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Sign Language Assessment in Aphasia: New tools, preliminary data, and insights for clinical practice

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Background. Signers, deaf or hearing, can experience acquired language disorders following neurological conditions, yet unlike for spoken languages, standardized diagnostic tools are lacking for most sign languages. This might result in delayed or incorrect diagnoses, inappropriate intervention and negative impact on quality of life. As for all languages, diagnostic tools should be developed or adapted respecting the cultural and linguistic specificities of each sign language. To address this, our team built on insights from the SIGN-HUB project testing batteries [1], which provided rich data but whose assessment battery proved too complex for clinical use. This work serves a dual purpose: developing the first aphasia assessment tools for French Sign Language (LSF) and Italian Sign Language (LIS), and contributing to the neurolinguistic understanding of sign language. We briefly describe a screening test and a more detailed assessment tool for both languages, along with preliminary LSF results from a normative sample and selected clinical case studies.

Methods. For the screening test, we completed the adaptation of Language Screening Test (LAST) [2] to LSF and adapted it to LIS. LAST is composed of naming, automatic language, repetition, lexical comprehension, and order execution tasks. Adaptations involve appropriate phonological, semantic, and visual distractors for lexical tasks and minimized use of highly iconic items that could be performed also by non-signers. For the comprehensive assessment, named Assessment of LSF/LIS in Aphasia (ALSFA/ALISA), we developed a battery based on neurolinguistic tools for spoken languages [3-4], previous assessments for American Sign Language (ASL) [5] and the SIGN-HUB batteries [1]. SIGN-HUB findings, particularly the influence of age of sign language acquisition on performance, informed the choice of clinically relevant tasks and structures. ALSFA/ALISA includes tests for apraxia, semantics, picture description, automatic language, verbal fluency, naming, repetition, lexical comprehension, sentence comprehension, and verbal agreement. Normative data collection and clinical case studies have begun for LSF, with LIS data collection scheduled to start in September.

Results. Preliminary normative data come from 25 LSF signers: gender (16F/9M), age (mean: 43 y), education (mean: 17 y), hearing status (16 deaf, 9 hearing), LSF acquisition (6 native, 5 early, 14 late), spoken French use (17 daily, 4 frequent, 4 rare). We also analyzed 6 case studies of signers with acquired language disorders: gender (2F/4M), age (mean: 48 y), education (mean: 12 y), hearing status (4 deaf, 2 hearing), LSF acquisition (2 native, 2 early, 2 late), spoken French use (2 daily, 2 frequent, 2 rare), etiology (5 stroke, 1 unknown). LAST results are in *Table 1*; ALSFA comprehension tasks in *Table 2*. Production data are partly analyzed; semantic fluency and sentence repetition results appear in *Table 3*. *Table 4* compares picture description performance between one Deaf signer with aphasia and a matched control.

Discussion. Participants in the normative sample performed near ceiling on all LAST tasks and on ALSFA comprehension tasks, except for verbal agreement in late signers, in which not at ceiling performance may stem from the change in task format (match/mismatch rating vs. picture matching used in other ALSFA/ALISA tasks) and from the limited number of items which may impact on the familiarization with the task. LAST reliably detected language impairments in all clinical case studies except one CODA with mild post-stroke symptoms. ALSFA lexical and sentence comprehension tasks, along with sentence repetition, identified difficulties in 4 out of 6 cases, while semantic fluency revealed impairments in 5. Picture description analysis showed reduced spontaneous production in the pathological case, with fewer signs, lower syntactic complexity, and less conveyed information. Overall, these preliminary findings support LAST as a promising screening tool and ALSFA/ALISA as possibly informative instruments for assessing distinct linguistic components.

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Tables

Table 1. LSF-LAST preliminary normative data and case studies performance.

	LAST – version A									LAST – version B								
	Production (/8)			Comprehension (/7)			Total (/15)			Production (/8)			Comprehension (/7)			Total (/15)		
	Mean	SD	Cutoff	Mean	SD	Cutoff	Mean	SD	Cutoff	Mean	SD	Cutoff	Mean	SD	Cutoff	Mean	SD	Cutoff
Deaf control signers (n=16)	8	0	≤ 7	6,8	0,54	≤ 6	14,8	0,54	≤ 14	7,94	0,25	≤ 7	6,75	0,45	≤ 6	14,69	0,48	≤ 14
PT1 (Deaf late)	7		=	6	-1,48	=	13	-3,33	<	NA	NA		NA	NA		NA	NA	NA
PT4 (Deaf early)	NA	NA	NA	NA	NA		NA	NA		NA	NA		NA	NA		NA	NA	NA
PT5 (Deaf late)	7		=	5	-3,33	<	12	-5,19	<	7	-3,76	=	4	-6,11	<	11	-7,69	-
PT6 (Deaf early)	7		=	5	-3,33	<	12	-5,19	<	7	-3,76	=	5	-3,88	<	12	-5,6	-
Hearing control signers (n=9)	**7.78**	**0.67**	**≤ 6**	**6.89**	**0.33**	**≤ 6**	**14.67**	**0.71**	**≤ 13**	**8**	**0**	**≤ 7**	**6.89**	**0.33**	**≤ 6**	**14.89**	**0.33**	**≤ 14**
PT2 (CODA)	8	0.33	+	7	0.33	+	15	0.46		8		+	7	0.33	+	15	0.33	+
PT3 (CODA)	6	-2.65	=	5	-5.73	<	11	-5.17		7		=	6	-2.7	=	13	-5.73	-

Notes (Tables 1 to 3). Normative data in bold. Red: performance <-1.5 SD; yellow: -1.5<x<-1 SD; green: >-1 SD.

Table 2. ALSFA preliminary normative data and case studies performance (comprehension).

	Semantics		Lexical comprehension		Sentence comprehension		Verbal agreement	
	%correct	SD	%correct	SD	%correct	SD	Mean	SD
Deaf control late signers (n=8)	**0.97**	**0.33**	**0.99**	**0.03**	**0.98**	**0.06**	**0.71**	**0.38**
PT1 (Deaf late)	0.9	-0.21	1	0.33	1	0.33	0.88	0.45
PT5 (Deaf late)	1	0.09	0.92	-2.33	0.83	-2.50	0.13	-1.53
Deaf control early signers (n=5)	**1**	**0**	**0,98**	**0,06**	**1**	**0**	**1**	**0**
PT4 (Deaf early)	1		0.63		NA	NA	NA	NA
PT6 (Deaf early)	0.7		0.87		0.75		0.25	-4.50
Hearing control native signers (n=3)	**1**	**0**	**0.94**	**0.09**	**1**	**0**	**0.94**	**0.34**
PT2 (Hearing CODA)	1		1	0.67	1		1	0.2
PT3 (Hearing CODA)	0.9		0.73	-2.33	0.92		0.63	-0.9

Table 3. ALSFA preliminary normative data and case studies (production, partial analysis).

	Semantic fluency (Animals - 1 minute)		Sentence repetition (Score /12)	
	Mean	SD	Mean	SD
Deaf control signers (n=16)	**19,93**	**5,61**	**9,73**	**1,8**
PT1 (Deaf late)	11	-1,59	9	-0,41
PT4 (Deaf early)	1	-3,37	3	-3,74
PT5 (Deaf late)	16	-0,70	4	-3,18
PT6 (Deaf early)	9	-1,95	5	-2,63
Hearing control signers (n=9)	**17.11**	**4.54**	**9.41**	**1.91**
PT2 (Hearing CODA)	9	-1.79	9	-0.21
PT3 (Hearing CODA)	7	-2.23	1	-4.4

Table 4. Examples of ALSFA picture description analysis.

	Content score (/27)	N° of signs	MLU	%CIU	CIU per minute	Extract
PT1	18	31	3.9	81%	40.6	[OLD] [WATCH] [TELEVISION] [HEM….] [OLD] [BOOK]
PSC11	26	63	12.6	76%	51.3	[GRANDMOTHER] [SIT] [personal-transfer-ROCKING CHAIR] [BOOK] [READ] [NEXT TO] [GRANDFATHER][WATCH] [ARMCHAIR] [WATCH] [TELEVISION].

Notes. PT1 45 yo, male, post-stroke aphasia (12 months post onset). PSC11, 53 yo, female. Both born Deaf in a hearing-French speaking family, exposed to LSF in late childhood; equal education levels (12 ys). MLU: Mean Length of Utterance. CIU: Correct Information Unit.

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