Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

Chapter 7

The Effort Models of interpreting

1. Introduction

One of the most striking and challenging phenomena in simultaneous interpreting is the interpreters' persistent perception that it is fundamentally 'difficult'. This awareness may arise first during initial training, perhaps under the pressure of instructors who are felt by students to always find fault with their target speeches in interpreting exercises and to always demand better performance. And yet, even after graduation and after many years of experience, most interpreters feel that simultaneous interpreting requires intensive efforts to render all the information of the source speech in a good quality target speech and that they often fail to reach this objective to their satisfaction in spite of their best efforts.

Upon close scrutiny, it turns out that performance problems arise not only in fast, informationally dense or highly technical speeches, but also in clear, slow speech segments in which no particular obstacles are identified. Moreover, errors and omissions are found not only in the students' interpreting exercises, but also in the work of seasoned professionals. As an illustration, in a case study by Gile (1989, Chapter 4), over a segment of 70 seconds of speech, more than 10 incorrect and/or obviously clumsy target-language segments were identified in a slow, non-technical target-language speech made by an experienced professional interpreter with an excellent reputation. Similar observations can be made when looking at the data from most empirical studies, which involve several (up to ten, sometimes more) professionals and students who are given the same recorded speeches to interpret. For example, the following errors were noted in simultaneous French renderings of one English source speech produced by experienced interpreters:

> "that wasn't my fault" was interpreted into "*c'est ma faute*" ("it is my fault")
> "the Vietnamese government" was interpreted into "*les gouvernements*" ("the governments") by one interpreter, and into "*le gouvernement chinois*" ('the Chinese government') by another
> "and you think they think you're foolish" was interpreted into "*vous pensez qu'ils sont idiots*" ("you think they are stupid")

In view of the general level of mastery of English of these interpreters (all of them had English as an A or B language), insufficient understanding of the source language as an explanation of the errors must be ruled out. Moreover, since each source-speech segment was interpreted erroneously by only one or two of the 10 professional interpreters

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

who had accepted to participate in the experiment, it is unlikely that the reason was technical, perhaps the poor quality of the recording at these points in the speech – otherwise, more interpreters would probably have had problems with the same segments. A third point is that some interpreters who interpreted the speech twice in a row (after a short break of a few minutes) made some errors the second time in segments which they had interpreted correctly the first time. This is an intriguing point: if they had overcome a difficulty when first interpreting a speech, why should they not be able to overcome it when interpreting it a second time, with the advantage of having become familiar with it and having had time to think about it? One possible explanation would be fatigue. However, the speech was less than 11 minutes long, and subjects were allowed to rest for a couple of minutes before starting to reinterpret it. In view of the fact that when interpreting in the field, the same subjects take turns of 30 minutes in the simultaneous interpreting booth, fatigue is also an unlikely explanation for the phenomenon. (Gile 1999a is a full report on this experiment – see also Section 9, which discusses this experiment again around the concept of 'Tightrope Hypothesis').

Observations of errors made by professionals in speech segments containing no apparent obstacle are intriguing, and trying to understand the reasons behind them seemed important, if only in order to help students understand why interpreting is so difficult and accept this as a fact of life rather than as a worrying sign of incompetence. Insight into the mechanisms leading to performance flaws was also sought in the hope of finding ideas and methods to help overcome the obstacles.

In this mindset, I developed an Effort Model for simultaneous interpreting, which was first sketched out in a paper on the relative difficulty of interpreting as a function of the specific pairs of languages involved (Gile 1983b). Ever since, I have been developing it and extending the analysis. This chapter is an up-to-date discussion of the Models (there are now several), which are central in my teaching of interpreting and have been adopted as a conceptual framework by many interpreting teachers – and, as it turned out, by researchers (see Gile 2008) – over the past 25 years. The Effort Models for simultaneous interpreting, for consecutive interpreting and for sight translation are introduced here as a simple set of constructs for explanatory purposes. Since in the literature, they are also discussed in the context of considerations from cognitive psychology, I have added some clarifications on how they relate to and differ from models and theories from mainstream cognitive psychology.

2. Automatic operations, processing capacity and interpreting Efforts

2.1 Automatic and non-automatic operations

The development of the Models originated in two intuitive ideas based on observation and introspection:

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

- Interpreting requires some sort of 'mental energy' that is only available in limited supply.
- Interpreting takes up almost all of this mental energy, and sometimes requires more than is available, at which times performance deteriorates.

The idea that there is some association between the deterioration of the interpreter's performance and some kind of overload was not new. It had already been mentioned by Pinter (1969), as well as by several other authors, mainly in the context of discussions of the role of short-term memory in simultaneous interpreting (Fukuii & Asano 1961; Kade & Cartellieri 1971; Lederer 1978; Moser 1978; Wilss 1978). Subsequent reading in cognitive psychology provided useful information revolving around the concepts of *attention* and 'automatic' and 'non-automatic' operations, thus establishing a link between intuitive ideas from interpreting practice and some theoretical and empirical research.

Toward the end of the 1940s, Claude Shannon, an engineer working on communication, formulated the idea that any channel serving to transmit information had a finite transmission capacity beyond which information losses occurred (Shannon 1948). This idea, which had come out of studies on electric communication lines, was taken up by cognitive psychologists who adapted it to the case of the human mind (Broadbent 1958; Moray 1967; Kahneman 1973; Norman 1976). The idea is that some mental operations ('non-automatic operations') require attention (alternative names are 'attentional resources' and 'processing capacity'), and others ('automatic operations') do not. Such non-automatic operations also take time, whereas automatic operations are very fast. Non-automatic operations take processing capacity from a limited available supply (whether all of them take it from the same single reservoir or not is under debate). When the processing capacity available for a particular task is insufficient, performance deteriorates.

The distinction between automatic and non-automatic operations is sometimes difficult to make, as non-automatic operations vary in the processing capacity they require and may become automatic after enough repetition (see for instance Eysenck & Keane 1990). Gradual automation of cognitive operations is important in interpreting skills acquisition and will be discussed further in the next chapters.

Finding these concepts and theories in cognitive psychology was encouraging: if operations involved in interpreting were non-automatic, there was some basis for constructing an interpreting model around the ideas of processing capacity requirements and processing capacity limitations with prospects for good explanatory power as regards various phenomena experienced and observed while interpreting.

According to cognitive psychology, non-automatic operations are those which cannot be or are not automated, such as detecting a brief stimulus, identifying a non-familiar stimulus or a familiar stimulus presented under poor conditions, storing information in memory for later use, preparing for a non-automated response, controlling

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

the accuracy of a movement or manipulating symbols in a person's cognitive system. Automatic operations include decoding a familiar stimulus presented under favourable conditions, triggering an automated response and operating a motor programme without control (Richard 1980: 149–150). Again, this distinction is a simplification of reality, if only because it may sometimes be difficult to discriminate between long and short stimuli or between familiar and unfamiliar stimuli. Nevertheless, it is shown in the next sections of this chapter that the operations making up interpreting as defined below clearly include components on the non-automatic side.

2.2 Interpreting Efforts

Drawing on my experience as a practitioner of simultaneous interpreting and as an instructor, I thought of attempting to analyze its operation with conceptual entities immediately familiar to interpreters and to students, namely a listening and analysis component, a speech production component, and a short-term memory component. I called these components 'Efforts' to stress their effortful nature, as they include deliberate action which requires decisions and resources.

2.2.1 *The Listening and analysis Effort*

The Listening and analysis Effort (or 'Listening Effort' for short) was defined as consisting of all comprehension-oriented operations, from the subconscious analysis of the sound waves carrying the source-language speech which reach the interpreter's ears through the identification of words to the final decisions about the 'meaning' of the utterance. In signed language interpreting, a parallel Viewing and Analysis Effort can be defined when the interpreter works from a signed language into a spoken language.

It is not yet clear how far the analysis of the meaning of the source-language speech must go before interpreting is possible. In the discussion of the interpreting and translation of specialized speeches and texts in Chapter 4, it is suggested that such comprehension goes at least as far as understanding the general underlying logic of each sentence. Even by the most conservative standards, one can say that except for some names which interpreters may simply try to imitate phonetically, interpreting requires at the very least the recognition of words in the source-language speech. This is enough to put the Listening and analysis component in the non-automatic category. The reason is that there is no one-to-one relation between the sound reaching one's ears and any single phoneme, word, or group of words pronounced by a speaker (the same applies to the visual flows perceived by one's eyes when interpreting from signed languages – a view which signed-language specialists Carol Patrie and Robert E. Johnson of Gallaudet University confirmed in a personal exchange). There is some variability in the way such words are pronounced, not only from one individual to another, but also in the same speaker repeating the same speech segment.

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

This is also why it is very difficult to recognize words on sonograms (graphic representations of sound). According to Guibert (1979), even human experts familiar with phonetics and with the lexical and syntactic rules of a language never manage to read correctly more than 75% of the phonetic segments on a sonogram. It is therefore not surprising that machines, which do not have at their disposal as much lexical and syntactic information, nor a level of knowledge of the world comparable to a human's, are unable to recognize natural chained (continuous) speech (as opposed to speech in which there are pauses between the words) with 100 percent reliability. This limitation persists even when they have gone through a 'learning process' with the voice of individual speakers (a necessary process when using dictation software).

In order for words to be recognized, acoustic features of the incoming sounds have to be analyzed and compared with patterns stored in the listener's long-term memory (or in the hard disk of a computer, in the case of speech recognition software). Following a complicated process involving knowledge of the probabilistic structure of the relevant language, the context and the situation, the listener decides that particular sound sequences correspond to particular words (see for example Hörmann 1972; Clark & Clark 1977; Costermans 1980; Noizet 1980; Matthei & Roeper 1985; Greene 1986). Undoubtedly, speech recognition as it occurs in interpreting has non-automatic components.

Actually, interpreters know that interpreting involves much more than speech recognition. Some kind of semantic representation of the content of source speeches is always present, which includes plausibility analyses (see Chapter 4, 5 and 6) and probably some anticipation. Chernov (1973) conducted an experiment in which he made students interpret sentences that seemed to be leading in a certain direction and then veered off to an unexpected ending. He found they were usually interpreted according to the direction they were taking initially, not as they finally turned out to end. His subjects not only identified words, but also made inferences about their meaning and anticipated on-line. Several studies by Gerver (1976), Lambert (1988) and others focused on comparisons of recall and recognition under various conditions and also led to results suggesting that when interpreting simultaneously, interpreters do achieve a level of comprehension much beyond the recognition of individual words.

No sophisticated research is necessary to ascertain that interpreting comprehension goes beyond word recognition: field observation provides ample evidence for the fact in practically any interpreted speech. As an illustration, below are French renditions by five professional interpreters of the same English speech segment. The material is taken from one experiment (Gile 1999b) involving in-laboratory interpreting of the same recordings of actual conference speeches.

Original English sentence (by speaker):

> "I was hoping to encourage the oil people to give a little bit back to the countries that they take the oil from"

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

French versions produced by five professional interpreters:

> «*Je voulais encourager les pétroliers à rendre un peu de leur butin aux pays où ils vont le prélever* » (Interpreter A)
>
> « *Je pensais pouvoir encourager les compagnies pétrolières à restituer un peu des profits aux pays qu'ils exploitent* » (Interpreter B)
>
> « *J'espérais que les compagnies pétrolières rendraient quelque chose à ceux dont ils prennent le pétrole* » (Interpreter C)
>
> « *Je voulais encourager les pétroliers entre guillemets à rendre un petit peu de ce qu'ils ponctionnent aux pays qui ont du pétrole* » (Interpreter D)
>
> « *… pour en quelque sorte sensibiliser les gens du secteur pétrolier afin qu'ils rendent un petit peu de ce qu'ils gagnent aux pays où ils prennent le pétrole* » (Interpreter E)

In this example, "oil people" was interpreted into "*pétroliers*", "*compagnies pétrolières*", "*gens qui font de la recherche pétrolière*" and "*gens du secteur pétrolier*". None of these rendering are word-for-word translations. In particular, *compagnies pétrolières* means 'oil companies' and shows that the English term was interpreted instead of being taken literally. As to the rest of the sentence, the word "*butin*" ('loot') used by interpreter A, the expression "*les profits*" used by interpreter B, "*sensibiliser*" ('raise the awareness') show the interpreters' understanding of the economic meaning of the situation and of the moral stance taken by the speaker. Many similar examples of the interpretive nature of comprehension during conference interpreting have been given by other authors, in particular by Seleskovitch and Lederer of ESIT. Such observations only confirm the difference between human interpreters and translators on the one hand, and machine translation programmes based on linguistic analysis on the other. The latter's failure can be attributed to their present inability to relate linguistic signs to knowledge of the world so as to disambiguate and solve other problems arising from the author's linguistic errors, mistakes in substance, and deviations from standard language and logic.

One might also add that the comprehension effort is probably more intense for interpreters than it is for conference delegates, i.e. the people to whom the speaker is talking (see also Chapter 8 and Chapter 9):

- While they are interpreting, interpreters have to concentrate on everything the speaker says whereas delegates can select the information they are interested in.
- The interpreters' relevant extralinguistic knowledge, and often the terminological part of their linguistic knowledge, are less comprehensive than the delegates'.

It follows that comprehension during interpreting is a non-automatic process. As will be explained later in this chapter, it is also critical in terms of processing capacity management.

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

2.2.2 *The Production Effort*

This is the name given here to the 'output part' of interpreting. In simultaneous interpreting, it can be defined as the set of operations extending from the mental representation of the message to be delivered to speech planning and the performance of the speech plan, including self-monitoring and self-correction when necessary.

As in speech comprehension, the impression of effortlessness in speech production is deceptive. Matthei and Roeper stress that (1985: 114),

> … the fact that virtually all people make many false starts, add ums and ahs, and often speak ungrammatically, suggests that production may be making quite a number of very substantial demands on our linguistic systems.

According to Holmes (1988: 324), "Speakers' efforts to realize their intentions are seldom completely fluent and error-free." For Clark and Clark (1977: 226), "Speaking is problem solving." Such problems become particularly salient in hesitations associated with the search for lexical units and with syntactic decision-making (Maclay & Osgood 1959): it often takes time to find the right word, and it often takes time to decide how to steer the sentence at a syntactic junction. Hesitations are the main symptom that makes speakers and their listeners aware of speech production difficulties. Hesitations are also the main factor that determines effective speech rate, i.e. the number of words actually uttered per unit of time, as opposed to the more mechanical articulation rate (Goldman-Eisler 1958; Clark & Clark 1977; Costermans 1980).

Speech production problems account for a number of interesting phenomena. One of them is that speakers tend to "be tempted and constrained to having recourse to ready made verbal sentences, phrases and clichés" (Goldman-Eisler 1958: 67–68). Cherry (1978: 79) explains that "We become prone to verbal habits. It is only too easy to use clichés, proverbs and slogans as a substitute for reasoned statements." Goldman-Eisler found that "Fluent speech was shown to consist of habitual combinations of words such as were shared by the language community and such as had become more or less automatic" (1958: 67), and concludes that meaning itself may be "guided through these channels and modified as a result" (1958: 68).

These observations suggest one reason why speech production under interpreting conditions may be difficult. People who speak on their own behalf are free to speak their own mind and bypass possible production difficulties by rearranging the sequence of information and ideas, or by dropping or modifying some of these or using standard phrases which are not necessarily quite in line with their initial message. In contrast, interpreters find themselves forced to follow rather closely the path chosen by another speaker, if only because waiting for a sentence to finish before starting to interpret it would cause excessive short-term memory load (see the discussion of memory load later in this chapter). In addition, "habitual combinations of words" generally differ from language to language, which makes the interpreter's speech production task more

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

difficult than the speaker's – at least in this respect (see also the discussion of speech production in Chapter 9).

On the other hand, the very fact that lexical and syntactic choices are made by the speaker can in some cases help the interpreter, if s/he can make similar or 'parallel' choices in the target language, or at least use them in some way when retrieving words from his/her mental lexicon and making his/her own syntactic choices. Such verbal piggy-back riding is often done, at times consciously, and seems to help interpreters speak faster than they can when they have only their natural fluency to rely on – but entails risks, as explained below.

If an interpreter uses source-language words and structures to construct his/her own target-language speech, the speech production process becomes more vulnerable:

– Following the source-language structure and lexical choices in one's target-language speech is risky because the interpreter may get stuck because of syntactic and grammatical differences between the languages.

In a training session in the classroom, one student tried to interpret into French the following English sentence by following its structure and the speaker's lexical choices:

> "This movement was shown by our team as consisting of three parts …"

The student started with: "*Ce mouvement a été montré par notre équipe …*", which mirrors the English sentence structure, and could not construct a natural, grammatical segment to complete the sentence, as French does not allow the passive of the verb *montrer* (to show) to be followed by a structure similar to "as consisting of." A natural translation of the sentence into French would have put "team" in the beginning of the target version, in something like:

> *Notre équipe a montré que ce mouvement se compose de trois parties …*

("Our team showed that this movement consists of three parts")

– Besides the risk of getting stuck, when following the target-language structure and lexicon, interpreters may find themselves deprived of part of their own favourite productive linguistic resources as speakers (words and structures) which they might put to use if they were to produce a speech on the basis of meaning rather than on the basis of a linguistic structure borrowed from another speaker, in another language at that.
– Third, such transcoding is associated with great danger of linguistic interference between the two languages, be it gross interference resulting in grammatical errors, mispronunciations and false cognates, or more discrete interference that will make the interpreter's speech more hesitant, less idiomatic, less clear, less pleasant to listen to.

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

– Fourth, by focusing on language, the interpreter is in greater danger of processing the incoming speech more superficially than if s/he produced the speech from the meaning. This may generate more errors, because the interpreter will do less plausibility-testing (see Chapter 5).

For all these reasons, which they do not necessarily explain in so many words, interpreting instructors tend to say that the rule to be followed whenever possible is to produce the target-language speech on the basis of the meaning, not the words of the source-language speech (but see Chapter 9 on the role of Translinguistic Equivalences).

The fact that interpreting constraints force interpreters to deviate from their habitual speech production patterns may account for the poor quality of language output in students' interpreting exercises. In a naturalistic study conducted on five native speakers of French at ESIT, Paris, during a whole academic year (Gile 1987), the number of deviations from acceptable linguistic standards (as indicated by native informants) per sequence of 100 words was measured in three types of exercises: presentations by the students, exercises in consecutive and exercises in simultaneous interpreting. The target language was French in all cases. Deviations were found to be more numerous in consecutive than in presentations, and more numerous in simultaneous than in consecutive. Interestingly, most of these deviations did not seem to be due to interference between source and target language, at least not in any direct, visible way. No systematic comparison was done with the output quality of professional interpreters, but scrutiny of consecutive and simultaneous interpreting transcripts from other experiments seems to suggest that overall, linguistic deviation rates in professionals are much lower (however, see Alonso Bacigalupe 2006 for different findings). It appears that the effects of interpreting constraints on production are stronger in simultaneous than in consecutive, probably because of differences between the two modes, both in processing capacity management and in time constraints – the two are obviously linked.

A further difficulty, already mentioned for the Comprehension Effort in Section 2.1, arises from the fact that interpreters often have to produce speech in fields with which they are not necessarily familiar. Neither are they always familiar with the particular sociolect used by the relevant groups with respect to words, particularly technical terms, and phraseology – the same issue was highlighted in previous chapters when discussing written translation. Again, speech production in interpreting is clearly a non-automatic operation.

2.2.3 *The Memory Effort*

During interpreting, short-term memory operations (up to a few seconds) succeed each other without interruption. Some are due to the lag between the moment speech sounds are heard and the moment they are interpreted: phonetic segments may have to be added up in memory and analyzed until they allow identification of a word or phoneme.

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

To take only one example, when spelling a name and saying "D as in Denmark," phonetic features of the sound carrying 'D' may have to be held in memory until the word 'Denmark' is recognized, which makes it possible to recognize 'D' as opposed to 'T'.

Other short-term memory operations are associated with the time it takes to produce speech (selecting the appropriate words and syntactic structures and implementing the speech plan), during which interval the idea or information to be worded has to be maintained in memory.

Still others may be due to individual characteristics of a given speaker and/or his/her speech: if the speech is unclear because of its logic, information density, unusual linguistic structure or speaker's accent, the interpreter may wish to wait for a short while before reformulating it (in simultaneous) or taking notes (in consecutive) so as to have more time and a larger context to deal with comprehension and reformulation difficulties.

Language-specific factors may also require short-term memory operations. Inversions in determination sequences are one example, for instance in "System and application strategy" (from a Data Processing conference). The sequence was translated into French as "*stratégie en matière de systèmes et d'applications*." The sound and/or meaning of "System" and "application" had to be stored in short-term memory until after the interpreter heard the English word "strategy" and had said "*stratégies en matière de*".

Short-term memory operations fall under the category of non-automatic operations because they include the storage of information for later use (see Richard 1980, cited earlier). Furthermore, stored information changes both from one speech to another and during speeches as they unfold, and both stored information quantities and storage duration can vary from moment to moment, so that there is little chance for repetition of identical operations with sufficient frequency to allow automation of the processes.

3. Working memory

As explained in Chapter 1 and elsewhere in this book, in order to optimize the basic concepts and models for training purposes, they are kept simple and I have tried to avoid theoretical components to which students cannot relate in their daily interpreting experience. However, over time, the concept of working memory from cognitive psychology has come up again and again in the analyses of interpreting found in the literature. It also helps gain better understanding of the Effort Models presented later in this chapter and is useful in the analysis of some language issues (see Chapter 9). It is therefore briefly mentioned here.

Psychologists traditionally make a distinction between long-term memory (what we refer to as 'memory' in everyday life) and short-term memory, which is the ability to keep information and process it over a short period. A third type of memory, called sensory memory, as well as the interaction between the three, will be introduced in Chapter 9. Short-term memory has been investigated by many cognitive psychologists

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

over the past decades. It is considered an important determinant of cognitive operations and is now sometimes referred to as 'working memory' (though 'short-term memory' is a fairly generic concept while 'working memory' is more specific). In 1974, Baddeley and Hitch developed a model of working memory with a specific structure and operational components, including a 'Central Executive', a modality-free cognitive mechanism which coordinates the operation of the other entities in the model, namely a 'phonological loop' which holds information in phonological form and a 'visuo-spatial sketch pad' specialized in spatial and/or visual information coding. Baddeley and Hitch's model is described in most introductory books on cognitive psychology – see for example Eysenck and Keane 1990. Further research in the field naturally led to tests of its ability to explain and predict cognitive phenomena and then to other models with further ideas about its components, including specialized verbal working memory (Caplan & Waters 1998), about its operation, about is relationship to long-term memory. According to Miyake and Shah (1999), several ideas and theories about the components and operation of working memory compete in cognitive psychology circles (for a recent review, see Timarová 2008), and some authors even doubt the usefulness of the concepts of working memory as a separate entity, but a consensus can be found with respect to the following points:

1. Working memory is a set of mechanisms or processes involved in the control, regulation and active maintenance of task-relevant information in the service of complex cognition; it operates primarily on currently 'activated' information from long-term memory.
2. Working memory requires processing capacity
3. Working memory has a small storage capacity

As explained in more detail in Chapter 9, working memory is necessarily part of the language-comprehension process and of the speech-production process. It is obviously part of the Memory Effort and perhaps conceptually very close to it, but the Memory Effort is explained here in such a way as to be intuitively recognizable by students and professional interpreters as a step in the interpreting process which involves memory and memory operations, not as a conceptual entity from cognitive psychology. Readers may consider the Memory Effort as corresponding to working memory if they wish, but for reasons explained in Section 13, I prefer to talk about short-term memory and about the Memory Effort when referring to the mechanisms of interpreting in general and to invoke working memory only in more technical considerations.

4. An Effort Model of simultaneous interpreting

4.1 A first view of the model

Using these definitions, simultaneous interpreting (SI) can be modelled as a process consisting of the three core Efforts described above, namely the Listening and Analysis

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

Effort L, the Short-term memory Effort M and the Speech production Effort P, plus a Coordination Effort C which corresponds to resources required to coordinate the three other Efforts (Eysenck & Keane 1990):

(1) SI = L + P + M + C

(In this formula, the 'equal' sign should be interpreted as meaning 'consists of', not as an equality in the usual mathematical sense, and the 'plus' sign as some kind of 'addition' in a very general sense, not as the usual arithmetic addition).

In a somewhat oversimplified form (see below), this model depicts simultaneous interpreting as a process which involves a set of operations on successive speech segments. Each of them is heard and analyzed (L), then stored in memory for a short while (M), and finally reformulated in the target language (P).

4.2 Simplifications in the model

Before going into further analysis of the Model, two major simplifications which it incorporates need to be highlighted.

4.2.1 *The sequential linearity simplification*

It is convenient to think of the Listening, Production and Memory Efforts as handling sequentially Translation Units or 'speech segments' (or 'chunks' as they would be called in the psycholinguistics literature), which can vary in length from one to several words forming a clause or even a sentence (see the discussion of Translation Units in written translation in Chapter 5), in the order in which they were uttered by the speaker: if the source speech consists of successive segments A, B, C, D, E, F etc., Production could focus on segment A while segment B has been analyzed and is waiting in short-term memory for its turn to be reformulated, and segment C is being analyzed by the Listening and Analysis Effort. Generally, with the exception of anticipated segments, source-speech segments can be reproduced in the Target Text (Effort P) only after they have been understood (Effort L).

Reality is more complex, if only because of syntactic differences between the source- and target language which naturally lead to information-order changes in the target speech. Other phenomena can lead to similar results. For instance, when the initial words in a speaker's sentence are not clear, the interpreter may need to keep them in memory until they are well understood. By that time, more than one Translation Unit is stored in short-term memory and it is not clear which will be rendered first. Finally, linguistic and semantic anticipation as alluded to earlier occur frequently in speech comprehension, and interpreters sometimes find themselves voicing in their target speech ideas or information which the speaker has not expressed verbally yet, at least not fully.

Nevertheless, the linearity assumption remains a useful simplification for the purpose of explaining strategies and tactics in the daily practice of interpreting, as discussed in Chapter 8.

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

4.2.2 *The additivity simplification*

As indicated in Section 4.1 above, the 'plus' sign in Formula (1) is a symbol referring to additivity in a very wide sense, not in a strictly arithmetic sense. Because of the complexity of the operations involved, including the sharing of the interpreter's working memory by speech comprehension and speech production (see Section 3 and Chapter 9), it is difficult to assess the added cognitive load which can be attributed to each Effort at each time. Inter alia, processing capacity requirements for each individual Effort are probably determined not only by their individual needs, but also by their interaction. One relevant factor is possible interference between the two languages in contact, the avoidance of which requires special attention. Indeed, some linguistic interference from source language to target language is often felt in the field (see for instance Alonso Bacigalupe 2006), and interpreters are taught to be aware of the danger and fight it, for instance by striving to avoid using words and sentence structures similar to those used in the source-language speech whenever possible.

In the Effort Model, additivity of cognitive load is assumed only in the sense that overall, the simultaneity of two Efforts is associated with heavier load than the operation of one (such as the Listening Effort only), and the simultaneity of three Efforts leads to higher cognitive pressure than the simultaneous operation of two.

5. Processing capacity–related problems in simultaneous interpreting

5.1 Operational requirements

At any time, one, two, or three of the core Efforts are active: at one point, the interpreter may be producing a speech segment which has been planned beforehand while the speaker has paused, in which case only one Effort is active; at other times, s/he may be listening to speech and maintaining information from the speech in memory but is not speaking or preparing reformulation yet, in which case two of the Efforts are active; finally, there is now ample evidence that at least part of the time, interpreters do listen and speak simultaneously (see Gerver 1975; Čeňková 1988), and all three Efforts are simultaneously active. Operational processing capacity requirements during simultaneous interpreting can therefore be represented as follows:

(2) TR = LR + MR + PR + CR

TR Total processing capacity requirements
LR processing capacity requirements for L
MR processing capacity requirements for M
PR processing capacity requirements for P
CR processing capacity requirements for C

In this 'equation', the equality sign can be interpreted in its usual mathematical meaning, but the plus signs refer to some additivity in a very wide sense.

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

In order for interpreting to proceed smoothly, the following five conditions have to be met at any time:

(3) TR ≤ TA

TA total available processing capacity

(Total processing capacity requirements should not exceed the interpreter's total available processing capacity.)

(4) LR ≤ LA

LA being the processing capacity available for L

(5) MR ≤ MA

MA being the processing capacity available for M

(6) PR ≤ PA

PA being the processing capacity available for P

(7) CR ≤ CA

CA being the processing capacity available for C

The last four inequalities state that processing capacity available for each Effort should be sufficient to complete the task it is engaged in.

The difference between the two types of prerequisites defined by inequalities (3) on one hand and (4) to (7) on the other is an important one. Condition (3) refers to the availability of sufficient processing capacity to cover the needs of all active Efforts. When it is not met, a situation of saturation arises. For instance, a speaker's utterance may be fast and dense, therefore requiring the processing of more information per unit of time and raising capacity requirements beyond what is available to the interpreter (see Chapter 8).

Problems may also arise even if processing capacity requirements do not exceed total available capacity. Sometimes, it is inappropriate allocation of available processing capacity between Efforts which causes problems. For instance, the interpreter may direct too much attention to producing elegant reformulation of a previously heard segment of the source speech, and may therefore not have enough capacity left to complete a Listening task on an incoming segment. Had s/he been content with a simpler reformulation, enough capacity would have been left over for the L Effort. Inappropriate management of processing capacity results in individual processing capacity deficits ('individual deficits') in one or several Efforts, i.e. a situation where one or several of conditions (4) to (7) are not met.

Some students may be put off by a mathematical formulation of these conditions. A metaphor can also be used to illustrate the same ideas: interpreting can be likened

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

to the management of manpower in a company 'SI' which has a service agreement with other companies 'A', 'M' and 'P' and assigns and despatches employees to their sites to cover their needs. Each of the three client-companies 'A', 'M' and 'P' is engaged in projects with variable manpower requirements. Firstly (condition (3)), 'SI' must have enough employees to cover all the needs of its clients 'A', 'M' and 'P' on their respective sites. Secondly (conditions 4 to 6), at any time, a sufficient number of employees from 'SI' must be assigned to 'A', to 'M' and to 'P' to cover their respective requirements. If the total number of employees in 'SI' is sufficient but they have not been assigned and sent to the site of the right client at the right time, work cannot proceed smoothly on the three sites. Finally, within 'SI', a team 'C' must coordinate the assignments, that is, receive requests from the clients, see who is available to be sent to 'A', 'M' and 'P' and make the necessary arrangements . If operations are to proceed smoothly, there must be enough employees in team 'C' as well.

5.2 Problem triggers

As explained in the introduction, a major objective of the Model is to explain interpreting difficulties, in particular recurrent problems which are well known to the interpreting community and often mentioned in the literature but which have not been analyzed in the past using a common conceptual framework (such triggers include names, numbers, enumerations, fast speeches, strong foreign or regional accents, poor speech logic, poor sound, etc.). In the Effort Models framework, problem triggers are seen as associated with increased processing capacity requirements which may exceed available capacity or cause attention management problems, or with vulnerability to a momentary lapse of attention of speech segments with certain features. These triggers, as well as the interpreters' common responses to the problems they generate, are discussed in Chapter 8.

5.3 Failure sequences

Problem triggers do not necessarily lead to actual problems. For instance, a long name may come up at the end of a sentence rather than in the middle and be followed by a long inter-sentence pause. In such a case, the requirements of the Listening and Analysis Effort are nil for a while right after the name has been pronounced by the speaker, and the interpreter can devote his/her full processing capacity to the Memory and Production components. If the same name is followed right away by a new sentence, it can cause more problems, because the three Efforts will have to be engaged in other tasks as well.

Quality deterioration, when it occurs, is not necessarily detected by observers. Processing capacity problems may result in deterioration of the content of the target-language speech (errors, omissions, etc.) and/or of its delivery (linguistic output, voice,

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

intonation, etc.). As explained in Chapter 2, distortions of content are not always easy to identify (for some empirical evidence of the lack of sensitivity of listeners to errors and omissions, see Gile 1995). As for characteristics of delivery, unless there is a clear difference from one moment to the next, it may be difficult to judge that an acceptable rendition of a particular speech segment could have been better had there not been a problem.

Also note that, as explained below, it may be difficult to associate a particular quality deterioration phenomenon with the specific problem it originated in, because quality degradation may occur at a distance and affect a segment which poses no particular problem in itself. It is therefore not easy to identify all deterioration sequences from the trigger to the consequences or vice versa. However, some of the processes are perceived clearly enough by the interpreters themselves to be described, and theoretical models provide plausible explanations for phenomena observed in the field and help devise tactics and strategies for improved interpreting (see Chapter 8).

The simplest type of failure sequence can be exemplified by a momentary attention deficit affecting the Listening and Analysis Effort. This may result in the auditory loss of information in an incoming segment such as a name or number, which the interpreter fails to identify or understand and subsequently to reproduce in the target-language speech. In another simple failure sequence, an unexpectedly difficult segment comes up in the source-language speech, and because it is unexpected (a word in a foreign language, a name appearing out of the blue, a word which does not belong to the particular language register used, etc.), the interpreter has not allocated enough resources to the Listening and Analysis Effort and cannot complete the listening and comprehension task successfully; again, this results in his/her inability to render the information in the target speech.

Insufficient availability of processing capacity for an Effort may also be the consequence in a whole chain of events which can last several seconds: for instance, the interpreter may be devoting too much processing capacity to the Production Effort in an attempt to produce elegant wording in the target speech; this leaves him/her with insufficient processing capacity for the Listening and Analysis Effort, an ulterior speech segment is missed, and cannot be rendered. Alternatively, s/he may have engaged considerable resources in the Memory Effort, for instance in the translation of a long name such as "*Association internationale des villes francophones de congrès*" into English; some reordering of the informational sequence is needed in order to produce "International Association of Francophone Conference Cities", and this takes time and processing capacity at the expense of capacity left for analysis of succeeding incoming segments, which may therefore be missed. In this context, it is interesting to note that in her experiments on relay interpreting, Mackintosh (1983) observed that when numbers (a well known problem trigger – see also Mazza 2000) were rendered correctly, neighbouring segments were missed. Similar observations were made in more recent studies around other problem triggers (see also Section 9).

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Following are two other possible scenarios:

- A long name comes up in the source speech, and the interpreter chooses to interrupt or slow down the reformulation of a previous segment so as to concentrate on the name. S/he may then want to reproduce it as soon as possible in the target speech so as to unload memory and avoid saturation. By the time this is done, the previous segment may have been forgotten.
- Bad pronunciation by a non-native speaker forces the interpreter to devote much processing capacity to the Listening and Analysis Effort, and therefore slows down production. This results in lag which in turn overloads the Memory Effort and results in loss of information from memory. Alternatively, memory is not overloaded, but production becomes very difficult because the interpreter has to accelerate in order to catch up with the speaker, which results in deterioration of output quality or decreased availability of processing capacity for the Listening and Analysis Effort and in the loss of a later segment.

Many other sequences are possible, resulting in the possible loss of segments that may not be difficult to understand or translate under normal circumstances but happen to be processed at the wrong moment, that is, at a time when not enough capacity is available to the relevant Effort for successful completion of the task at hand.

5.4 Anticipation

The usefulness of anticipation, often underscored by interpreters (see Chernov 1973, 2004; Moser 1978; Déjean Le Féal 1981; Cartellieri 1983), also becomes clear when analyzed through the Effort Model for simultaneous interpreting. Two types of anticipation are considered here: 'linguistic anticipation' and 'extralinguistic anticipation'.

5.4.1 *Linguistic anticipation*

The probabilistic nature of speech comprehension is widely accepted. In every language, words follow each other not at random, but with highly differentiated probabilities ('transitional probabilities'): for instance, in English, the probability that an article will be followed by a noun or an adjective is high and the probability that it will be followed by another article or a verb is low. Beyond general grammatical rules, collocations and standard phrases offer obviously high probabilities for specific word sequences. Knowledge of such rules, albeit unconscious, helps reduce uncertainty and thus also reduces processing capacity requirements in speech comprehension. Such 'linguistic anticipation' is viewed as very central in human language perception by Richaudeau (1973: 21). It appears, in particular in studies on reading, that subjects use transitional probabilities when identifying words (see Hörmann 1972: 97-101). All other things being equal, the more numerous and the higher transitional probabilities are in language as it is used and

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

the better they are known to the interpreter, the less processing capacity is required for speech comprehension. A high level of linguistic proficiency implies not only that one knows words and structures and can recognize them, but also that one has good knowledge of transitional probabilities and can use them in comprehension. Such high proficiency is difficult to assess in most everyday situations in which all or nearly all available processing capacity can be allocated to the listening task. In simultaneous interpreting, two other Efforts compete with the Listening and Analysis Effort for processing capacity, and mastery of transitional probabilities can become critical.

The potential importance of anticipation in interpreting can be seen very clearly in the case of Japanese. Japanese speeches offer many predictable sentence endings: from a certain point on, the informational content of the sentence is virtually ended. A naturalistic study of Japanese conference speeches reported in Gile 1992a suggests that they are numerous and can be rather long, up to more than 6 syllables and lasting more than one second. In the same paper, a theoretical analysis of potential implications is presented. In particular, Gile believes that interpreters working from Japanese may find considerable cognitive relief in such sentence endings. So far, it has been difficult to test this assumption directly due to methodological difficulties – as explained earlier, it is difficult to detect in the interpreter's online output the influence of any single factor – but modern brain imaging technology might open new avenues by making it possible to measure online cortex activation parameters at a high spatial and time resolution and perhaps detect changes when predictable sentence endings are identified by the interpreter.

5.4.2 *Extralinguistic anticipation*

Besides so-called 'linguistic anticipation', good knowledge of the conference situation, of the subject and of the speaker and good understanding of the unfolding statements often make it possible to anticipate ideas and information expressed in speeches. 'Anticipation' is defined here as some knowledge of the probability of the speaker reacting or speaking in a particular way in the context or situation at hand, not necessarily as the exact prediction of the speaker's world.

For instance, if during a debate on a problematic issue, a speaker starts his/her statement as a reaction to the opinion uttered by the previous speaker with the words: "No, Mister Chairman, I do not think that….", interpreters may anticipate that the statement will express disagreement. If in the course of a debate at a UN agency on the election of representatives to a committee, an African speaker says "Madam Chair, Europe, Asia and the Pacific as well as the Americas are represented in the committee, but there is no….", depending on the context, interpreters may expect words to the effect that there is no member from the African continent. Sometimes, a speaker refers to a diagram projected on screen and describes it. The interpreter, who can see the diagram as well, can see what part of it the speaker is referring to and anticipate with some accuracy what s/he is going to say.

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Note that the distinction between 'linguistic' and 'extralinguistic' anticipation is made for didactic purposes, because of the practical implications, just as the distinction was made between 'linguistic' and 'extralinguistic' knowledge (Chapter 4), but depending on the type of analysis performed, one could well challenge the existence of a fundamental difference between the two.

~

Basically, the more anticipation reduces uncertainty, the more cognitive relief can be expected from it. This is where extralinguistic knowledge and conference preparation (see Chapter 6) become important. By using documents and preparatory briefings in order to acquire knowledge about a conference, that is, about relevant facts, names, ideas, terms and expressions likely to be referred to or used respectively during the conference, interpreters increase their ability to anticipate and therefore decrease processing capacity requirements for their Listening and Analysis Effort, and sometimes for their Production Effort. More capacity is left for tasks which require it, and risks of saturation can be reduced.

6. An Effort Model of consecutive interpreting

The initial Effort Model was developed for simultaneous interpreting. Using the same principle, a similar Model was developed for consecutive interpreting. Note that this section deals with what AIIC members call 'true consecutive', in which the speakers' uninterrupted utterances are at least a few sentences long, as opposed to sentence-by-sentence consecutive in which there is no systematic note-taking.

Consecutive interpreting is performed in two phases, the comprehension phase (or listening and note-taking phase), and the speech production (or reformulation) phase.

Phase one: listening and note-taking

(8) Interpreting = L + N + M + C

- L Listening and Analysis
- N Note-taking
- M Short-term Memory operations
- C Coordination

During this phase, L is the same Listening and Analysis Effort as in the simultaneous mode, and M is similar to the Memory Effort in simultaneous interpreting. In simultaneous, it is associated with the time which elapses between the moment a speech segment is heard and the moment its content is reformulated in the target language, deliberately omitted or lost from memory. In consecutive, it is associated with the time between the moment it is heard and the moment it is written down (if it is written

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

down) or processed mentally and sent on to (long-term) memory. As to the Production Effort, during the first phase of consecutive interpreting, it is devoted to the production of notes, in contrast to the production of structured natural language as in simultaneous interpreting. The implications of this difference are discussed later in this section.

Phase two: target-speech production

(9) Interpreting = Rem + Read + P + C

Rem	Remembering
Read	Note-reading
P	Production

In phase two, the Rem component is the set of mental operations devoted to recalling the successive parts of the original speech from long-term memory and is therefore different from the short-term M component. At first sight, phase two may seem more difficult than phase one, with its long-term memory (Rem) and note-reading (Read) Efforts. However, if notes are good, they help perform Rem operations and may actually reduce Rem processing capacity requirements rather than increase them. Interpreters occasionally mention the role visual memory plays in recalling the speech: indeed, when notes are taken according to a few simple layout rules (see Rozan 1956), the layout itself can be hypothesized to act as a visual stimulator of memory regarding the logical structure of the speech. Furthermore, while phase one is paced by the speaker, in phase two the interpreter is free to perform the three Efforts and allocate processing capacity to each at his/her own pace, which also reduces pressure on the Coordination component.

In the reformulation phase, unlike the situation in the comprehension phase or in simultaneous interpreting, the interpreter does not have to share processing capacity between tasks under high cognitive load, and for competent interpreters with adequate mastery of their working languages, there are no problems arising from an accumulation of tasks under the pressure of time resulting in capacity requirement peaks. This is why, in terms of processing capacity, only phase one seems to generate potential threats of saturation. Operational requirements are defined as inequalities (10) to (14) as they were for simultaneous interpreting through inequalities (3) to (7) in Section 5.1. In consecutive, they apply to the comprehension phase, not to the reformulation phase.

Similarly to the case of the simultaneous interpreting model, the following conditions must be met at all times in order for consecutive interpreting to proceed smoothly:

(10) $LR + NR + MR + CR \leq TA$

(11) $LR \leq LA$

(12) $NR \leq NA$

(13) $MR \leq MA$

(14) $CR \leq CA$

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

When inequality (10) is not true, saturation may occur. When inequalities (11), (12), (13) or (14) are not true, failure may result in spite of the possibility of total available capacity being larger than total requirements.

Consecutive interpreting, processing capacity and note-taking

The fact that in consecutive, speech comprehension and speech production are separated in time is a major difference which distinguishes it from simultaneous. It lowers markedly the pressure on target speech production as well as short-term memory load arising from syntactic differences between the source language and the target language: interpreters can take down information in notes as it arrives, as opposed to simultaneous, where they have to keep it in short-term memory until it can be put together and reformulated into a succession of natural-sounding target language sentences. The fact that during the second phase of consecutive interpreting, more capacity and time are available for speech production than in simultaneous may explain why some interpreters who refuse to work into B in simultaneous are willing to do so in consecutive.

As for the first phase, which is paced by the speaker, it does not necessarily generate the same constraints as simultaneous, because note-taking allows more freedom than speech production. Note-taking is not governed by rules of linguistic acceptability – lexical, syntactic, stylistic, or otherwise. As explained below, notes can be taken with much latitude. When processing capacity requirements for the Listening and Analysis Effort become high, some resources can be freed by reducing the quantity of notes being taken. In simultaneous, slowing down speech production results in some lag, which has a cost in Memory Effort load and may have to be made up later at the expense of increased capacity requirements for Production. In consecutive, reducing the amount of information that is written down in notes does not necessarily result in much increase in information to be stored in short-term memory and reformulated in the target language at a later stage. Below are a segment from a speech and an approximate reproduction of one professional interpreter's notes (from an experiment reported in Gile 2001):
Source-language speech

> "… because every child has the same needs, and the right to a basic education, the right to food, the right to shelter, and the right to basic health and every child needs a friend …"

Consecutive notes

```
all same
rights      ed.
            shelter
            health
need friend
```

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

As can be seen, words such as 'because', 'every child', 'needs' and 'basic', as well as grammatical words, were not written down by the interpreter, who nevertheless rendered faithfully the whole segment. This illustrates the latitude in note-taking mentioned above. Notes do not reproduce the speech; they are only written indications to help the interpreter remember it.

During the first phase of consecutive interpreting, problem triggers are similar to those found in simultaneous interpreting. The main difference between the two situations is associated with the manual nature of note-taking: it requires more time than speech production because hand movements are slow, and therefore lead to some lag, hence to a higher pressure on short-term memory, which may in turn reduce the capacity available for the Listening and Analysis Effort. This has implications. For instance, single-word names which are recognized by the interpreter need not be problematic in simultaneous, but if they need to be written down and are long, they can trigger problems in consecutive.

It could be argued that note-taking requires less time than speech production in simultaneous, because notes can take the form of single words, abbreviations, drawings and symbols, whereas speech production in simultaneous requires the construction of full sentences. Furthermore, as highlighted above, only part of the information is taken down while the rest is committed to (long-term) memory. This is true enough. However, for whatever information is written down, the time factor becomes important, especially when the interpreter does not have a readily available symbol or abbreviation for the information, and as shown by a number of empirical studies (see Section 5.3), lag at local level can impair the interpreter's ability to render the source speech successfully further down the road.

It follows that in terms of processing capacity, note-taking is critical, which explains and justifies the large volume of literature it has generated, from Rozan (1956) to Matyssek (1989) to a number of recent empirical studies (including Andres 2000; Gile 2001; Dam 2004a, b; Albl-Mikasa 2006 and several MA theses from China reported in various issues of the *CIRIN Bulletin* at www.cirinandgile.com). The critical nature of note-taking is the focus of a classroom experiment (Gile 1991a) which demonstrates that students who have not yet mastered its principles and techniques tend to miss more names (used as an indicator – see Gile 1984b) when interpreting after taking notes than when they do not take notes (see a description of the experiment in Section 12).

In the interpreting community, there are differing opinions as to the desirable quantity of notes, the language in which they should be taken, the use of symbols, etc. Note-taking is an area in which the concept of processing capacity can be useful but has only recently been used extensively in performance analysis. The basic question is how to reduce processing capacity and time requirements of note-taking while maintaining the efficiency of notes as memory reinforcers.

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

Viewed from this angle, symbols and abbreviations are an attractive tool, provided they have been fully mastered by the interpreter – otherwise, retrieving them from one's memory when they are needed for writing may take up too much time and processing capacity. The much-decried idea of learning a large set of symbols rather than making them up when needed may therefore have distinct advantages.

The same line of reasoning can be applied when considering whether it is preferable to take notes in the source language or in the target language. Some interpreting instructors recommend taking notes in the target language, arguing that this fosters analysis during the comprehension phase and does away with the need to 'translate' in the reformulation phrase. On the other hand:

- Thinking of target-language 'equivalents' in the source language while listening takes up extra processing capacity,
- This is done during the listening phase, which is critical in terms of processing capacity, and may therefore increase risks of saturation,
- The extra time and processing capacity required in order to 'translate' source-language notes during the reformulation phase do not jeopardize the interpreter's performance, since reformulation is self-paced, with little risk of saturation.

A reasonable alternative would be taking notes in the target language when cognitive pressure is not too high and reverting to source-language notes when close to saturation. In an experiment, Dam (2004a,b) found that students tended to take notes in their A language when the going got rough irrespective of whether it was the source language or target language, but these data which reflect the performance of students are not enough to generalize. Until enough empirical evidence is available, it is difficult to say which position is of more practical value, but instructors do seem to agree on the need to save both time and processing capacity in note-taking.

7. Efforts in sight translation

Sight translation is less frequent in conference interpreting than simultaneous or consecutive (but is very common in signed-language interpreting – according to a personal communication by Carol Patrie). It consists in 'reading' a source-language text aloud in the target language. It occurs when delegates receive a text and want to have it translated orally on the spot, or when a speech segment has been read from a text which is then handed over to the interpreter who is asked to translate it orally. It can be modelled as follows:

(15) Sight translation = Reading Effort + Memory Effort + Speech Production Effort + Coordination

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

In sight translation, what was the Listening and Analysis Effort in simultaneous becomes a Reading Effort, and the Production Effort remains, but while short-term memory is necessary to identify and understand speech segments as it is in simultaneous or consecutive, longer-term retention of words and clauses until they are enlisted for target-speech production is less of a problem because of the continued availability of the information in the text.

Pressure on short-term memory therefore seems lighter in sight translation than in simultaneous or consecutive (as it is assumed by cognitive scientists to be lighter when reading than when listening to spoken discourse – see Michael *et al*. 2001: 240). Moreover, sight translation is self-paced, not paced by the source-language speaker. It would therefore be tempting to consider cognitive load less heavy in this particular translation modality than in interpreting.

On the other hand, in the Reading Effort, sight translators are not helped by vocal indications such as the speaker's intonation, hesitations or other pauses which are found in simultaneous and consecutive interpreting and which help them segment the text into Translation Units. Moreover, in contrast to consecutive, while reading, they cannot devote all their efforts to understanding the meaning of the text but must think of its translation as well in order for their target-language rendition to be smooth enough. This may pose little difficulty when the two languages are syntactically similar and when the source text is written in a style easy to segment, in particular when sentences are short and made up of independent clauses. When sentences are long and/or include embedded clauses, it may be necessary for the sight-translator to read much more than one Translation Unit before reformulating it, which involves more time and more effort, both in the reading component and in short-term Memory during production. This occurs inter alia when translating from languages such as German or Japanese into French or English. The same difficulty arises in consecutive and simultaneous interpreting, but, as noted above, in sight translation there is no help for segmentation from the speaker's voice.

When the text is given to interpreters in advance, they can take care of this particular difficulty partly or fully by reading sentences and preparing their segmentation mentally before sight translation, or by inserting handwritten slashes in the appropriate places. It is meaningful that many interpreters seem to perform this operation before they do anything else, including writing down target-language equivalents of source-language terms. Sight translators may also write numbers above words in a segment which will have to be reordered in the target language, as in:

2	4	3	1
Interamerican	Tropical	Tuna	Commission

To be translated into French as:

Commission (1) *interaméricaine* (2) *du thon* (3) *tropical* (4)

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

When prior preparation is possible, Effort load can be reduced considerably.

Another major difficulty in sight translation is important in the initial training context: in interpreting, and especially in consecutive, the sounds of the source-language speech disappear rapidly from the interpreter's memory, permitting the reconstruction of the speech from its semantic content with little interference from source-language words and linguistic structures; in sight translation, these remain present before the practitioner's eyes throughout the operation (though the reader's gaze focuses only on a small text segment each time). This increases the risk of interference between the two languages and calls for more intense anti-interference efforts than in interpreting, making it a difficult exercise for beginners in spite of the facilitating factors described above.

8. Simultaneous interpreting with text

Simultaneous interpreting with text is a very common interpreting modality, inter alia in speeches at international conferences, when speakers read a text which has also been given to interpreters.

Simultaneous interpreting with text is associated with the following Efforts:

(16) Simultaneous Interpreting with text = Reading Effort + Listening Effort + Memory Effort + Production Effort + Coordination Effort

This combination of simultaneous interpreting and sight translation has the following features:

On the facilitating side:

- The existence of vocal indications from the speaker, though these may not be as helpful as in ad-libbed speeches, because pause and intonation patterns when reading are not the same as when planning and producing speech online in ad-libbed statements (see an interesting analysis in Déjean Le Féal 1978).
- The visual presence of all the information, which reduces memory problems and the effect of acoustic difficulties and unusual accents as well as the probability of failures due to insufficient processing capacity in the Listening and Analysis Effort. In other words, the Reading Effort and Listening Effort cooperate to a large extent – but they also compete, as explained below.

On the negative side:

- The high density and peculiar linguistic constructions of written texts as opposed to oral discourse, which require more processing capacity in the analysis component (see Halliday 1985; Brown & Yule 1983).
- Increased risks of linguistic interference, as explained above for sight translation.

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

– The added cognitive load arising from the need to follow both the vocal speech and the written text. Two associated risks are noteworthy:

  a. Since all the information is present in the text, students often try to translate all of it even when delivery is too fast and they are being outdistanced. In such cases, saturation may occur and important speech segments may be lost.
  b. Speakers often deviate from the written text by adding comments, changing segments or skipping segments. When interpreters focus on the written text, they may miss these changes.

In conclusion, classroom experience shows that simultaneous interpreting with text is a difficult exercise, but it does seem to make interpreting feasible under acoustic and delivery conditions which would make it more difficult, and sometimes impossible without the text.

Instructors insist that precedence should be given to the speech as it is heard from the speaker, not to the text, but students generally feel a strong temptation to rely on the text, which appears safer than the speech because its content remains available in 'solid' print whereas words disappear rapidly – and so does their memory. The key to good simultaneous interpreting with text is good processing capacity management with the right balance between processing resources allocated to listening and resources allocated to reading.

9. The Tightrope Hypothesis

The full relevance of the Effort Models in explaining interpreting difficulties only appears in conjunction with the 'Tightrope Hypothesis'. The Tightrope Hypothesis says that most of the time, interpreters work close to saturation, be it in terms of total processing capacity requirements or as regards individual Efforts because of high Effort-specific requirements and/or sub-optimized allocation of resources to each of them. Without the Tightrope Hypothesis, the natural assumption would be that available processing capacity is sufficient to cover all the needs and that interpreting failures are due to insufficient linguistic or extralinguistic knowledge or mistakes rather than to chronic cognitive tension between processing capacity supply and demand.

Evidence for the Tightrope Hypothesis is mostly anecdotal, but it is massive: many authors of texts on interpreting report that they or others experience frequent interpreting failures not because they do not have the necessary knowledge at their disposal, but because speeches are "too fast" or "too dense", in other words because they do not have the capacity to process them rapidly enough. In many studies in the literature, findings are explained explicitly or implicitly on the basis of the assumption

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

that interpreters work close to their maximum capacity (a Tightrope situation) even though the Tightrope Hypothesis is not necessarily named by the authors.

Evidence of a more 'scientific' nature (though indirect) comes from empirical studies. In one such study, Gile (1999a) had 10 professionals interpret simultaneously the same speech twice in a row. While many errors and omissions made during the first pass disappeared in the second pass, other segments which were interpreted correctly the first time were interpreted incorrectly the second time. In view of the fact that interpreting conditions were the same both times and that during the second pass, the interpreters had the advantage of previous familiarity with the speech, it is difficult to explain these new errors and omissions by factors other than processing-capacity limitations which left little room for sub-optimal allocation of attentional resources. This experiment was replicated by Matysiak (2001), who found similar results. Other evidence comes from a study (Gile 2001) which predicted specific difficulties in simultaneous interpreting vs. consecutive interpreting of the same speech on the basis of the Tightrope Hypothesis and which found errors and omissions consistent with the hypothesis. More indirect evidence comes from other studies in which problem triggers were found to affect adversely neighbouring segments (see inter alia Mazza 2000; Puková 2006; Cattaneo 2004 respectively on numbers, names and idiomatic expressions).

Note that no specific attempt at falsification has been carried out so far and that the evidence does not make it possible to identify the cognitive components which suffer most from limited capacity. Nevertheless, available evidence and the absence of criticism of the idea in interpreting circles and in the literature seem to grant reasonable credibility to the Hypothesis, which is central to the discussion of strategies and tactics in training and in the professional practice of interpreting.

10. The Effort Models and translation

Is processing-capacity saturation more frequent in the simultaneous mode or in the consecutive mode? Which of the Efforts require more capacity on average and under what specific conditions? What are the most frequent processing capacity-related errors in simultaneous and in consecutive interpreting? No answers are available to these questions yet because of the paucity of quantitative studies of processing capacity in interpreting.

One hypothesis that can probably be accepted as true even without such quantitative studies is that the risk of processing capacity saturation is far lower in written translation than in either mode of interpreting. In terms of Effort Models and for the purpose of the comparison between translation and interpreting, written translation can be modelled as:

(17) Translation = Reading Effort + Writing Effort

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

In translation there is virtually no competition between Efforts, since all the available capacity can be devoted alternately to the Reading and analysis Effort and to the writing Effort. Moreover, as recalled elsewhere in this book, unlike interpreters, translators can generally read source-text clauses and sentences several times, and improve their target-language renderings iteratively.

This is an important but all too often forgotten point in the debate on the similarities and differences between interpreting and translation. Analysts tend to focus on linguistic differences between spoken and written language and point out that mastery of one does not imply mastery of the other. They also say that interpreters have to be faster than translators. These two conditions can be partially analyzed in terms of processing capacity, as shown above and as explained in Chapter 9.

Even when translators do have excellent mastery of spoken language in everyday communication conditions, it may not be adequate for simultaneous interpreting in view of the simultaneity and competitive relationship between the core Efforts in this interpreting mode. This could explain why translators who seem to understand and speak the two languages just as well as interpreters in everyday communication situations and who understand the basic principles and methods of interpreting and translation are sometimes found to be incapable of doing simultaneous interpreting (see also Chapter 9 on this issue). Processing capacity considerations could also explain why they can perform adequately in consecutive in fields they know well: because there is no overlapping of listening and speaking as in simultaneous interpreting, consecutive interpreting does not impose high pressure on speech production, and because of their familiarity with the subject, they anticipate much of the content of speeches and require little note-taking, both of which reduce markedly processing capacity requirements.

Finally, besides task-dependent processing capacity requirements, good processing capacity management (allocating and shifting processing capacity between the various Efforts) is important for interpreting. It takes some training to achieve good capacity management performance (see Pinter 1969), and expertise studies in cognitive psychology suggest that the improvement process continues over years. This is probably another reason why translators without specific training in interpreting find it particularly difficult to interpret in spite of their familiarity with the themes and mastery of the relevant languages.

These considerations suggest that possibly what separates interpreters from translators, besides the points already made in Section 4 of Chapter 5, is not so much a set of different personality patterns and professional attitudes or 'cultures' as a lack of oral production and comprehension practice and of attention-management training in translators – and perhaps a lack of training in editorial skills in interpreters.

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

11. Processing capacity and interpreting students

At the present time, little is known about the baseline status and possible changes over time of student interpreters' (and professional interpreters') total available capacity. Carroll (1978: 266) notes that:

> It is assumed that individuals vary not only in terms of their cognitive information, but also in the speed and facility with which they store, retrieve, and manipulate elements of information.

Just and Carpenter (1992) stress the existence of high inter-individual variability in working memory performance. An important question is whether it is possible to develop this capacity (and if so to what extent) through appropriate training or otherwise. Over the past decades, a number of empirical studies have focused on the interpreters' working memory performance by measuring memory span (see for example Padilla *et al.* 1995; Bajo *et al.* 2001) and the ability to perform certain tasks in interpreting (Liu 2001). Differences have been found between experienced interpreters and students, but these measured specific aspects of working memory performance rather than overall 'processing capacity'. Many other studies compared interpreting performance in beginning students, advanced students and professionals, but differences shown could be due to factors other than improved working memory performance, including knowledge acquired during training and work and higher availability of language for production and comprehension (see Chapter 9).

It is therefore difficult to say whether some kind of baseline processing capacity 'capital' increases during interpreter training, the term 'capacity' meaning storage capacity and/or computational efficiency of the interpreter's cognitive resources. What is likely is that over time, students learn to manage their available processing capacity (the Coordination Effort C) more efficiently and that processing-capacity requirements of the Listening and Analysis Effort and of the Production Effort decrease due to enhanced linguistic and extralinguistic knowledge and higher language availability for the relevant lexicon and language structures (see Chapter 9). It is generally difficult to identify the contribution of any of these factors in performance improvements, but there are some clear-cut cases: when students are told to construct simple sentences with simple words when interpreting into their B language, the aim is to reduce capacity requirements in the Production Effort by using highly available lexical units and by doing away with extra load arising from the planning and execution of complex speech plans; when they are advised to cut German sentences into small segments in German-to-French simultaneous interpreting (Ilg 1978: 88) or to try to stick closely to a fast speaker rather than lag behind (this lag is known as EVS or 'Ear-Voice Span'), they are given advice for capacity-management.

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

A small number of capacity-management tactics are taught in interpreting schools. Some attention-division exercises such as listening to a speech and counting backwards or shadowing are also advocated by some instructors as preparatory exercises before starting to study simultaneous interpreting (see for example Moser 1978; Lambert 1989, 1992; Watanabe 1991). Other teachers oppose shadowing, claiming that it is inefficient and dangerous because it allegedly fosters repetition with limited analysis (Thiéry 1989; Seleskovitch & Lederer 1989). At present, there is no experimental or other evidence supporting either of these views (but see de Groot's interesting observations on the relative efficiency of holistic exercises versus component exercises in de Groot 2000). Nevertheless, many if not most teachers do use some shadowing exercises in their interpreting classes, and many instructors consider them useful and important in preparing students for simultaneous, an opinion which is defended by Lambert (1992). In Japan, this is apparently the view of a large majority of interpreting teachers (see the first issue of *Kuootarii Tsuuyakurironkenkyuu*, reviewed in Gile 1992b).

Regardless of whether such component-skill training is used or not, much improvement seems to come from interpreting exercises held in the classroom and in practice groups, and later from the professional practice of interpreting – but how much is associated with increased processing capacity as opposed to better linguistic and extralinguistic knowledge, better language availability (see Chapter 9) or better processing capacity management remains unclear.

12. Teaching suggestions

Compared to most other chapters in this book, this chapter is definitely on the theoretical side. The concept of processing capacity and the Effort Models are central to the general conceptual framework offered to students and seem to be efficient in helping them understand many difficulties they experience as well as interpreting strategies and tactics advocated by teachers, including conference preparation, guidelines for work into one's B language, note-taking in consecutive and language skills enhancement (taken up in Chapter 9).

The concept of processing capacity can be introduced to interpreting students toward the beginning of the syllabus, for instance after the fundamental concepts and models around quality and fidelity (Chapters 2 and 3). The idea is to show them that listening for interpreting purposes requires more attention than listening in everyday life.

One way of demonstrating the fact it to make a short, informationally dense presentation, and then ask a student to repeat its content in the same language. In virtually every case, part of the information will have been missed. Other students are then asked what was omitted. Whenever one such piece of information is mentioned by one student, the class is asked who 'did not hear it'. It turns out that generally, some

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

students will claim they did not hear particular words or ideas, at which point the instructor can point out that they did hear them, but did not register them because they were not listening with enough attention.

This can be used as a starting point to explain the basics of oral speech comprehension, including the fact that in most ordinary listening situations, listeners do not maintain a uniformly high level of concentration on the incoming speech, hence the 'listening losses'. The instructor can then move on, introduce the students to the role of processing capacity in speech production and explain the hesitations associated with the retrieval of words and with syntactic decision-making in speech production.

This will be facilitated by the students' new awareness of their own speech production problems, which is generally observed early on when they start studying interpreting (see Gile 1987). When they start exercises in consecutive with note-taking, the instructor can explain the Effort Model of consecutive, possibly using the following experiment for awareness-raising (already mentioned in Section 5):

Students are divided into two groups for an exercise in consecutive interpreting. One group is instructed to take notes and the other to refrain from doing so except as regards numbers, names, and technical terms if necessary. A short presentation containing several names is made, and a student is asked to interpret. Whenever s/he reaches a name, students are asked to indicate whether they heard the name properly. At the end of the exercise, the proportions of names 'heard' correctly among members of both groups are compared. In replications I have carried out in class, it turned out that students who did not take notes 'heard' the names better than the ones who did. The explanation, namely the idea that note-taking took away some of the processing capacity initially available for listening, can be a good starting point for the presentation of the whole model.

After they have been introduced, the Effort Models can be recalled whenever difficulties are analyzed and strategies and tactics are presented.

13. The Effort Models and cognitive psychology

Over the years, I have endeavoured to check the compatibility of the Effort Models with current theories in cognitive psychology, which I believe is the most relevant reference discipline since the phenomena under consideration come under the general framework of interpreting cognition. In informal talks, psychologists have told me that the principles on which the Effort Models are built are in line with current theories. Some, who are interested in simultaneous interpreting, cite them without criticizing them as they would probably criticize theories from within cognitive psychology. I believe they do so because these models are well known in the interpreting community, not because of their value for or in terms of cognitive psychology. For the sake of clarity, I should like to highlight some of the differences between their structure and underlying philosophy and models and theories in cognitive psychology.

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

Most importantly, the Effort Models were designed with a didactic purpose in mind, not for research purposes: they set out to explain well-known, recurrent difficulties in interpreting as well as advice given to students to overcome them, not to explore reality for the purpose of developing a theory which would explain and predict an increasing proportion of phenomena observed in the field until replaced by another theory which would explain and predict reality more accurately. In particular, they remain holistic, with no attempt to specify and test systematically the components of each Effort and their inter-relations. A comment by Eysenck and Keane (1990: 116) on the theory of attention as a central capacity (a general theory, which does not address interpreting) is relevant here:

"Perhaps the main argument against continuing to postulate the existence of attention of central capacity is that it has not proved fruitful in terms of deepening our understanding. For example, it is very easy to "explain" dual-task interference by claiming that the resources of some central capacity have been exceeded…. However, such reasoning singularly fails to provoke any further, and more searching, examination of what is happening."

This criticism, in line with the essential exploratory nature of scientific research, could well be applied to the Effort Models by cognitive psychologists. These models seem to work well as an explanatory framework, which is the very reason why they were developed in the interpreter training environment, but perhaps they "fail to provoke any further and more searching examination of what is happening".

Not unrelated to that is a clarification in response to some authors who write that the Effort Models have not been tested as a theory. Theories which require 'testing' in the sense of Popperian falsification are those which make claims. The Effort Models are basically a conceptual framework rather than a theory in the Popperian sense (i.e. one which should be formulated in such a way as to make it testable for the purpose of revealing its weaknesses if any so as to foster the development of alternative theories). What needs to be verified is the consistency of the concepts and principles on which it is based with current theories and findings in cognitive psychology. In this respect, the following points can be made:

1. The idea that human performance in cognitive tasks, including speech comprehension and speech production, relies on a limited amount of processing capacity, has been a mainstream idea in cognitive psychology and psycholinguistics since Kahneman's capacity theory of attention (1973) – as can be checked in virtually any textbook of cognitive psychology. Inter alia, Caplan and Waters (1998: 2) state that "Appeal to the notion of a limited capacity working memory system (or to equivalent concepts such as "processing resources") to account for features of human cognitive performance is widespread in cognitive psychology". The idea that maintaining information in short-term memory has

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

a cost in processing capacity is also in line with current thinking in cognitive psychology. So are the ideas that allocation of attention is at least partly deliberate and that coordinating several cognitive actions during the same time span also has a cost in processing capacity (see for example Gopher 1992; Newman *et al.* 2007).

2. What could be more problematic for cognitive psychologists is the definition of the 'Memory Effort'. If it is the same as working memory (WM), depending on the model of working memory chosen, one could argue that since working memory is a major component of both the Listening Effort and the Production Effort, it would be more logical to divide simultaneous interpreting into a Listening Effort, a Production Effort and a Coordination Effort while acknowledging that demands placed on WM are often heavier in interpreting than under ordinary conditions of speech comprehension and speech production.

   As recalled repeatedly in this chapter and elsewhere in this book, the Effort Models and other models presented here are essentially didactic and have been developed in such a way as to be immediately understood by student interpreters. Interpreters and students are aware of the fact that while interpreting, they need to store some information which they will later need to recover, and while some information storage and retrieval operations are subconscious (in the course of the Listening Effort and of the Production Effort), some are conscious and deliberate, with choices regarding what information to render immediately in the target language or take down as notes and what to store tactically while waiting for more information which will help understand it, confirm it and/or reformulate it into the target language. The 'Memory Effort' as defined in the Effort Models is what they experience consciously and can relate to both conceptually and in the choice of words. I feel that referring to specific working memory models as developed in cognitive psychology would be counterproductive both because teaching their architecture would be an inefficient overkill in view of the students' needs (understanding that short-term memory operations take up processing capacity and that they rely on a system with limited capacity) and because they tend to change rapidly.

   Nevertheless, the limited storage capacity of WM as well as its processing capacity requirements as demonstrated to be paramount in language comprehension and production (inter alia) by psychologists do play a central role in the Memory Effort.

3. The competition-between-Efforts principle is consistent with the theory of one central pool of processing capacity, not with the theory that there may be several pools that the Efforts can draw upon without there being interference between them. While the idea that working memory (or verbal working memory) is shared (see Caplan *et al.* 1998) can bridge the gap by explaining that all efforts need this central resource even if they also use processing capacity from other pools, the issue is not addressed specifically in the Models.

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110

4. Finally, as explained earlier in this chapter, while much anecdotal evidence corroborates the Tightrope Hypothesis, it has not been submitted to precise empirical tests in compliance with the criteria of empirical research in experimental psychology. Note, incidentally, the similarity of the concept with Just and Carpenter's analysis and ideas about the 'total amount of activation' (1992).

It is encouraging for an author of models from the Interpreting Studies community to find references to them in publications by psychologists (for instance in Shreve & Diamond 1997; de Groot 2000; Bajo *et al.* 2001; Christoffels 2004; de Groot & Christofffels 2007; Ruiz *et al.* 2007) but some of these authors' translation of concepts used in the Effort Models into the language of psychology, for instance the transposition of the Memory Effort into working memory and of the Coordination Effort into the Central Executive in Baddeley and Hitch's working memory model, indirectly involves assumptions which are not part of the Effort Models.

14. What students need to remember

1. Simultaneous interpreting can be viewed as a set of three core Efforts, namely the Listening and Analysis Effort, the Production Effort and the short-term Memory Effort, each of which takes up part of a limited supply of processing capacity.
2. Problems occur when total processing capacity requirements exceed available processing capacity (saturation), and when processing capacity available for a given Effort is not sufficient for the task it is engaged in at a given time (individual deficit). Such problems are frequent because interpreters tend to work close to saturation level (Tightrope Hypothesis).
3. Consecutive interpreting consists of a listening phase, followed by a reformulation phase. In terms of processing capacity, only the former is critical.
4. Note-taking is a major processing capacity-consuming component of consecutive. Note-taking management is an important aspect of failure prevention. There are many valid systems for note-taking, and adapting them to the interpreter's personal 'style' or creating one's own note-taking system are valid strategies. The main point to remember is that note-taking should take as little time and processing capacity as possible so that the Listening Effort can remain efficient.
5. In sight translation and simultaneous with text, some of the pressure on short-term memory disappears, but texts often have a higher density than ad-libbed speeches, and there is increased danger of linguistic interference. When interpreting simultaneously with text, it is important to give precedence to the speaker's voice rather than to the written text.
6. Processing capacity constraints account for major differences between the skills required for interpreting and translation.

Copyright © 2009. John Benjamins Pub. Co. All rights reserved. May not be reproduced in any form without permission from the publisher, except fair uses permitted under U.S. or applicable copyright law.

EBSCO Publishing : eBook Collection (EBSCOhost) - printed on 3/26/2014 6:19 AM via WASHINGTON RESEARCH LIBRARY CONSORTIUM
AN: 318601 ; Gile, Daniel.; Basic Concepts and Models for Interpreter and Translator Training
Account: s9273110