

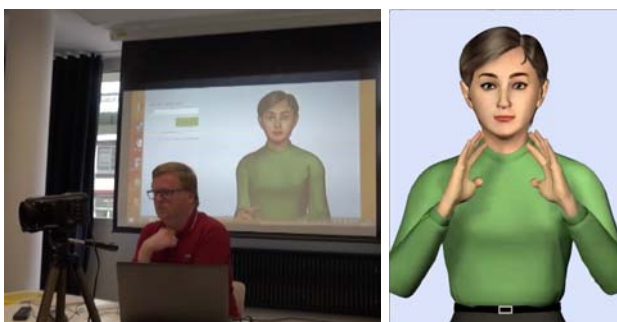
# Evaluation of Animated Swiss German Sign Language Fingerspelling Sequences and Signs

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July 31, 2017

## Overview: Our Study

- Acceptance evaluation of...
  1. Animated Swiss German Sign Language (DSGS) signs
  2. Animated DSGS fingerspelling sequences
- Focus group with seven early learners of DSGS, Deaf moderator



**Figure:** Focus group on animated fingerspelling sequences (left) and signs (right)

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## Finger Alphabet

- Finger alphabets: used, e.g., whenever there is no lexical sign for a concept
- Dedicated signs used for each letter of a spoken language word
- DSGS finger alphabet: separate signs for -Ä-, -Ö-, -Ü-, -CH-, -SCH-

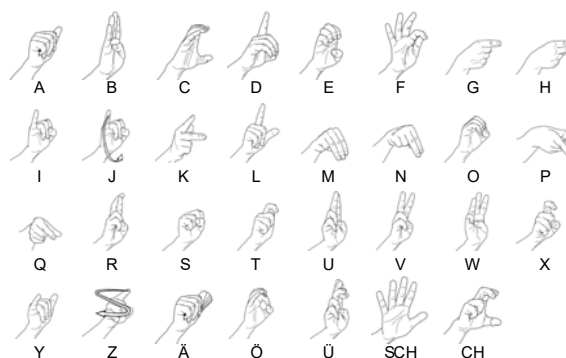


Figure: Finger alphabet of DSGS (Boyes Braem 2001)

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## Need for Finger Alphabet Animation

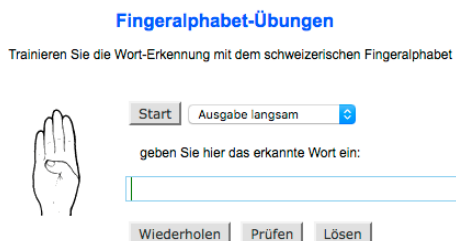


Figure: Traditional fingerspelling learning tool for DSGS  
(<http://www.gebaerden-sprache.ch/informationen-zur-gebaerdensprache/fingeralphabet/erkenne-das-fingeralphabet/index.html>)

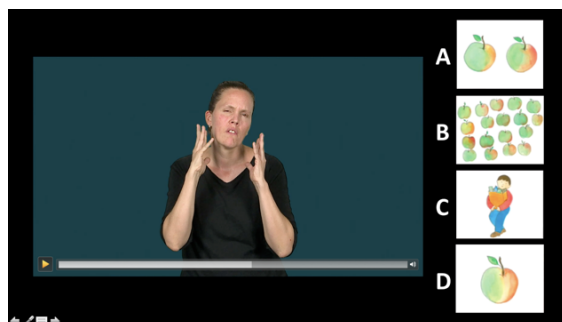


Figure: Fingerspelling sequence N-A in ASL: static (top) vs. animated (bottom)  
(Wolfe et al. 2006)

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## DSGS Receptive Skills Test




- Sign language avatars presumably able to increase motivation and interest in young learners of sign language → *Persona effect* (Lester et al. 1997)
- Our aim: conduct the study with items of Receptive Skills Test (RST) for DSGS (Haug/Perollaz 2015) signed by avatar instead of human



**Figure:** Item APFEL VIELE ('APPLE MANY') in the DSGS Receptive Skills Test (Haug/Perollaz 2015)

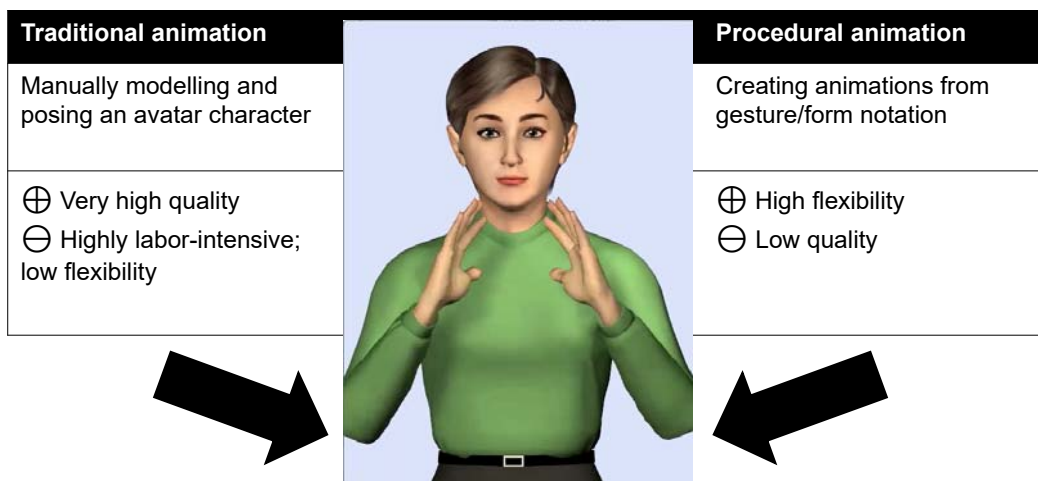
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## Sign Language Animation: Approaches

Traditional animation	Motion capturing	Procedural animation
Manually modelling and posing an avatar character	Recording a human's signing	Creating animations from gesture/form notation
⊕ Very high quality ⊖ Highly labor-intensive; low flexibility	⊕ High quality ⊖ Long calibration time, extensive postprocessing; low flexibility	⊕ High flexibility ⊖ Low quality
 <p><b>Figure:</b> Hand-animated avatar Pedro (<a href="http://www.youtube.com/watch?v=QiY5LU-I16Q">http://www.youtube.com/watch?v=QiY5LU-I16Q</a>)</p>	 <p><b>Figure:</b> Motion capturing at MocapLab (<a href="http://www.mocaplab.com/news/bbc-2-see-hear-visit-mocaplab/">http://www.mocaplab.com/news/bbc-2-see-hear-visit-mocaplab/</a>)</p>	 <p><b>Figure:</b> Fully synthesized avatar Anna, JASigning, University of East Anglia</p>

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## Meet Paula (Again)!



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## Fingerspelling Animation with Paula

- ASL fingerspelling learning tool (Toro et al. 2014; Wolfe et al. 2006, 2015)
- Hand animation of unique transitions between every possible two-letter combination in the alphabet



**Figure:** Fingerspelling sequence T-U-N-A in American Sign Language (Wolfe et al. 2006)

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## Animation of DSGS Fingerspelling with Paula

- Production of hand postures for each letter of alphabet and transitions for each pair of letters
- DSGS finger alphabet: -Ä-, -Ö-, -Ü-, -CH-, -SCH- in addition to ASL
- Difference ASL/DSGS overall: 14 out of 31 hand postures
- Previous study: comprehensibility of animated DSGS fingerspelling sequences (Ebling et al. 2015) → comprehension rate of 90.06%
- Feedback previous study: speed controls needed



**Figure:** Comprehension study DSGS fingerspelling sequences (Ebling et al. 2015)

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## Animation of DSGS Signs with Paula

- Sign transcriber (Wolfe et al. 2011)
- Ten signs from DSGS RST:
 

APFEL ('APPLE')	BLEISTIFT ('PENCIL')
AUTO ('CAR')	BUB ('BOY')
BALL ('BALL')	DA ('THERE')
BÄR ('BEAR')	ESSEN ('EAT')
BETT ('BED')	FRAU ('WOMAN')
- No mouthings included → future work
- Other non-manual features (e.g., head movements, upper-body movements) present



**Figure:** Animation of DSGS sign BETT ('BED')

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## Sign Language Animation Evaluation

- User studies
- Two concepts (Huenerfauth et al. 2007):
  - Comprehension → objective comprehension tasks
  - Acceptance → subjective participant judgments
- Our study: acceptance

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## Our Study (Revisited)

- Evaluate acceptance of...
  1. a subset of animated signs from the DSGS RST
  2. animated DSGS fingerspelling sequences
- Focus group with seven early learners of DSGS between ages 32 and 55, Deaf moderator
- 1.5 hours



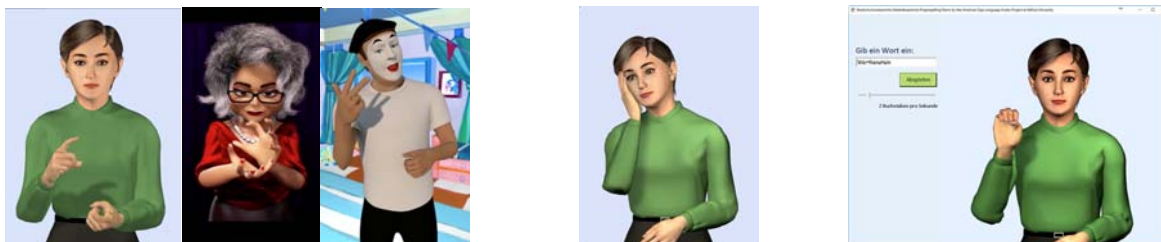
**Figure:** Focus group on animated fingerspelling sequences (left) and signs (right)

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## Our Study: Activities

Three activities:

1. Three examples of avatars producing continuous signing
2. Ten animated DSGS signs from the DSGS RST
3. DSGS fingerspelling learning tool

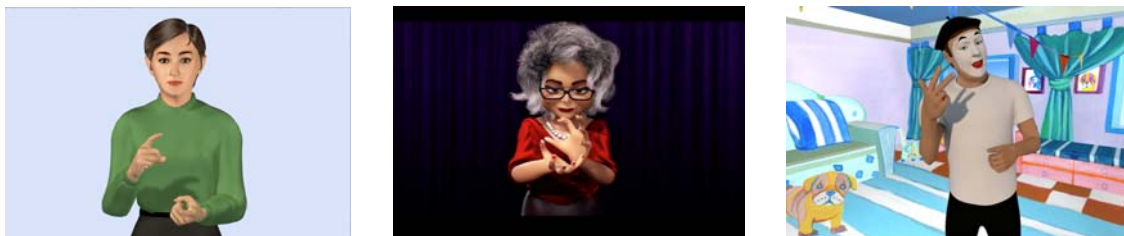


**Figure:** Three activities: Activity 1 (left), Activity 2 (center), Activity 3 (right)

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## Activity 1: Three Examples of Avatars

- Importance of facial expressions → Mira's face very expressive, MocapLab/Gallaudet's a bit less, Paula's too little
- Paula best choice for public information setting, Mira not suitable for this



**Figure:** Three avatars shown: Paula, Mira, and MocapLab/Gallaudet

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## Activity 2: Ten Animated DSGS Signs

- Lack of mouthings
- More facial expression needed
- More movement of head, shoulders, and upper body needed for two signs
- Some movements executed too abruptly
- Handshapes and/or hand positions of some signs need improvement



**Figure:** Animation of DSGS sign BETT ('BED')

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## Activity 3: DSGS Fingerspeller

- Many handshapes correct
- Some hand positions incorrect
- *Glides* missing
- Sign for -SCH- not used
- Signing location of -M-, -N-, -Q- too low



**Figure:** Fingerspeller interface

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## Conclusion and Outlook

- Need improvement:
  - Non-manual features (particularly, facial expressions, head movements, shoulder movements)
  - Manual movements (fluidity)
  - Hand positions of fingerspelling signs
- Future work:
  - Above aspects
  - Replace S-C-H and C-H with -SCH- and -CH-, respectively, where appropriate in fingerspeller interface
  - Incorporate glides for double letters in fingerspeller interface

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## Acknowledgments

We are grateful to the Swiss Deaf Association for hosting the focus group.

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# Thank You!

# Questions?

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