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«Speech handling»[1]:A multimodal analysis of simultaneous interpreters' gestural behaviours. Patterns of gestural usage under increased cognitive load during simultaneous interpretation from L2 to L1.

Abstract

In the present paper the results of empirical research aimed at investigating the phenomena of gestural behaviour of simultaneous interpreters at times of increased cognitive load will be presented.[2] *19 participants – both professional interpreters and undergraduate students in Conference Interpreting – were asked to record their SI performance on a TED Talk lecture from English to Italian. The gathered material, consisting in a 209-minute corpus of video footage, was analysed with the aim of assessing the types and functions of the specific gestures all subjects performed in co-occurrence with perceived disfluencies in interpreting production, with the purpose of demonstrating the facilitative role gestures play in the context of multimodality of simultaneous interpreting, which goes far beyond a mere communicative function.*

Keywords: *co-verbal behaviour, simultaneous interpreters, intense cognitive load, gestures, simultaneous interpreting, facilitative role.*

1. Introduction - Theoretical overview

The literature on simultaneous interpreting has long defined this profession as a highly-demanding activity, cognitive efforts-wise. According to Gile's Effort Model (1980), SI is composed of «a set of multiple cognitive operations which can be grouped into three Efforts» (Gile 2008: 1): 'Listening and Analysis Effort', 'Production Effort' and 'Memory Effort'. What's more, this cognitive triad is subordinated to the 'Coordination Effort', allowing attention allocation and shifts between the three aforementioned steps[3]. All three Efforts implied are not spontaneous, and «at least partly competitive» (Gile 2017: 2). In this respect, the 'Tightrope Hypothesis' – departing from the assumption of limited attentional resources available – shows that SI performance quality is not as much jeopardised by intrinsic difficulties of a particular source text, as by the fact that interpreters work most of the time near 'saturation level', i.e. close to cognitive processing capacity saturation for each effort involved.

In order to obviate such difficulty – as sustained by the concept of «economy of intermediate representation» (Setton 1999: 4) based on Johnson-Laird and Byrne's Mental Model Theory of cognition (1983) – interpreters can coordinate input and output through a mental modelling processing, which makes both language comprehension and production faster and more accurate,

1 Cfr. List of cited literature (Streeck 1994).

2 This experimental project was conducted in collaboration with the Moscow State Linguistic University's Centre for Socio-Cognitive Discourse Studies (SCoDis).

3 Cfr. List of cited literature (Baddeley-Hitch 1974: 47-89).

enabling them to process any portion of a given speech creating a sort of 'mental segmentations' which have the potentiality to reduce both Listening and Production Efforts as the process of interpretation proceeds.

From that, it follows that SI should be regarded as a Multimodal process which involves matching the interpreter's input and output with the «activated mental representations that are conceptually shared by two working languages» (Pavlenko 2009). As an additional cognitive burden, in interpreters – as in all bilingual or multilingual individuals – these mental images are semantically linked to the lexical representations in all their languages. Thus, correlations between the lexical items in one language may be triggered even when another language is used, since they are linked to the same internal constructs.

That being said – since the final objective of this study is to analyse simultaneous interpreters' gestural patterns, with the aim of providing robust evidence in support of the facilitative role of gestures in offloading an increased cognitive pressure – it is worth wondering how the function of gestures fits into the context of Multimodality in SI.

The earlier discussed ability of the mind to create perceptual experience via mental models leads to the principle of 'Embodied Cognition' – and, subsequently, of 'Embodied Language Processing' – which describe human sensorimotor system as fundamentally integrated with cognitive and language processing. This very same idea can be found at the basis of the well-renowned 'Theory of Growth Points' developed by McNeill (1992), which postulates the existence of conceptual links between utterances and gestures. Therefore, gestures serve a fundamental communicative function, substantially affecting the final message extractable from the communicative act.

Nevertheless, results from many research studies suggest that gestural behaviours may also serve a speaker-oriented function, both in terms of co-speech and «co-thought» (Schwartz-Black 1996, Hegarty-Mayer-Kriz-Keehner 2005) gestures. In this regard, it has been proved that people tend to perform gestures even in the absence of an interlocutor[4] since – as mentioned by Kita (2000) and further demonstrated by Bavelas et al. (1992) – not all gestures are intended to be seen. As a further proof, studies about gestures used by congenitally blind individuals, who have never seen gestures and have no experience whatsoever with their communicative function[5], as well as research showing a general increase in quality of both speech comprehension and production for individuals suffering from aphasia or stuttering[6], reinforce, once again, the role of gestures as a self-oriented facilitative tool in cognitive and linguistic processing.

Lastly, departing from the important difference Streeck (2006) outlined between 'depiction' and 'ception' [7] , it is possible to motivate the rationale behind this study. Simultaneous interpreting constitute a stand-alone communicative typology which implies interpreters' ability to simultaneously understand and match the lecturer's inner world with their own, in order to reproduce

4 Cfr. List of cited literature (Rimé 1983).

5 Cfr. List of cited literature (Iverson-Goldin-Meadow 1997); (Alibali-Chu-Kita 2017).

6 Cfr. List of cited literature (Akhavan-Goksun-Nozari 2016).

7 From Latin 'cap-', take, 'ception' is the «bodily form of conceiving, i.e., of conceptually structuring content to be articulated in speech» (Streeck 2006: 74).

meaning through a monomodal linguistic channel, in a way to convey the intended message to a multitude of heterogenous 'world conceptualisations'. This – which has been analogously described by Poyatos as «the absurd but inevitable incongruence inherent in interpretation» (Poyatos 1997: 260)

– can nothing but result in a significant increase in cognitive load.

Assuming the validity of gesture's self-oriented facilitative role in cognitive and linguistic processing as the only possible explanation for simultaneous interpreters' gestural behaviours, this study is aimed at proposing a third role of gestures, i.e. as a coping strategy applied «outside the realm of conscious awareness» (Streeck 2006), in order to offload intense cognitive pressure during SI, ensuring the highest possible quality of the mediated communicative act.

2. Methods

In order to assess the key role gestures play in SI at times of 'cognitive overload', this research was carried out on the specific interpreter's gestural patterns that co-occurred during perceived disfluencies in interpreting production, analysing video recordings from 19 Italian simultaneous interpreters – both novice and experienced subjects – who were asked to interpret a TED Talk video lecture[8] from English to Italian on evolution and extinction of species.
All participants were provided with a glossary to consult to prepare on the subject; the topic didn't require any special knowledge, however the lecture contained various terms and numbers, which are known to be particularly difficult for SI[9].

For reasons related to the impossibility of scheduling a single recording session for all participants on the same date and in the same venue, each interpreter autonomously filmed themselves; nevertheless, they were meticulously instructed on how to proceed in order to ensure the design of the study to be as ecologically valid as possible.

During the recording sessions, the interpreters were asked to sit at a desk – which had to be completely cleared of any kind of object – and to record their simultaneous interpretation using a device placed in front of them, making sure to frame themselves half-length, without cutting their head or removing their hands from the frame throughout the recording. Besides, since the aim of the study was to analyse hand movements, they were also asked not to hold anything in their hands. The source text was presented as an audio and video file and played through headset, simulating, as much as possible, a normal booth-like work environment.

Afterwards, all participants were provided with 3 documents to fill in: the LEAP-Q[10] and Handedness Questionnaires, as well as the Survey for Interpreters form, for us to collect data on their language proficiency level, professional expertise, dominant hand and personal opinions on the

[8] https://www.ted.com/talks/michael_benton_mass_extinctions_and_the_future_of_life_on_earth

[9] Cfr. List of cited literature (Desmet-Vandierendonck-Defrancq 2018).

[10] Language Experience and Proficiency Questionnaire (Marian-Blumenfeld-Kaushanskaya 2007; North-Western Bilingualism & Psycholinguistics Research Laboratory).

source text in terms of familiarity with the topic, expert knowledge needed, level of vocabulary used and the speaker's way of speaking. A descriptive analysis (total numbers and percentage) for each investigated parameter was conducted to assess their relevance for the entire group of subjects.

3. Data extraction

The gathered material was analysed using ELAN annotation software[11], in which we created tiers to annotate speech difficulties and their categories, as well as all gesture typologies and the hand(s) used to perform them.

3.1 Speech analysis

Firstly, each participant's speech was transcribed and the respective audio files were segmented, allowing to insert the written target text in the dedicated tier, in order to mark each speech disfluency in the exact same portion of both the text and the audio file. The following step consisted in marking moments of difficulty in the interpreting output, always referring to the transcription of the original text to check whether some of the perceived disfluencies were somehow part of the original lecture or whether they actually reflected the interpreter's increased cognitive pressure.

3.2 Gesture analysis

The Gesture Coding phase was firstly concerned with the analysis of all gesture phrases occurring at times of fluent interpreting, obtaining a 'control portion' to see, for comparison, what interpreters did when they were not having difficulties. Secondly, we investigated all gesture phrases overlapping in time with instances of disfluencies detected in the interpreting output. Once all gestural units were detected, we focused on coding gesture functions, choosing them while listening to the interpreter's audio file, determining their role in context, as accurately as possible; indeed, – although gestures are usually multifunctional – we selected the main function we perceived a given gesture had in that precise context.

4. Results

Jamovi Statistical Software12 was used to find correlations between interpreters' gestural activities and their co-occurring linguistic signals of increased cognitive load.

[11] The programme was developed in the Max Planck Institute for Psycholinguistics (Sloetjes-Wittenburg 2008).

Speech Disfluency and Resolution

Total occurrences for each category

Descriptives

	N	Mean	Median	Sum	SD	Minimum	Maximun
Restart (Disfluency)	19	5.579	4	106	7.381	0	33
Truncation	19	35.053	28	666	21.415	11	92
Filter	19	58.053	49	1103	31.308	8	106
Stumbling	19	5.053	4	96	3.325	0	12
Source	19	0.526	0	10	0.612	0	2
Slow	19	3.368	2	64	4.232	0	19
Dragging	19	7.947	7	151	5.681	2	23
Long pause	19	2.947	2	56	3.135	0	11
Restart (Resolution)	19	35.632	29	677	20.427	11	91

Table 1
Filler: 38%
Truncation: 23%
Restart (Resolution): 23%
Slow: 2%
Long pause: 2%
Source: 0.3%

Speech disfluency and gestural usage

Total occurrences with or without gestures

Descriptives

	N	Mean	Median	Sum	SD	Minimum	Maximun
Speech disfluency + resolutions	19	154.2	156	2929	64.8	52	325
Speech disfluency + resolutions with gesture	19	137.6	143	2614	68.9	33	319
Speech disfluency + resolutions without gesture	19	16.6	8	315	21.7	0	89

Table 2
Disfluencies/Resolutions with gestures: 89%
Disfluencies/Resolutions without gestures: 11%

Speech disfluencies and resolutions

Gestural usage occurrences for each category

Descriptives

	Sum
Disfluencies without gesture	266
Resolutions without gesture	49
Resolutions with gesture	1986
Resolutions with gesture	628

Table 3

Disfluencies with gestures: 88%

Resolutions with gestures: 93%

Disfluencies without gestures: 12%

Resolutions without gestures: 7%

Gesture typology

Total occurrences for each category

Descriptives

	N	Mean	Median	Sum	SD	Minimum	Maximun
Adapter	19	97.26	83	1848	53.88	10	225
Representation	19	4.84	3	92	6.17	0	23
Pragmatic	19	59.84	39	1137	59.27	2	261
Deixis	19	9.32	6	177	9.70	1	33
Beats	19	82.11	73	1560	74.03	2	338

Table 4

Adaptor: 38%
Beats: 32%
Pragmatic: 24%
Representation: 2%

Adapter

Descriptives

	N	Mean	Median	Sum	SD	Minimum	Maximun
Restart (Disfluency)	19	2.895	1	55	3.799	0	15
Truncation	19	20.684	20	393	12.481	1	48
Filter	19	38.158	33	725	27.747	2	95
Stumbling	19	2.474	3	47	2.118	0	6
Source	19	0.263	0	5	0.452	0	1
Slow	19	3.000	2	57	3.590	0	15
Dragging	19	4.737	3	90	4.445	0	17
Long pause	19	3.263	2	62	5.455	0	24
Restart (Resolution)	19	21.789	18	414	16.144	0	60

Table 5

Filler: 39%

Beats

Descriptives

	N	Mean	Median	Sum	SD	Minimum	Maximun
Restart (Disfluency)	19	4.211	2	80	7.906	0	35
Truncation	19	20.421	15	388	19.543	0	88
Filter	19	22.842	18	434	20.716	0	73
Stumbling	19	3.211	3	61	3.409	0	14
Source	19	0.368	0	7	0.597	0	2
Slow	19	2.000	0	38	3.801	0	11
Dragging	19	3.263	2	62	3.494	0	11
Long pause	19	1.526	0	29	4.287	0	19
Restart (Resolution)	19	24.263	21	461	24.046	1	110

Table 6
Resolution: 29.5%

Pragmatic

Descriptives

	N	Mean	Median	Sum	SD	Minimum	Maximun
Restart (Disfluency)	19	3.263	2	62	6.288	0	28
Truncation	19	15.000	8	285	16.506	0	68
Filter	19	16.316	10	310	15.731	0	62
Stumbling	19	2.684	2	51	2.849	0	11
Source	19	0.263	0	5	0.562	0	2
Slow	19	1.421	0	27	2.545	0	10
Dragging	19	2.316	1	44	3.019	0	10
Long pause	19	0.263	0	5	0.653	0	2
Restart (Resolution)	19	18.316-	13	348	19.276	1	82

Table 7
Resolution: 31%

Representation

Descriptives

	N	Mean	Median	Sum	SD	Minimum	Maximun
Restart (Disfluency)	19	0.3684	0	7	0.761	0	3
Truncation	19	1.2105	0	23	2.323	0	8
Filter	19	1.6842	2	32	1.857	0	7
Stumbling	19	0.0526	0	1	0.229	0	1
Source	19	0.0000	0	0	0.000	0	0
Slow	19	0.0000	0	0	0.000	0	0
Dragging	19	0.3158	0	6	0.671	0	2
Long pause	19	0.0000	0	0	0.000	0	0
Restart (Resolution)	19	1.2105	0	23	1.988	0	8

Table 8
Filler: 35%

Adapter - Total occurrences for each hand

Descriptives

	N	Mean	Median	Sum	SD	Minimum	Maximun
LH	19	22.6	18	430	18.9	0	74
BH	19	53.4	55	1014	33.5	2	108
RH	19	21.3	22	404	16.5	1	55

Table 9
BH: 55%

Beats - Total occurrences for each hand

Descriptives

	N	Mean	Median	Sum	SD	Minimum	Maximun
LH	19	14.16	9	269	16.71	0	55
BH	19	60.21	54	1144	64.52	2	300
RH	19	7.74	7	147	6.06	0	20

Table 10
BH: 73%

Pragmatic - Total occurrences for each hand

Descriptives

	N	Mean	Median	Sum	SD	Minimum	Maximun
LH	19	10.58	2	201	14.10	0	37
BH	19	45.79	31	870	54.43	0	243
RH	19	3.47	2	66	5.07	0	17

Table 11
BH: 76%

Representation - Total occurrences for each hand

Descriptives

	N	Mean	Median	Sum	SD	Minimum	Maximun
LH	19	0.316	0	6	0.749	0	3
BH	19	4.053	3	77	4.870	0	17
RH	19	0.474	0	9	1.389	0	6

Table 12
BH: 84%

Filler

Descriptives

	N	Mean	Median	Sum	SD	Minimum	Maximun
LH	19	17.2	13	326	18.92	0	70
BH	19	51.2	40	973	37.24	1	144
RH	19	11.6	10	220	9.84	0	38

Table 13
BH: 64%

Truncation

Descriptives

	N	Mean	Median	Sum	SD	Minimum	Maximun
LH	19	11.58	6	220	13.41	0	45
BH	19	40.37	27	767	37.42	5	170
RH	19	8.00	7	152	6.57	0	19

Table 14
BH: 67%

Restart (Resolution)

Descriptives

	N	Mean	Median	Sum	SD	Minimum	Maximun
LH	19	12.32	7	234	13.13	0	47
BH	19	47.84	34	909	44.81	6	207
RH	19	9.21	8	175	8.44	0	34

Table 15
BH: 69%

5. Discussion

5.1 Results on speech Disfluencies and Resolutions

The analysis of the total occurrences for each Disfluency and Resolution categories showed that the most frequently used ones were 'Fillers', 'Truncations' and 'Resolutions', while the least frequently encountered speech disruption indicators were 'Slow', 'Long pause' and 'Source' (table 1).

The most used Disfluency categories listed above can all be referred to as the «cognitive resource footprint»[12] (Seeber 2017: 467) for SI, an 'audible proof' of local cognitive load. As per 'Fillers', they can be detected at times in which a given clause, sentence or word turned out to be problematic in terms of either its translation or retrieval, also accounting for the so-called TOT (Tip-Of-The- Tongue) state, i.e. whenever «you are unable to think of the word but feel sure that you know it and it is on the verge of coming back to you» (Brown-Mcneill 1966: 327). 'Truncations' and 'Resolutions' – as extensively discussed by Levelt (1983) – imply self-monitoring and self-repair strategies, which are inherent in the very functioning of human cognition when 'thinking to speak' in order to obviate 'lineralisisation' and appropriateness problems, up to actual error repairs, for the purpose of ambiguity reduction or nuance editing[13] while formulating – or rather, re-formulating – a message.

A possible reason for the least encountered speech difficulties – accounting for only 4.3% of the total number of cases (table 1) – could lie in the fact that all participants were familiar with the specificity of the SI technique, even in the case of students, who are exposed to such cognitive ef-

[12] Expression used by Seeber to indicate a two-dimensional representation of Wickens' (1984) three-dimensional multiple resource model to allow the visualisation of cognitive resources involved in SI as a time-shared task. Here the same term is used in a broad sense.

[13] Cfr. List of cited literature (Levelt 1981); (Levelt 1982); (Levelt 1983).

fort almost on a daily basis during their training. Besides, the source language – indicated by the majority of the subjects (79%) in the LEAP-Q document as their first foreign language – should not have caused any problems in terms of contents comprehension.
Furthermore, out of the total number of speech Disfluencies and Resolutions identified, a significantly higher percentage indicates their co-occurrence with detected gestural patterns, compared to their use in the absence of gestures (table 2). For both of the aforementioned speech categories considered separately, the same result is reported (table 3), thus emphasising gestures' paramount importance both at the precise moment in which an increase in cognitive effort is registered and in the use of relative strategies aimed at its reduction.
Since the ratio of speech disfluencies has been shown[14] to increase under 'noisy conditions' – and given the status of SI as a multimodal , highly demanding cognitive activity, thus exposed to different types of 'noise' – results reported provide interesting insight into the main problems all participants encountered during their SI performance, enabling us to focus on these very instances to conduct a reliable, problem-specific investigation of simultaneous interpreters' gestural patterns.

5.2 Results on Gestures

Data extraction from the gesture coding revealed 'Adaptors', 'Beats' and 'Pragmatic' as the most frequently used gesture typologies. In parallel, 'Representation' was the gesture function that reported the fewest occurrences (table 4).

Next, individual co-occurrence instances for each predominant gesture typology with all speech Disfluency and Resolution categories were investigated, highlighting that both 'Adaptors' and 'Representations' were most commonly performed along with 'Fillers', while 'Pragmatic' and 'Beat' gestures were most commonly performed along with Resolutions (tables 5-8).

'Adaptors' helped reducing emotional stress. This gesture typology, devoid of semantic meaning and directed either at oneself ('SAD') or the surrounding objects ('OAD'), can «serve as regulator» (Kendon 2004: 97, Quoting Ekman And Friesen 1969), supporting that SI involves an increased global and local load, not only in cognitive but also in emotional terms. Apart from the motoric explicitation of emotions, 'Adaptors' may also «establish control over a cognitive process aimed at solving demanding mental tasks» (Planap 1999). This could explain the fact that 'Adaptors' have been recorded both in students and professional interpreters, who – at least theoretically – should be less influenced by the emotional component. In this respect, the motor activity of touching or grasping appears to be connected with the simulation of 'grasping mental objects', over which control is established through a corresponding physical act. Quite often, the tension-reducing and control- (re)establishing functions of 'Adaptors' have been attributed to the speaker's difficulty of retrieving a word or concept, or even when experiencing the TOT phenomenon. This can also be supported by our results, showing 'Adaptors' employed above all when 'Fillers' were being used. Overall, this seems to provide further data supporting both the Tension Reduction and Lexical

[14] Cfr. List of cited literature (Gosy 2007).

Retrieval hypothesis.

The second gesture typology most frequently used by interpreters were 'Beats'[15]. This category has been also referred to as «motor gestures» (Krauss-Chen-Gottesman 2001), «batons» (Efron 1941, 1972), (Ekman-Friesen 1972) and «rhythmical pulse» (McClave 1994). Their function has been connected with organising speech in the target language, facilitating both words activation and speech segmentation, strategies which enable concepts retaining in working memory, thus facilitating the storing and retention of mental images and related lexical items in both languages.

Since 'Beats' tend to have the same form, regardless of the speech content they co-occur with, they have been described as the least significant gesture typology from the point of view of physical manifestation[16]. Even though they «bear no obvious relation to the semantic content of the accompanying speech» (Feyereisen-Van De Wiele-Dubois 1988), this category is one of the most revealing as it enables to concretely visualise the interpreter's mental models when advancing in the construction of narrative speech, revealing the semantic and discourse pragmatic significance of the lexical items it accompanies.
Having underlined 'Beats' most frequent co-occurrence with 'Resolutions' seems in line with their very function, i.e. allowing interpreters to self-monitor their own speech structuring process, providing further evidence as per the crucial role gestural kinetics plays in speech structuring and production during SI. Nevertheless, where interpreters put the rhythmic emphasis of their Beat gestures may not necessarily be related to the semantic key elements of the source speech.

To summarise, the obtained results underline how 'Beats' can help interpreters in reducing cognitive load during SI, allowing them – through rhythmic body movements – to store, retain and activate mental and lexical items in the working memory, while keeping constant track of their language processing and sentence structuring, hence facilitating the retrieval of the source speech key elements and the consequent logical structuring of their output. Lasty, since they appeared to be used more often during Resolutions, 'Beats' could also be seen as 'interpreters' embodiment of local cognitive load', with rhythmic movements used to emphasise a speech component, which was somehow challenging to translate, in the moment of its successful formulation in the target language.

The third gesture typology that showed a significant number of occurrences was the 'Pragmatic' one. This category includes all gestures which are idiosyncratic and do not have neither representational nor referential functions . In other words, 'Pragmatic' gestures do not appear to be semantically linked to the word or phrase they accompany and can be detected in different contexts. Many 'Pragmatic' gestures have become «recurrent gestures» (Bressem-Müller 2014), such as 'sideways sweeping' to underline negation, 'cyclic gesture', depicting the idea of something continuing (especially during word-search) or even 'wavering hands', expressing uncertainty about something or even «during the retrieving of the desired lexical unit (Leonteva- Agafonova- Petrov 2020). These gesture can also explicit the speakers' attitude towards the content of what they are saying, thus expressing one's point of view. Finally, 'Pragmatic' gestures can either serve a generic

[15] Cfr. List of cited literature (Kendon 1983); (Mcneill-Levy 1993).

[16] Cfr. List of cited literature (Mcneill-Levy 1993: 5).

discourse structuring function or can be «empathic gestures» (Iriskhanova-Petrov-Makoveeva-Leonteva 2019), illustrating the lecturer's own intentions, through «matching the interpreter's point of view with that of the lecturer, whose voice they hear through their headsets» (Ibid.).

In line with the latter function, data we collected showed that 'Pragmatic' gestures were used to a greater extent along with Resolutions, supporting this as a further modality through which interpreters can reduce cognitive pressure during SI. Namely, through 'Pragmatic' gestures, interpreters can «copy the imaginary physical movements of the person whose speech is to be interpreted» (Ibid.), supporting the self-oriented function gestures have and acknowledging the fact that giving physical form to a concept is an extremely useful cognitive effort reduction strategy. It can thus be argued that during 'Resolution' – when the interpreter's cognitive efforts are channelled into the repair or retrieval of a given word, phrase or concept – giving motoric form to that same linguistic unit can help them in successfully solving a given speech perturbation.

Lastly, 'Representation' – happening to be the least performed gestural function amongst all subjects – was predominantly identified with 'Fillers'. Notwithstanding, it is worth mentioning some interesting assumptions about its limited use. Representational gestures are usually performed to create similarity between the shape that hands acquire and the referred element, be it a person, object, thing, action or event. They have been proved to «facilitate mental activity and speech production as they are based on mental images» (Kita 2000, Mittelberg-Evola 2014). By their very nature – being based on different mental models and memories – they can produce different, highly personalised representations of the same lexical unit, enhancing the quality of both thinking and speaking processes in two main ways. Firstly, 'Representations' have been commonly detected during the TOT state , thus helping in the retrieval of the sought-for word. Besides, since they have been also addressed to as «metaphoric gestures» (Mcneill-Levy 1993: 5), their second function consists in relying in the human body ability to help with the verbalisation of an abstract concept. Such «thought illustration» (Iriskhanova-Petrov-Makoveeva-Leonteva 2019: 9) function is a more structured form of 'Adaptors', i.e. 'Representation' may serve as a coping strategy to overcome local cognitive load when strictly connected to precise linguistic components or discourse topics.

Both abovementioned functions seem in line with results from this study, underlying a predominance of 'Representation'-'Filler' co-occurrence. However, despite the well-established facilitative function of this gestural behaviour in complementing speech, «adding its own imagery of the narrative event» (Mcneill-Levy 1993: 5), it is interesting to note that 'Representations' were performed more rarely, compared to results gathered on 'Adaptors' and 'Beats'. Given the high improbability that our detection is to be interpreted in terms of the ineffectiveness of such gestures in facilitating simultaneous interpreters' task, the main reason might instead lie in a reduced management ability of the cross-language activation that a mental image originates in SI. As explained by Pavlenko (2009) – and applied here to the specific case of simultaneous interpreters – the facilitative role mental image activation has for these particular 'communicative actors' is not as immediate as in cases of monolingual interactions. Indeed, image activation in SI entails the stimulation of the corresponding lexical element in all the languages known by the interpreter, making the correct linguistic equivalent retrieval much more demanding.

In light of this, the fact that more than half (around 63%) of the subjects who took part in our study are still finishing their training as interpreters could explain the lower use of representational gestures. A further study focusing exclusively on the use of 'Representations', comparing their occurrence rates between professional and novice interpreters could provide further support for this assumption.

Lastly, results on Handedness underlined – for each most detected gesture typology alone and in conjunction with the most used speech Disfluency and Resolution categories – an absolute predominance of gestures performed using both hands, compared to the percentages of gestural behaviours in which right or left hand alone were engaged (tables 9-12; tables 13-15). Both hands' predominant use was found to be over 50% in all cases investigated. This result is in line with data gathered from the 'Handedness' Questionnaire, in which – for all fifteen action types listed – all participants reported being able to use both hands to perform eleven of the given action categories, albeit almost always in smaller percentages than either left or right hand alone. However, only four action categories (27% approximately) reported no preference for using both hands. In this respect, it is possible to briefly illustrate the relevance of such a datum, by referring to what has already been discussed in the literature with regard to 'Handedness' and, in particular, the predominant use of both hands over the left or right hand alone.

Generally, the use of hands has been shown to mirror the structure of the speech they accompany, in terms of both grammatical structures and content types. «Cohesion of Handedness» (Mcneill-Levy 1993: 12), reflects the speaker's tendency to physically reproduce the cohesion between main and subordinate clauses that should always exist in a well-structured discourse. In particular, along with 'Space and Form Cohesion', the main relationship established between 'Handedness' and speech concerns greater gestural complexity together with main utterances, as «the subordinate clauses refer to information carried forward from previous clauses but the main clause doesn't convey presupposed information, and plausibly this clause does more to 'push the communication forward'» (Ibid.). In parallel, McNeill (1994) devoted a section entirely to the use of both hands in gestural production, underlining that in some gestures they can move «in the same pattern but in mirror images. Such gestures do not seem to differ semantically or functionally from their one-hand counterparts» (McNeill 1994: 117). Besides, both hands can perform different movements, or rather, «considered separately, perform different movements but, jointly, create a scene in which there is a single event» (Ibid.).
Summarising thus far, we may say that gestures performed with two hands – analysed in relation to the verbal typology they accompany – show the integration of speech and gestures at the level of meaning. In relation to our study, these considerations are particularly significant, allowing us to investigate how simultaneous interpreters use their body to reproduce in space both the possible changes in the point of view along the narration and the structural coherence of the source speech, in order to facilitate its transmission in the target output.

A final observation regarding 'Handedness' concerns – irrespective of the hand used to perform a given gesture – the timing of gestural performance in relation to the specific portion of linguistic content uttered. It was found that, very often – after sentence truncations or at times when the fluency of the interpretation was clearly disrupted by an increased cognitive load (e.g. during filled or long pauses) – gestures serving different functions appeared well before the lexical element to which they referred was actually uttered.

From this, taking into account that interpreters always work with a more or less wide-ranging décalage from the lecturer's voice – and, thus, assuming that in moments of difficulty the specific source speech element responsible for the momentary disruption of the interpretation should have already been heard – it is possible to state with further confidence that gestures are crucial in activating effective coping strategies during SI, even when speech stops.

6. Conclusion

Contrary to the claim that preventing gestures has no particular effect on speech production[17] , standing in contrast to research showing that people gesture more when their listeners can see them[18], and unlike scholars who argue that «when speech stops, gesture stops» (Graziano-Gullberg 2018), our data seem to support the exact opposite.

Results from the present study suggest a very tight link between speech and gestures, therefore supporting our hypothesis as per their facilitative role in offloading an increased cognitive pressure during simultaneous interpretation.

Given the fact that simultaneous interpreting is a multimodal, highly demanding professional activity which requires high levels of cognitive – global, local and emotional – load, and departing from the core theoretical concept of Embodied Cognition, this experimental research shows how gestures are accountable for the so-called «cross-modal priming» (Krauss-Chen-Gottesman 2001: 10).

Through the 'manipulation' of one's own world conceptualisation and perception, gestures enable to represent in motoric or kinesic form features of the «source concept» (Ibid.).

Overall, data gathered from our analysis suggest that gestures help interpreters in reducing stress, in lexical retrieval as well as in analytic and spatio-motoric thinking[19], serving as an invaluable support not only at times of fluent interpretation, but also and above all during speech disfluencies, enhancing the quality of both language comprehension and production processes.

Lastly, a comparison between results obtained from our investigation and those extracted from similar studies conducted by the Moscow State Linguistic University's Centre for Socio-Cognitive Discourse Studies (SCoDis) underlined interesting similarities in gestural behaviour patterns, from which we may infer – although further research is needed – that gestures not only help simultaneous interpreters in reducing an increased cognitive effort, but also that their self-oriented

[17] Cfr. List of cited literature (Holler-Turner-Varcianna 2012); (Kisa-Goldin-Meadow-Casasanto 2021).

[18] Cfr. List of cited literature (Alibali Et Al. 2001); (Mol Et Al. 2011).

[19] Cfr. List of cited literature (Chu-Kita 2011); (Alibali-Chu- Kita 2017).

facilitative function is cross- cultural and cross-linguistic.

ETICHS STATEMENT

This material is the authors' own original work, which has not been previously published elsewhere. All subjects gave their informed consent for inclusion before they participated in the study and were provided the right to withdraw. All personal data has been disclosed among members of the research group only, protecting anonymity and confidentiality and they have been analysed for research purposes of which all participants had been made aware of.

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