Investigating and operationalizing the construct of fluency in Swiss German Sign Language

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Overview

Background of study

Data that informed the development of the fluency rating scale

The fluency rating scale

Evaluating the scale

Discussion

Background

Fluency is one of the most salient features of spoken language proficiency (e.g., Derwing et al., 2004)

Narrow notion of fluency (Lennon, 1990), i.e., temporal aspects of speech: speed, pauses, repetitions, repairs (Tavakoli et al., 2020)

Very little research on sign language fluency

Goals of study

Identify aspects of fluency in Swiss German Sign Language (*Deutschschweizerische Gebärdensprache*, DSGS)

Develop and validate a DSGS fluency scale (not an entire test on fluency)

Data/sources of information that informed the rating scale development

Theory from spoken and sign language fluency

Focus group interview with sign language teachers (*N* = 3)

Regression analysis of annotated performances from DSGS users with three levels of proficiency (*N* = 28)

Sign language fluency

Speed of signing: Deaf L1 signers sign faster than hearing L2 signers (e.g., Cull, 2014; Hilger, 2013; Sipronen, 2018)

Number and length of pauses: Deaf L1 signers produce fewer and shorter pauses than hearing L2 signers (e.g., Sipronen & Kanto, 2022)

Status of unfilled pauses not clear: non-manual activities (Notarrigo & Meurant, 2014)

Filled pauses: PALM-UP, finger wiggling (Emmorey, 2002; Spijker & Oomen, 2023)

Repetitions of signs (Notarrigo & Meurant, 2022)

Sign language specific: Coordination of manual and non-manual activities, e.g. eye gaze, mouthing (Notarrigo & Meurant, 2014; Spijker & Oomen, 2023)

Focus group with sign language teachers

Focus group interview with three deaf sign language teachers (ages: 46, 47, 78)

Goal: Learn from intuitions of experts regarding the indicators of signing fluency

Focus group in DSGS was video-recorded, translated into written German

Development and application of coding categories to transcript

Categories: length of pauses, number of pauses, signing speed, repetition, self-correction, use of manual and non-manual activities

Frequency of different coding categories in the focus group transcripts (*N* = 218)

Coding Categories	Frequency
Pauses	55
Use of non-manual components (e.g., eye gaze, eyebrows)	38
Rhythm	30
Repetitions	28
Speed of signing	24
Finger wiggling	16
Stretched signs	15
Self-corrections	12

Annotated DSGS performances

Annotated DSGS performances from signers with different levels of proficiency (*N* = 28)

- Deaf L1 signers (*n* = 8): L1
- Hearing advanced users of DSGS (i.e., sign language interpreters; *n* = 9): L2 advanced
- Hearing beginning learners of DSGS (A1/A2; *n* = 11): L2 beginner

Goal: to identify aspects of fluency related to proficiency

Results of annotated data

Speed of signing: L2 beginner signed approximately 1.5 times slower than the L1 (no difference between L1 and L2 advanced)

Number of pauses: L2 beginner and L2 advanced produced significantly more pauses than the L1

Duration of pauses: L2 beginner produced 2.2 longer pauses than L1 (no difference between L1 and L2 advanced)

Repetitions/self-repairs: L2 beginner produced twice as many repetitions and self-repairs than L1 (no difference between L1 and L2 advanced)

Results of annotated data

Non-manual markers: *While pausing*, L1 produced more non-manual markers than the other two groups, specifically more mouth actions and head movements than L2 beginner

Summary

Criteria	Theory (review of literature)	Focus group interview	Annotated data
Criterion C1: Number of pauses	Yes	Yes	Yes
Criterion C2: Length of pauses	Yes	Yes	Yes
Criterion C3: Use of non-manual components during the production of pauses	Yes	Yes	Yes
Criterion C4: Signing speed	Yes	Yes	Yes
Criterion C5: One or more repetitions of a lexical or productive sign (no self-corrections)	Yes	Yes	Yes
Criterion C6: Self-correction of lexical or productive signs	No	Yes	Yes

DSGS Fluency Rating Scale

Rating scale for sign language fluency

Areas	No.	Criteria	Rating scale					
PAUSES	C1	Number of pauses	very many pauses 1	2	3	4	5	very few pauses 6
	C2	Length of pauses	very long pauses 1	2	3	4	5	very short pauses 6
	C3	Use of non-manual components (NMC, e.g. eyebrows, gaze, mouth activities) during the production of pauses	very rare simultaneous use of NMC and pauses 1	2	3	4	5	very frequent simultaneous use of NMC and pauses
SPEED	C4	Signing speed	very slow signing speed 1	2	3	4	5	natural signing speed 6
REPETITIONS	C5	One or more repetitions of a lexical or productive sign (no self-correction)	very many repetitions 1	2	3	4	5	very few repetitions 6
SELF-CORRECTIONS	C6	Self-correction of lexical or productive signs	very many self-corrections	2	3	4	5	very few self-corrections 6

Evaluating rating scale: Rating study

Goal: to evaluate and validate the fluency rating scale

Raters: three deaf DSGS teachers

Rater training: online, by deaf linguist

All signed productions (same as annotated data; *N* = 162) were rated by all three raters

Each production was approximately 20-30 seconds long

Rating on all six criteria

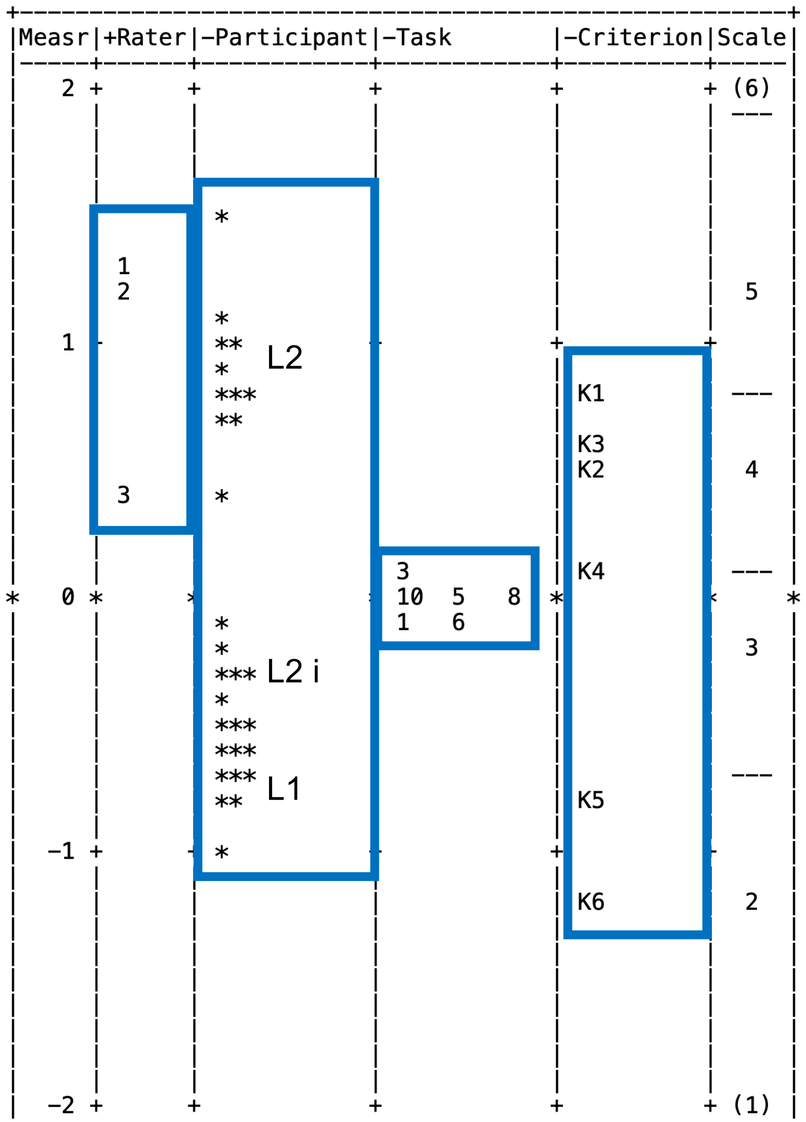
Results of rating study

Data analyzed with many-facet Rasch measurement (FACETS)

5-facet model:

- Raters (3 raters)
- Participants (28 participants)
- Languages (participants' language: L1, L2 advanced, L2 beginners)
- Tasks (6 tasks)
- Criteria (6 rating criteria)

Results of rating study



Rasch measures explained 59.49% of the variance

Good fit statistics across all facets (Infit and Outfit MS), close to 1

Rater 3 was significantly more severe

L1 participants performed best, followed by L2 advanced and L2 beginners

All tasks were of very similar difficulty (separation index = 1.96)

Criteria 1, 2 and 3 (pauses) were more difficult than other criteria

Infrequent use of scale category 1

Correlations of objective scores (annotated data) with specific scores (rated data) across all study participants (*N* = 28)

Correlation of objective scores with specific scores	Pearson's *r*	*p*	Strength of correlation*
Number of pauses	-.603**	<.001	strong
Length of pauses	-.777**	<.001	strong
Speed of signing	-.592**	<.001	strong
Self- corrections	-.608**	<.001	strong
Non-manual brows***	.344	.073	
Non-manual head***	.489**	.008	medium
Non-manual mouth***	.280	.150	

*According to Plonsky & Oswald (2014); **significant at the .01. level (2-tailed); *** correlated with specific score for general non-manual component use

Discussion

Content validity: theory of spoken and sign language fluency, intuitions of experts, investigation of performances samples

Validity evidence based on internal structure: Many-facet Rasch measurement

Valdity based on relation to other variables: compare scores of three proficiency groups

Limitations

Annotation process

Self-report in DSGS proficiency vs. objective measures

Task complexity

Task preparation time

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