THE EFFORT MODELS and GRAVITATIONAL MODEL

Clarifications and update

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With updates on the social situatedness of the EMs
And risk assessment

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Why this presentation?

To **update** people interested in the Effort Models (EM) on developments

To help **dispel misconceptions** about the Effort Models

This presentation will be periodically updated
But does not replace full papers on the same topic

The Effort Models: What for?

As a student of conference interpreting, and later as a practitioner, teacher and researcher, noticed:

- Language quality deteriorations in students' performance in class
- Marked fluctuations in other aspects of students' performance throughout the training period
- Numerous errors, omissions and infelicities (*EOI*s) in target speeches of experienced interpreters

Wished to understand the reasons
Wished to help students if possible, and at least explain

The Effort Models and Gravitational Model, as well as the Tightrope Hypothesis, are the resulting constructs

They were **not designed as research tools**, though they turned out to be used by theoreticians and empirical researchers as well

Historical background (1) – Early 1980s

Intuitive, introspection-based conceptual structuring of simultaneous interpreting as as set of 'Efforts' which could easily be identified as '*functions*' by students and trainers

LA – Listening and Analysis (of source speech) – later renamed as R (Reception) to account for interpreting from signed languages

M – Short Term Memory (not based on psychological construct of Working Memory though strongly related to this construct – see explanation later)

P – Production (of target speech), including self-monitoring

All competing for limited processing capacity
(*also called 'attentional resources'*)

$$\mathbf{Sim = LA + M + P \leq A}$$

A: Available processing capacity

Note: mathematical notation used very loosely, by convention

Historical background (2) – Automatic and controlled operations

Soon (still early 80s) started exploring cognitive psychology and psycholinguistics literature, and found out about the existence of a classification:

- Automated operations
- Controlled operations

Controlled operations become gradually 'automated' when repeated

Also found out that cognitive psychologists believe that attentional resources ('processing capacity) are limited at any time in humans

and that a 'coordination' function (*'executive' function*), which also uses up attentional resources, is important when managing cognitive activities
Added the ***coordination Effort C*** to the Model

Historical Background (3) – Is interpreting 'automatic'?

Conceptually tested my intuitive construct's fit with this knowledge: are listening and analysis, short-term storage of information and retrieval of information, speech production controlled or automatic?

Outcome: each has controlled components

Which meant that the intuitive construct made (general) sense in terms of cognitive psychological thinking

SIM = L + M + P + C
R(SIM) = R(L) + R(M) + R(P) + R(C) → TOTAL R

R stands for attentional resource requirements
The + signs do not mean arithmetic addition, but some additive effect

Conditions for successful simultaneous

1. Sufficient available PC (Overall condition)

At any time:

$$R(L) + R(M) + R(P) + R(C) \rightarrow \text{Total } R \leq A$$

(Total available PC is sufficient to cover the 'sum' of needs)

2. PC management condition (Interpreter's tactics and strategies)

At any time:

$$R(L) \leq LA$$

$$R(M) \leq MA$$

$$R(P) \leq PA$$

(The PC allotted to each Effort is sufficient to complete the task each is engaged in)

If one of the conditions is not met

One/several Efforts cannot perform adequately so:

Incomplete/incorrect comprehension of the source speech
and/or
Incorrect/clumsy target speech
and/or
Incomplete/incorrect storage/retrieval of information
from short-term memory
and/or
Slowing down of one or several Efforts' performance and **chain reactions**

All of these can result in Errors, Omissions and/or Infelicities (EOIs)

Infelicities: clumsy language, not quite incorrect

The Tightrope Hypothesis (1)

What makes this analysis useful is
the associated ***Tightrope Hypothesis***:

Interpreters tend to work ***close enough to cognitive saturation***
for ***many EOIs*** to occur

not because the interpreters' knowledge of the relevant working languages
or the topics or technical skills are insufficient

but because

attentional resources required to perform adequately were not available for a particular comprehension, memory storage or retrieval or production task
at a time when they were needed

The Tightrope hypothesis (2)

Tightrope hypothesis: "Interpreters tend to work close to saturation"

The nature of this hypothesis is ***often misunderstood*** *(e.g.* Seeber, 2011)
It was formulated as holistic and intuitive, in the same mindset as the EMs.
Not designed for explorations of cognitive architecture and interactions.

"No empirical support for the Tightrope Hypothesis"? Not true

- *Massive anecdotal evidence*
- ***Empirical evidence to support it*** *as a* ***general*** *explanation of EOIs*
  See inter alia Gile 1999 in *Hermes* with replication by Matisiak 2001, Gile 2011, ***Many studies on problem triggers***, the effect of pause lengthening on EOIs (Barranco-Droege, 2015) etc. – see studies listed in *CIRIN Bulletins* at www.cirinandgile.com
- and… ***no alternative explanation offered for many EOIs observed***

But definitively insufficient empirical testing and evidence to explore it further with respect to what exactly is saturated, when and how, what modules/ components in a particular cognitive theory/architecture are affected and how.

Other Effort Models

('long') **Consecutive interpreting**

Comprehension phase: L + M + NP + C

NP: Note Production

Reformulation phase: NR + SR + P + C

NR: Note Reading SR: Speech Reconstruction from Memory

Sight Translation

R + M + P + C

R: Reading Effort

Note: P is particularly difficult because of the visual presence of the ST and resulting risk of interference

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Simultaneous with text

L + R + M + P + C

L: Listening Effort R: Reading Effort

Explaining problems with Effort Models

Problems are more likely to occur:

1. When PC requirements increase

- Speech density

- Noise, Signal distortion

- Short-term memory overload

2. **When mismanagement of attention**

- Too much or too little attention devoted to an Effort

- EVS too long or too short

- Sub-optimal tactic selection resulting in cognitive interference

- Sub-optimal note-taking in consecutive

3. **In vulnerable segments**

Short words, homophones

Simultaneous from a spoken language into a signed language*

Sim = L + M + P + SMS + OID

SMS: Self-Management in Space
OID: Online Interaction with the Deaf

SMS: *Spatial positioning, distance to the speaker, angles to optimize comprehension of the source speech and transmission to Deaf users of the Target speech*

OID: *Attending to the signing by Deaf users of the Target speech, some of which is 'internal' and some of which is addressed to the interpreter*

see for instance **Pointurier-Pournin** 2014 and **Del Vecchio, Siliva, Marcello Cadarelli, Fabiana De Simone, Giuliana Petitta**. 2015. Interacting with Participants Outside of Interpretation. In **Nicodemus, Brenda & Keith Cagle** (eds). 2015. *Signed Language Interpretation and Translation Research. Selected Papers from the First International Symposium*. Washington, DC.: Gallaudet University Press. 24-48.

*The EM for simultaneous was adapted by a number of signed language interpreters over the years. The Model presented here is largely based on the work done with/by **Sophie Pointurier-Pournin**. 2014. *L'interprétation en Langue des Signes Française : contraintes, tactiques, efforts*. Unpublished doctoral dissertation, Université Paris 3 Sorbonne Nouvelle.

The gravitational model of language availability: Initial awareness

Plain ‘knowledge’ of words, rules of grammar etc.?
Other dimension to language mastery?

- Sometimes you ‘know’ a word, but have difficulty in retrieving it from memory, or ‘know’ a rule of grammar, style etc., but it takes some time and effort to apply it (‘tip of the tongue’ phenomenon)

- Sometimes you understand a foreign language when it is spoken slowly, but not when it is spoken faster

The time it takes to find/understand a words/linguistic structure
is correlated with the ‘effort’ this requires

‘**Language availability**’:
The (conceptual) variable which measures this time/effort

Low availability in production

Low availability slows down production
Hesitation pauses

Not a major problem in everyday conversation

Not necessarily problematic in consecutive

Highly problematic in simultaneous

because
If speech production is too slow
Interpreter lags behind speaker
Needs to store too much information in short term memory
and ultimately “loses” information

Low availability in comprehension

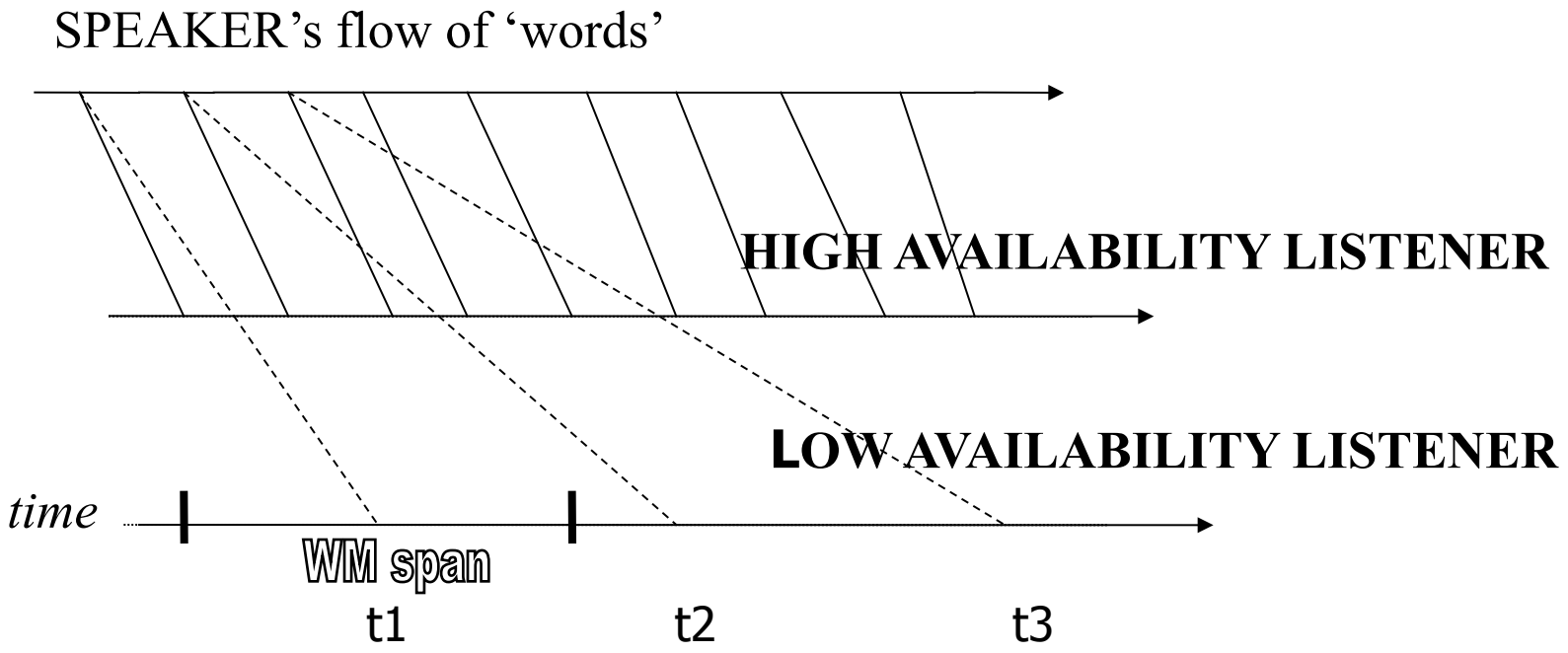
Low availability slows down the processing of incoming signal

Big problem in simultaneous and in consecutive

Can result

Not in slower comprehension

But in non-comprehension



At t1, high availability listener (HAL) has finished processing more than 2 words and keeps one in WM – low availability listener (LAL) has finished processing 1 word

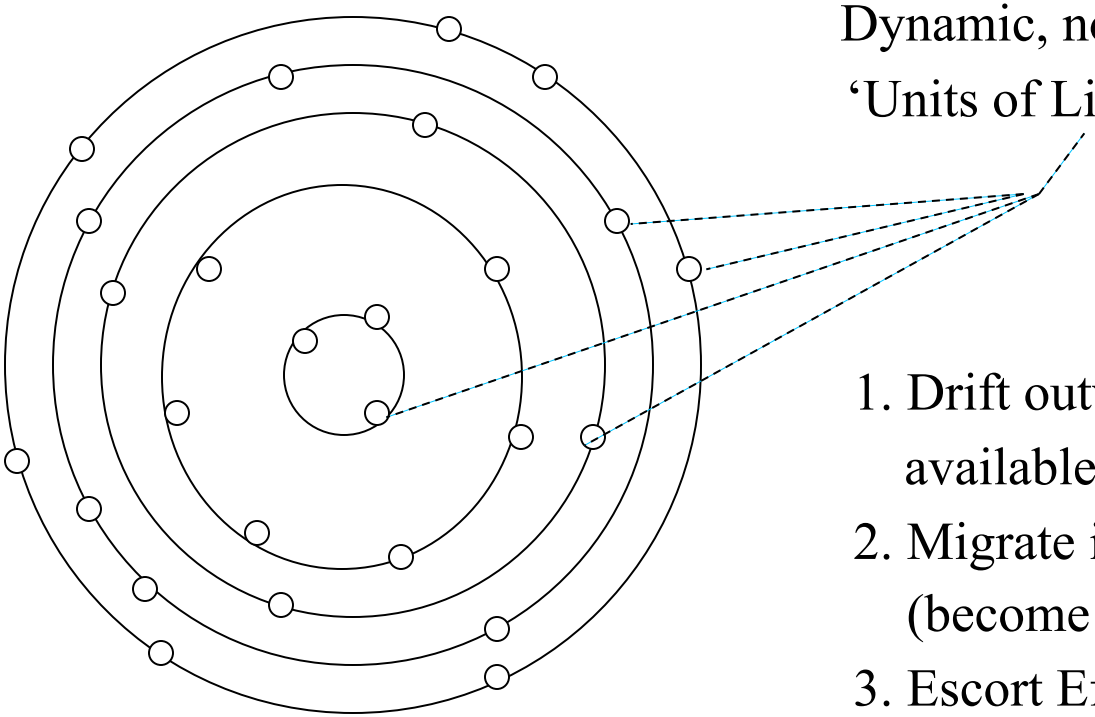
At t2, speaker is uttering 7th word, HAL has finished processing 6 words – LAL has finished processing 2 words, and must keep 5 words in WM.

At t3, LAL is probably saturated

GRAVITATIONAL MODEL OF LANGUAGE AVAILABILITY

A visual representation of availability

By convention: the closer to center, the more available



Dynamic, not static
'Units of Linguistic Knowledge':

1. Drift outwards (become less available) if not used
2. Migrate inwards if used (become more available)
3. Escort Effect
4. Interference Effect

One visual representation for many 'systems'/states of availability

If tried to **map a person's state of availability** for any language:

There can be **differences from one minute to the next**
(*for instance when a newly acquired technical term – or sign in a sign language – has just been used several times*)

The map would be **different**:

- For **production** (one's idiolect) vs. **comprehension** (other speakers of the same language's idiolects and sociolects),
- For **written vs. spoken** language
- In sign languages for **reading vs. producing fingerspelling** etc.

The single map with concentric circles is a gross simplification
Only used for visual, intuitive support

A ‘trans-linguistic correspondences’ gravitational model

The gravitational model can be used to map availability of production/ comprehension in single languages, but also

To ***map the availability of trans-linguistic correspondences***
i.e. SL-TL correspondences
Essentially for lexical units (terms, names)
and formulas (idioms, greetings, etc.)

The existence of such highly available correspondences
can be assumed to reduce markedly PC requirements for Production

The fundamental laws of:
Lower availability when rarely used (outward migration)
Higher availability when used frequently (inward migration)

apply as they apply to the single language mappings

Conceptual use of the Effort Models and Gravitational Model

These Models have been used – *inter alia* – to:

- ***Explain recurrent difficulties*** in interpreting
  Including errors, omissions and infelicities affecting 'easy' speech segments
- ***Discuss tactics*** (decisions with immediate goals)
  and ***strategies*** (decisions with less immediate goals, including preparation of conferences and working on one's language availability) – see Gile 2009
- ***Discuss language specificity*** in interpreting
- ***Discuss directionality***
- ***Discuss learning processes and methods***
- ***Discuss the relative difficulty of various types of interpreting***
- ***Discuss note-taking tactics***
- ***Discuss students' evolution***
- ***In research: Generate hypotheses for empirical research, explain empirical findings, serve as a basis for further theorizing***

The Effort Models and cognitive psychology (1)

A reminder: the basis of the EM: introspection + a few general concepts from cognitive psychology

Not a particular cognitive theory about

- Processes and/or cognitive architectures
- Working Memory
- Executive Functions
- depth/stages of processing during comprehension
- 'direct', 'automatic' trans-linguistic correspondences vs. conceptual mediation
- the existence of a single pool of attentional resources vs. distinct pools

What the EMs say:

for the purpose of

- explaining many recurrent phenomena in interpreting

- discussing strategies and tactics, including didactic and professional options, it is useful to think of interpreting as comprising functional 'Efforts' which compete with each other in terms of available' processing capacity

The Effort Models and cognitive psychology (2)

M (Short Term Memory Effort) is not the same as Working Memory (WM)

WM is part of the Reception Effort and of the Production Effort as well.

M corresponds to a **functional** view
often with tactical/strategic components
(should the interpreter wait or not?)
though admittedly, once information is selected for storage or retrieval, WM comes in.

While the ***Coordination Effort*** is sometimes misunderstood as another name for the 'Central Executive' in Baddeley's WM model, it is meant to have a far wider scope in the EMs

The Effort Models and cognitive psychology (3)

More generally
the Models were ***designed for the classroom***
In relative independence of new cognitive theories and models
as long as
Developments ***do not contradict its basic assumptions***:

the (overall) ***non-automaticity*** of the Efforts

the ***finite*** nature of human attentional resources

the ability of humans to ***allocate*** at least part of their attention to specific tasks

the ***competition*** between Efforts for available attentional resources
even if some also draw on distinct pools besides a common pool
(e.g. de Groot, 2015)

But ***cognitive psychology and psycholinguistics remain a fundamental reference discipline*** for the Effort Models

The social situatedness of the Effort Models (1)

Some authors have *claimed* that the EMs are cognitive only
and ***disregard human*** (social and psychological) situations
Not true. See *Chapters 2, 3 and 8 (inter alia) of Basic Concepts and Models*

Decisions on

- *what information should be rendered* in the target speech,
- with *what priority* and in *what form* (see example later),
- what *information should be omitted*,
- what *information should be added* (explanations, requests for clarification)

are based on communication situations, on ethical considerations and on codes of conduct

See the discussion of 'laws' underlying the selection of tactics in Chapter 8
Seeking maximum information recovery
Seeking maximum effect in a certain direction
Self-protection etc.

The social situatedness of the Effort Models (2)

Examples from signed language interpreting

Interpreters may decide they need to not only translate Hearing speakers' speeches, but ***also report on events in the room for the benefit of Deaf users*** of their service – this has a cognitive cost

Interpreters ***may decide to reformulate a concept in an iconic way through 'scene setting' rather than fingerspell it***, because they believe their Deaf clients will reject fingerspelling as an intrusion of the language of the Hearing, even if fingerspelling takes less time and has a lower cognitive cost

The social situatedness of the Effort Models (3)

The focus of the EM is cognitive, but this does not mean other aspects of interpreting are ignored

Focusing on tooth brushing
Does not mean that one disregards the need to wash one's hands

The Effort Models and risk assessment

Some authors have proposed risk assessment as an alternative to cognitive considerations to explain interpreting behavior.

Risk assessment is intrinsically part of the discussion of interpreting tactics
Inter alia when referring to avoidance of cognitive interference as one of the laws underlying the selection of tactics.

In some situations, risk assessment can indeed be a powerful explanation of interpreting behavior
In many others, cognitive considerations, with a small role played by risk assessment related to cognitive issues, are probably a better alternative

A few references

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