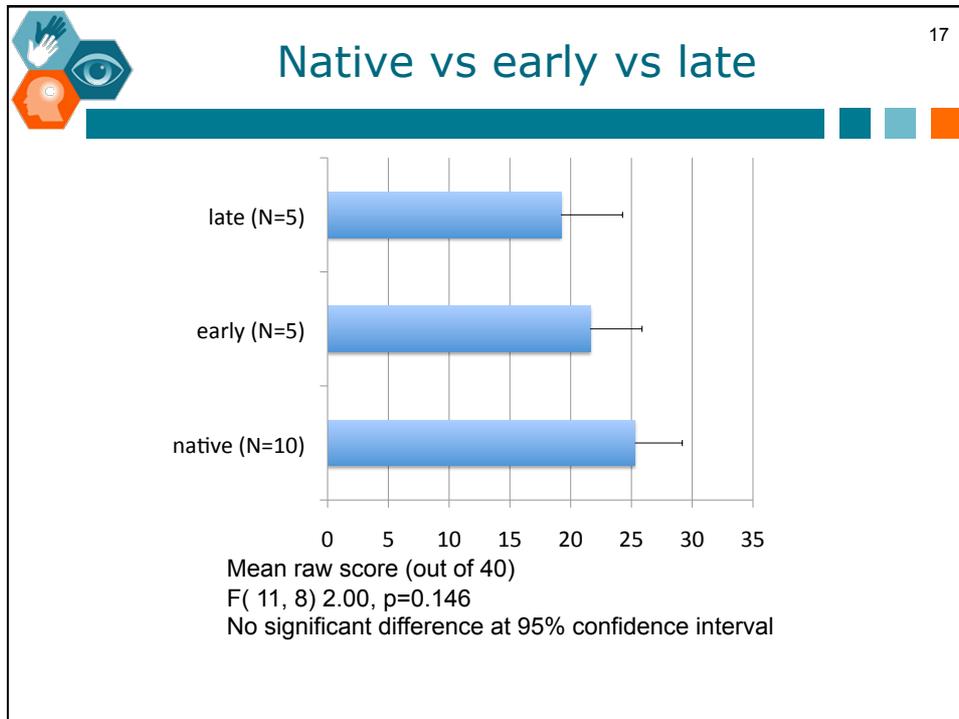
- Simple ELAN template
  - Score
    - Each sentence gets:
      - 1 for correct (accurate reproduction which may contain acceptable deviations as given in guidelines) or
      - 0 for incorrect (inaccurate reproduction; deviations beyond those considered acceptable)
  - Error type
    - Phonological,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

## Results

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





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## 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



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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)



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## 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
  - ◆ Partialling 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

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  - ◆ Karen Emmorey
  - ◆ Christian Rathmann
- ◆ Deaf participants
- ◆ Thank you!





## Extra slides

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## BSL-SRT: administering the test

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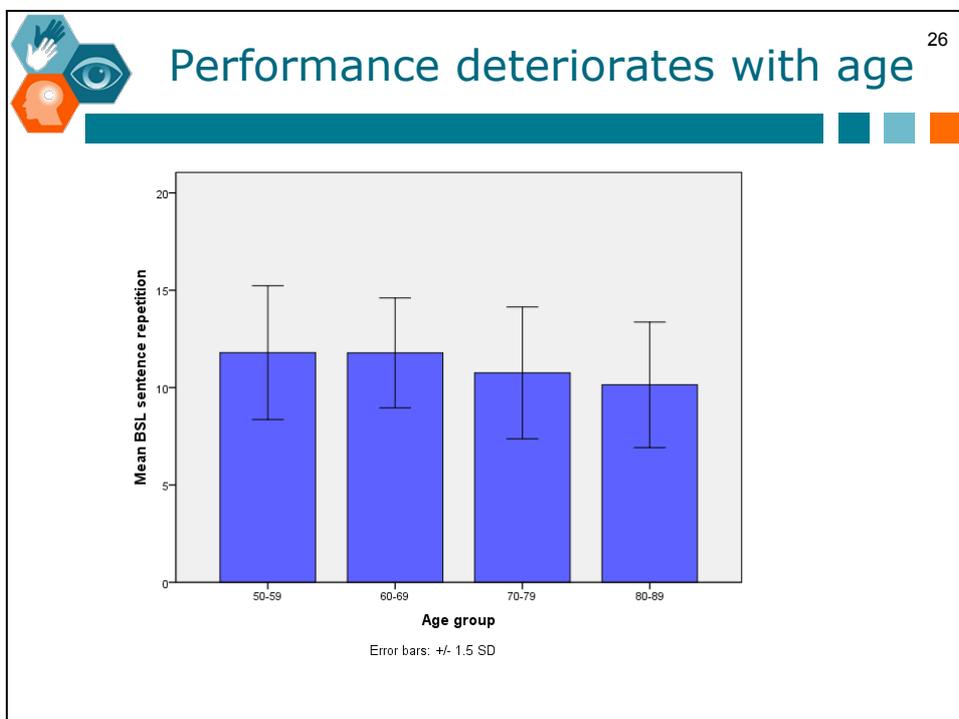


- Stimuli presented via one Quicktime movie (only need Quicktime Player installed)
- Can use video camera (set up behind monitor) or high quality webcam
- 1 hour max (with WASI and reading tests, info sheet, consent, instructions, practice, DCAL background questionnaire)
- 15 minutes (if WASI, reading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

## BSL-SRT: scoring

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





## Performance deteriorates with age <sup>27</sup>

- 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