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Structural Correlation between Location and Movement of Signs: Lacking Motion Economy for Co-speech Gestures?

Building a formal transcription system for Sign Language and gestures: Typannot.


GestualScript

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


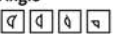
Affiliations

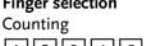

1. ESAD Amiens, France;
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A – General Framework

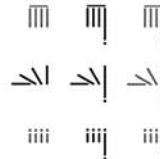
1  1TOCscCO 234Fo

1 Index
TO Thumb Opposed
Csc Curved semi-closed
CO Contact
234Fo Middle Ring Pinky Flat open

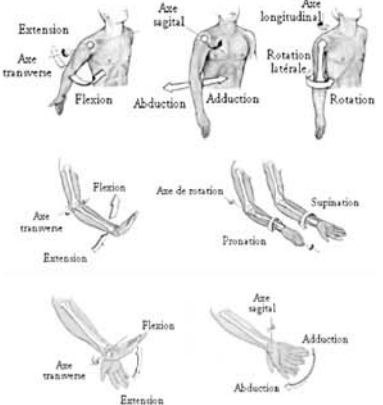
2 Lateralization   Finger designation  Angle 

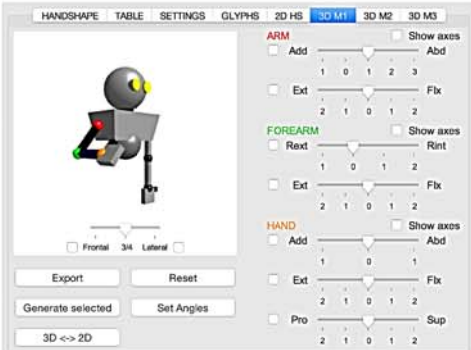
Finger selection Counting  Closeness 

Clustering  Shape 


3 


B – INITIAL LOCAtion (LOCini)


1 

2 

C – MOVement (MOV)

1  LOCini SIGN

2  [THANKS]

3  [THANKS]

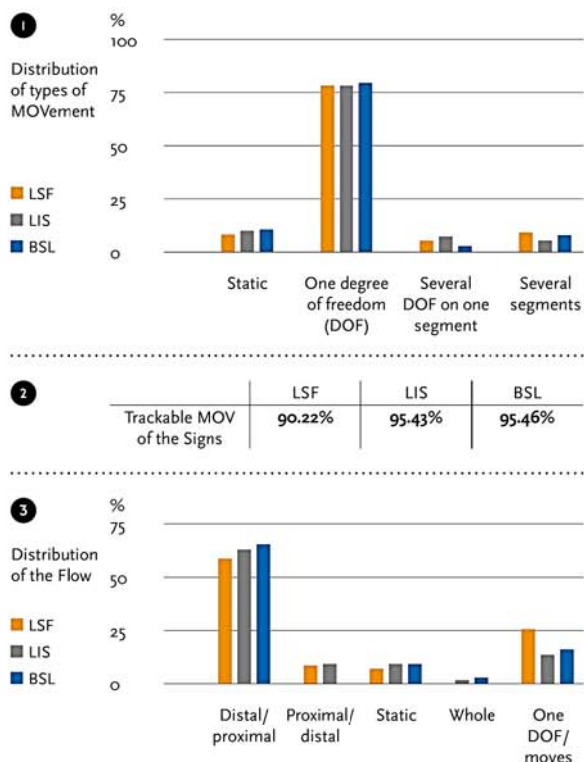
D – Hypothesis

- 1 Hyp. 1: The MOVement has a simple motor schema to minimize the motor control during the sign.
- Hyp. 2: The distal-proximal flow of the MOVement is predominant in SL.

E – Transcription

1 

F – Results

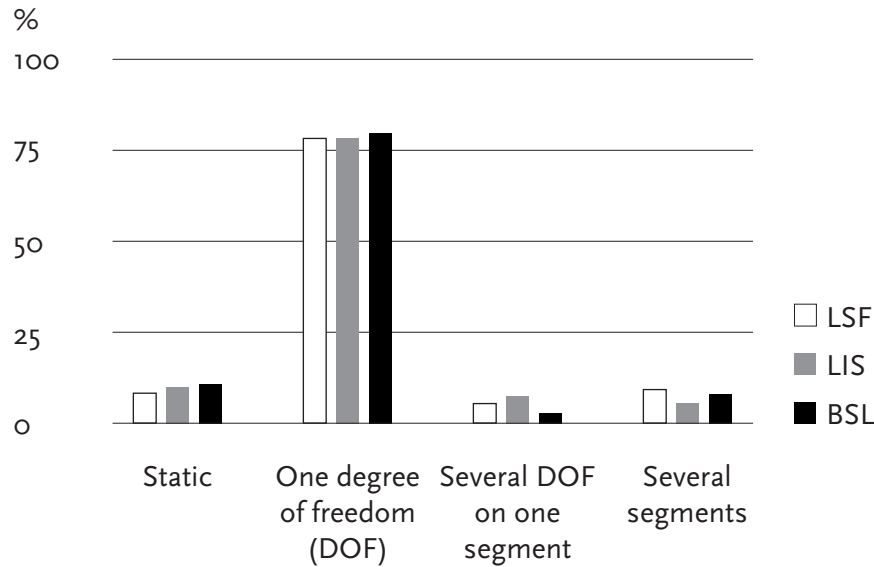


G – Outcomes

E – Results

1 Distribution of types of MOVement

Hyp. 1 is interesting.
Optimal use of ressources.
Reduction of the motor control > stabilization of Signs.

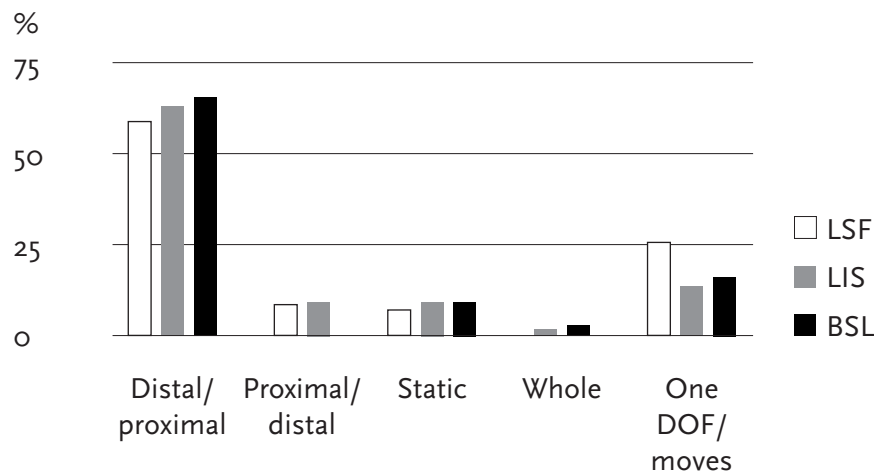


2

	LSF	LIS	BSL
Trackable MOV of the Signs	90.22%	95.43%	95.46%

3 Distribution of the Flow

Hyp. 2 is interesting.
The Distal-Proximal is the main flow.
The organization of the MOVement is coming from the distal segments.



F – Outcomes

1 Proof of concept

– The motor control is reduced for the most unstable parameter: the MOVement. This observation is available if and only if we consider signs according to intrinsic frames of reference (one per each segment).

It is one of the specificity of the project Typannot.
– The parameter LOCini participates to the conditions of realization for the stabilization of signs: the set up of the relative position of segments for a following simple MOVement.

2 Assumption

The MOVement for the preparation phase could be more unstable, more complex or more proximal-distal.
It gives some clues for the signs segmentation.

3 Next step

Check these points with a MOCAP Corpus.

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A – General Framework

11st step:
Graphematic formula



1TOCscCO 234Fo

1Index

TOThumb Opposed


CscCurved semi-closed

COContact


234FoMiddle Ring Pinky Flat open

22nd step:
Generic glyphic formula


Lateralization



Finger designation




Angle




Finger selection


Counting




Clustering



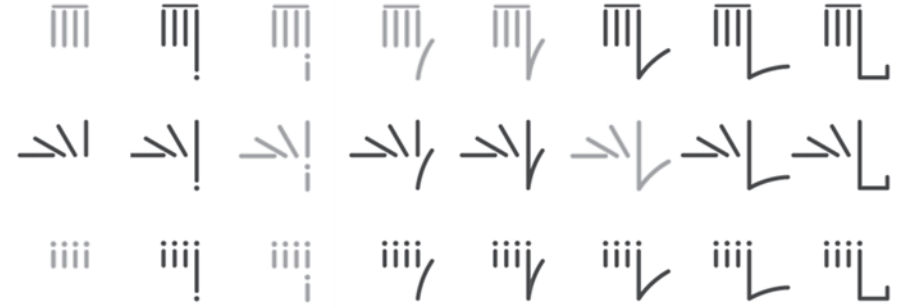
Closeness



Shape



33rd step:
Specific glyphic formula
for all the handshapes



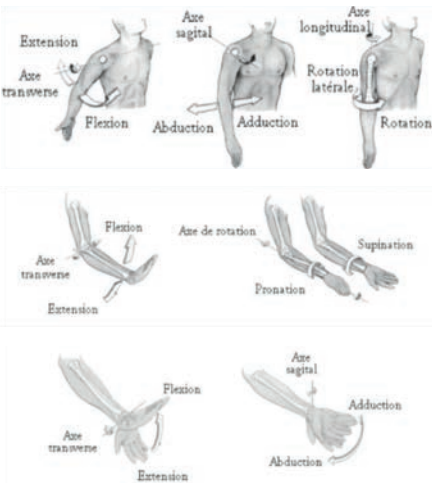
B – INItial LOCation (LOCini)

Motoric schemas (Keele 1967) are present before and during the Sign.

1Each degree of freedom (DOF) must be considered in its own frame of reference > Multiple intrinsic Frame of Reference (Boutet 2015).

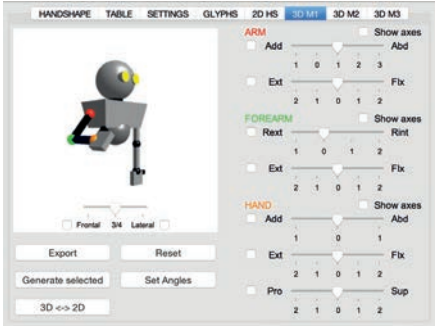
Then the LOCALization is much more complex than the location of the hand alone.

Hand Place =
Arm LOC + Forearm LOC + Hand LOC



2A virtual keyboard to compose graphematic formula.

Ex: ArmAbd1 ArmFlexØ
ForFlexØ ManuSupiØ
ManuFlexØ ManuAbdØ




C – MOVement (MOV)

1How MOVements in SL can be stabilized and simple while motion is changing?

Motoric schemas (Keele 1967) are present before and during the Sign.

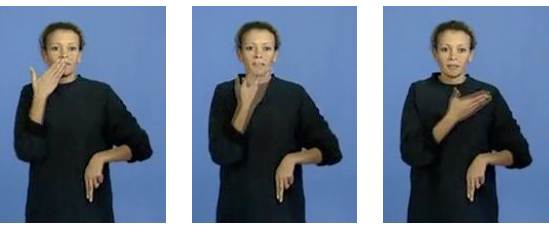
How to establish the MOVement from the preparation phase to the MOVement involved in a Sign?

2Preparation has a target:
– find a well balanced LOCini;
– stabilized enough to be the starting point of simple MOVements



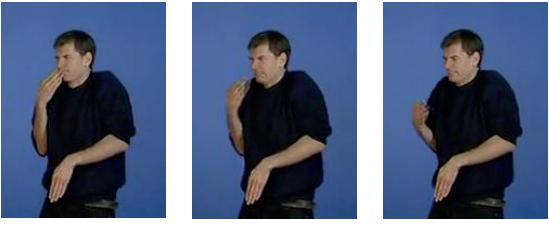
A simple motoric schema stabilizes Signs:
– because of the simplicity of what the motor control has to do after the LOCini positions;
– because of the transfer of the MOVement on other DOF due to inertia and to geometric relationships between what the joints allow as movements;
– when the transfer of the movements corresponds to the alignment of other DOF.

3LOCini: ArmAddØ FlexØ
ForFlex2RotInt2 Manu-SupiFlexØAdd1
MOV.: Segments affected: Forearm to Hand
Pulse: Supi Exten



[THANKS]

4LOCini: ArmAddØ FlexØ
ForFlex2RotInt2 Manu-SupiFlex1Add1
MOV.: Segment affected: Arm
Pulse: Exten



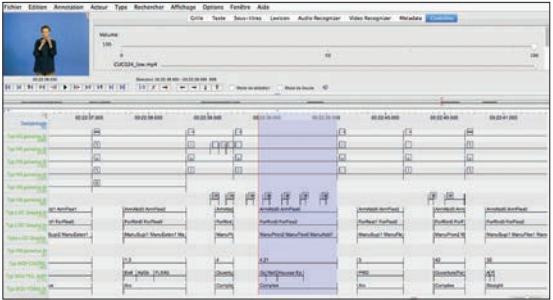
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D – Hypothesis

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Hyp. 2: The distal-proximal flow of the MOVement is predominant in SL.

E – Transcription

1



Transcriptions to proof our concept:
FSL: 1 min;
LIS: 1 min 53 s;
BSL: 50 s