Coherence in Simultaneous Interpreting: an Idealized Cognitive Model Perspective

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Abstract

This study aims to explore the two questions: 1) Does the interpreter's relevant bodily experience help her to achieve coherence in the source text (ST) and the target text (TT)? 2) How does the interpreter's mental effort expended in achieving coherence reflect the textual structure of the ST? The findings of this study contribute to the general understanding of how coherence is achieved in simultaneous interpreting (SI). The theoretical framework is based on the concept of the Idealized Cognitive Model (ICM), which emphasizes the role of bodily experience in organizing and understanding knowledge.

A bodily experience based experiment was conducted with two contrastive groups: experimental group and control group, involving thirty subjects from a China-based university, who had Chinese as their first language and English as their second language. The data collected was recordings of English to Chinese simultaneous interpretations. Coherence in SI was analyzed on the basis of both quantitative and qualitative approaches by virtue of coherence clues. The analysis shows that the interpreter's bodily experience helped her to achieve coherence and distribute her mental effort in both the ST and TT. As the term ICM suggests, the cognitive model is idealized on the grounds that the ICM does not fit into the real specifics of a textual structure perfectly or all the time. The ICM is an open-ended model in terms of the analysis of understanding abstract concepts especially in this SI discourse and needs more research. This study can contribute to SI research and training, suggesting that specialization is a trend in interpreting education.

Preface

The aim of this study is to explore coherence in simultaneous interpreting (SI) from the viewpoint of Embodied Cognition, a theory based on bodily experience, and in so doing, to make a critical examination of the previous theories in the field of linguistics and simultaneous interpreting studies, relating to coherence, and to provide a new perspective on SI research and training.

This study is the outcome of a growing personal concern and enthusiasm for interpreting theories and practice. I started to work as a professional translator and interpreter for a China-based machine tool company since 1991 after I had pursued my studies of English language, linguistics and translation and interpreting theories for nearly a decade since my BA program in 1982. My translation and interpreting profession involved mostly translating a large amount of technical documents, and more often than not, interpreting for technical and business negotiations consecutively, and intermittently doing whispered interpreting simultaneously, and occasionally sight interpreting. During this period I started to be fascinated by SI.

After some time groping for interpreting I came to find that, for an interpreter, making sense of the speaker's utterances in a particular situation by drawing on her background knowledge, and establishing links between units of concepts to achieve coherence is the most important skill. In other words, interpreting does not mean word-for-word literal translation, but involves both cognitive process and knowledge. Some knowledge which is directly related to understanding is based on bodily experience, that is, understanding on the basis of a certain physical engagement, coherence can be achieved instantly; other knowledge, for instance, technical concepts, is abstract, but can be understood indirectly by making analogy to everyday concept (e.g. electric current can be compared to water flow in the pipe). This suggests to me that I could make sense and achieve coherence more in what I was involved in through bodily experience than in what was invisible or beyond me. Therefore, what are the links between an interpreter's bodily experience, her understanding and her capacity to build coherence?

In addition, I normally received reminders from the chief negotiators before interpreting for an international technical and business project; for instance, *save your energy today because we start with general descriptions*; *but tomorrow your interpreting task will be demanding since we will move on to the technique specifics,*

especially, tomorrow afternoon, you must be attentive in that we will come to the critical terms of payment and its mode. It suggests to me that, there is a certain match between the way information is conveyed, i.e. the information structure, and the required mental effort expended in achieving coherence, but how are both of them connected?

To address these questions, it was obvious that an interdisciplinary approach was needed. I set out to formulate some of my concerns about the nature of the principle, rules and skills advocated in interpreting studies. Some of the methodology was valid and seemed to make sense, some was questionable.

In 2005 I had an opportunity to pursue my further study in translation and interpreting in the Department of Language and Intercultural Studies (LINCS), Heriot-Watt University, Edinburgh, UK, as a visiting scholar, thanks to the funding from China Scholarship Council (CSC). During the one year study (May 2006 to May 2007), I was privileged to be supervised by Professor Ian Mason, who helped to broaden my horizon by studying cognition and pragmatics-based Relevance Theory, from which I went on to study Embodied Cognition theory. The combination of interpreting and Embodied Cognition appealed to me, echoing the concern latent at the back of my mind, but it became obvious that the complex nature of the issues involved required a prolonged period of concentrated and diligent research.

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List of abbreviations and acronyms

ATT   Allgemeine Translationstheorie (General Translation Theory)

CDS   Current Discourse Space

CI   Consecutive interpreting

CIN   Conceptual Integration Network

CRP   Cognitive reference point

CM   Cognitive models

CP   Cognitive processing paradigm

CRP   Cognitive Reference Point

DV   Dependent variables

EST   English for science and technology

EVS   Ear-voice span

GAM   Generated Abstract Memory

GTI   General Theory of Translation and Interpreting

ICM   Idealized Cognitive Model

IEF   Immersed Experiencer Frame

IT   Interpretive Theory of Translation

IV   Independent variable

LTM   Long term memory

MM   Mental models theory

ODS   Optimized Disciplinary System

RPP   Reference Point Principle

SFL   Systemic Functional Linguistics

SI   Simultaneous interpreting

SL   Source language

ST   Source text

STM   Short term memory

TEM   Test for English Majors

TL   Target language

TT   Target text

Wpm   Words per minute

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Chapter 1 Introduction

Simultaneous interpreting (SI) is a mode of conference interpreting, in which the interpreter produces messages in the target language (TL) whilst listening to them in the source language (SL). SI is widely used in international conferences as a form of instant and efficient translation. As the communication needs in international cooperation have increasingly expanded in the fields of politics, business, science and technology, researchers have studied SI by drawing broadly on concepts of other academic disciplines, such as cognitive science and linguistics. However, much remains to be discovered about how exactly the interpreter is able to carry out her work. This thesis will contribute to the ongoing project by discussing how Embodied Cognition, a bodily experience based theory, may further our understanding of SI.

The simultaneous interpreter speaks into a microphone while seeing and hearing the source language speaker via the sound-proof booth windows and earphones respectively and rendering her interpretation to the target language listeners. She alternates with another team member every twenty to thirty minutes or as the speakers take turns on the conference floor. But conference interpreters are normally trained initially in consecutive interpreting (CI), either short or long. In short consecutive interpreting, the interpreter relies on memory and segments each message into short chunks, while in long consecutive interpreting the interpreter takes two to five minute notes to facilitate rendering a long chunk of speech. Consecutive interpreting is generally used at small, bilingual meetings, such as technical and business negotiations, and ceremonial occasions. In interpreting training, a continuous, successive approach to CI and SI is adopted; the interpreter trainees are guided from practising CI, allowing the greatest degree of accuracy and the full telling of the narrative, subsequently to practising SI, which requires great concentration in order to achieve the synchronic processing of listening and speaking.

The exclusive concern of this study is to discover how the simultaneous interpreter makes sense of the speaker's utterances and establishes links between concepts – units

of meaning and knowledge, in order to achieve coherence, while simultaneously producing the interpreted version. In order to achieve this coherence, the interpreter is trained to develop a particular set of skills. For instance, the interpreter needs to develop the skill of anticipation – that is, recognizing speech formulae (e.g. *ladies and gentlemen*), word collocation (e.g. we will *help* you *with* this project), and the function of the speaker's stress or intonation – using her knowledge to predict what the speaker is about to say. If the speaker's utterances are vague, or if the interpreter lacks the background knowledge, she has to use her skilled judgment to make a final, appropriate choice of the message among several alternative scenarios for her output. The interpreter needs to have the ability to compensate*,* using contextual or topical knowledge to summarize rather than trying to translate everything. This allows the interpreter to compensate for the idiosyncrasies in the speaker's delivery that is too fast, or unclear links or lack of clarity. The interpreter is trained to develop the skill of coordination, by dividing attention, or alternately switching attention between her listening and speaking progression, so as to become coordinated and automatic with practice and experience; in so doing, the interpreter learns to take advantage of the speaker's pauses to put out her interpreted messages where possible. Although it partially involves examination of these interpreting skills, this research is primarily focused on the interpreter's coherence-building process, in relation to the cognitive process which is taking place.

1.1 Introducing the topic

The most spectacular and mysterious aspect of SI is its synchronicity (Setton 1999: 27). SI requires the interpreter to listen in one language while speaking in another with ear-voice span (EVS) or lag ranging from two to four seconds minimum (Paneth 1957/2002), and two to ten seconds maximum (Oleron and Nanpon 1965). Regarding the rate of speech input, Seleskovitch (1965) suggested that an input rate of one hundred (100) to one hundred and twenty (120) words per minute (wpm) was an optimum one for the interpreter, with one hundred and fifty (150) to two hundred (200)

wpm as an upper limit. In order to achieve synchronicity, SI requires the interpreter to develop both her working memory (WM), the ability to hold actively in the mind the information needed to do complex tasks such as reasoning, understanding, and her short-term memory (STM), the ability to process and retrieve information.

The account of these phenomena in SI above involves *cognition*. In a broad sense, the term cognition refers to the mental processes in acquiring and using knowledge, involving perception, thinking, comprehension, memory, and language. In the field of cognitive science, the meaning of the term cognition varies between the classical view and the Embodied Cognition perspective. Embodied Cognition theory has been derived from the second generation of cognitive science of the embodied mind. According to Lakoff and Johnson (1999: 78), the distinction between first generation and second generation cognitive science lies in disembodied or embodied cognition, and the difference is one of philosophical and methodological assumptions. The traditional first generation of cognitive science claims that the capacity for thought and reason is abstract and not necessarily embodied in any organism. In other words, the human embodiment of understanding has no significant bearing on the nature of meaning and reason (Johnson 1987: x). In opposition to this classical Objectivist view, by the mid-to late 1970s, an increasingly prominent view of cognitive science, based on Experientialism, developed into Embodied Cognition theory, challenging the fundamental tenets of traditional cognition theories. On the basis of a series of empirical studies, the experientialists assert that thought primarily grows out of bodily experience, i.e. embodiment.

According to the notion of embodied cognition, in a broad sense, any interaction with both the physical and social environments counts as Experience (capitalized in the original) (Lakoff 1987: xv). In a narrow sense, embodied cognition stresses the role of the *sensorimotor system* (Lakoff and Johnson 1999: 11) - our eyes, legs, arms and their associated sensory nervous systems - to understand the world. This physical, direct experience gives rise to the 'best understanding' or 'direct understanding' which encompasses embodied concepts (Lakoff 1987: 294), 'accessible in a single

step' for processing (Sperber and Wilson1985/1996: 138). However, those concepts which are beyond the direct physical experience will need imagination to process, for instance, by metaphor. These non-embodied, abstract concepts which need several steps to process (Sperber and Wilson1985/1996: 138) are taken to be based on 'indirect understanding' (Lakoff 1987: 294). The concepts are formed at different levels of accessibility. They appear to be stored at different distances from the processing centre, i.e. the brain, measured via the cognitive load required to access them.

The term *cognitive load* in this study is used to refer to the interpreter's capacity to control her working memory in order to retain and process information. The interpreter has only a limited amount of mental capacity available for processing information with varying degrees of difficulty in the textual structure. The interpreter builds coherence better when she builds on what she already understands. However, if the interpreter does not make any sense of the current stretch of speech, she is unlikely to achieve overall coherence. In this case, the interpreter's cognitive load is higher because her brain must work harder to understand the new information. As an index of cognitive load, the interpreter's mental effort is defined and measured in different ways, for instance, in terms of the score of coherence clues (see Section 1.2) attained through her interpreting performance.

Cognitive processing is not just dependent on the immediate context but also on a large number of stored and interrelated contexts which we have experienced. The term *cognitive model* is used to cover these knowledge-based cognitive representations pertaining to a certain field (Ungerer and Schmid 2001: 47). The theoretical framework for this present research is based on the theory of the *Idealized Cognitive Model* (ICM). The ICM is one of the primary concepts of Embodied Cognition theory, and it is concerned with how knowledge is organized and structured on the basis of bodily experience and imaginative capacity. For the thinker, the ICM is an internal model constructed in the mind. As human individuals, basically we each make a mental model of patterns of our daily life in order to be able to think about

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things. For the theorist in embodied cognition, the ICM is a particular cognitive model, which is designed to describe knowledge structures. Knowledge consists of conceptual structures, and the ICM is used to describe these conceptual structures. According to Embodied Cognition theory, an ICM has the following basic properties (Lakoff 1987: xiv–xv): thought is embodied. The core of our conceptual system is directly grounded in perception, body movement, and experience of a physical and social character. Thought is imaginative. All of those concepts which are not directly grounded in experience must use imaginative capacities, such as metaphor, metonymy, and mental imagery for understanding. Thought has an ecological structure in which elements interact and feed off each other. The conceptual structure has the overall unified structure, beyond the mere mechanical manipulation of abstract symbols. This ecological structure determines the efficiency of cognitive processing, as in *interpreting* and memory. The word *idealized* means that the ICM might not fit what is true of the world all the time and 'one would need to allow background conditions to fit partially and to allow partial contradictions' (Lakoff 1987: 202).

Coherence is a problematic and elusive notion due to the diversity of linguistic and non-linguistic factors (Baker 2008: 218 - 253). From the perspective of the texture (i.e. aspects of text organization), coherence is a network of relations which organize and create a text. This approach to coherence analysis is based on text linguistics which concerns itself mainly with the analysis of spoken and written texts above the level of individual sentences (Hatim and Mason 1990: 243). From the perspective of the recipient, either the reader or the listener, coherence is an outcome of the interaction between knowledge presented in the text and the recipient's own knowledge and experience of the world (Baker 2008: 219). This kind of approach to coherence analysis is based on pragmatics, which is concerned with the way utterances are used in communicational situation and the way they are interpreted in context. It may also be based on cognition which is concerned with the way the communicator mentally processes the information for comprehension; the way a recipient's mental processes reflect the textual structure of the source text (ST) with different difficulty degrees in

information distribution. In this study, coherence is defined, from the perspective of the interpreter, as a cognitive process of building up links to relevant concepts from the source text (ST), and applying her bodily experience based knowledge, in order to generate an equivalent target text (TT). This research is conducted to explore how coherence is achieved in SI, from the textual and embodied cognition view, based on a comparison of the source text (ST) and target text (TT), by investigating two points: (1) the effect of the interpreter's relevant bodily experience in helping her to achieve coherence in ST and TT. As discussed above, bodily experience here emphasizes physically engaged actions which give rise to the basic-level concepts, directly grounded in our perception, rather than Experience in a broad sense. However, direct bodily experience is turned into Experience in this broad sense as it is integrated into the social context. 2) The interpreter's mental effort, expended in achieving coherence, reflecting the textual structure of the source text (ST). The concepts are formed at different levels of accessibility due to different distances to the processing centre - the brain, the interpreter's mental effort is measured, via her cognitive load required to access them, in her coherence-building process.

1.2 Introducing the research question and the objective

My research aims to address the following questions:

1) *Does the interpreter's relevant bodily experience help her to achieve coherence in the source text (ST) and target text (TT)?*

2) *How does the interpreter's mental effort expended in achieving coherence reflect the textual structure of the source text (ST)?*

These two questions are explored to contribute to the general understanding of how coherence is achieved in SI from an ICM perspective. These research goals are formulated in the following objectives:

(1) *to make a critical examination of previous theories in the field of linguistics about coherence and SI studies relating to coherence* (Chapters 2 and 3).

(2) *to provide a new perspective on coherence in SI as applied to the field of research and training* (Chapters 4 and 5).

(3) *to contribute to the general understanding of how coherence is achieved in SI (*Chapters 6 and 7).

1.3 Outline

To address these research questions and objectives, I have carried out a relevant literature review and attempted a supporting experimental study. There is a three-part literature review covering coherence, coherence in SI and the ICM. It begins with a review of linguistic theories on coherence (Chapter 2), summarizing and systematizing the findings while pointing to the limitations. It moves on to review the research on coherence in SI (Chapter 3), primarily giving an account of how linguistic theories on coherence have influenced SI research and findings, and also how the relevant SI theories and findings to be reviewed will contribute to this study.

Chapter 4 introduces the ICM as an approach to mental coherence, on the basis of relations between bodily experience and the coherence-building process, in Sections 4.1 and 4.2. Section 4.3 provides an account of the constituents of the ICM, and Sections 4.4 and 4.5 illustrate the way the ICM in the interpreter's mind works in achieving understanding and coherence both in cognition and in the discourse, while Section 4.6 summarizes the role of the ICM in achieving coherence. In Section 4.7 three ICM-based tools are discussed, and used for tracing coherence clues. On the basis of the literature review, Chapter 5 explains how the research methodology is established. In Section 5.1 primary research questions are formulated, as stated above in Section 1.2, and the hypotheses are posited. In Section 5.2 the test material is described, based on a conference speech about a shiatsu massager, explaining why and how this material serves the purpose of this research. Section 5.2 describes why

and how thirty subjects were recruited, including two contrastive groups, the experimental group who were exposed to a relevant bodily experience and the control group who were not. In each contrastive group there were five teachers, five postgraduates and five undergraduates in interpreting studies. The 15 subjects of the experimental group were given a bodily experience of handling the automatic shiatsu device, to enable them to develop a mental picture of its structure and installation procedures before their interpreting performance. They were guided in activating and construing the links of concepts and actions relating to the massager before carrying out their interpreting. When the interpreting subjects completed their interpretations, their recordings were transcribed and annotated, and corpora were built, helping me to observe and analyze how the experimental group had achieved coherence in SI performance, in comparison with the control group in different sections of the text (Section 5.3). Chapters 6 and 7 present the results and discuss the findings that primarily the experimental group achieved a higher level of coherence than the control group, and that the interpreter's mental effort expended in achieving coherence is also dependent on her relevant bodily experience and reflected in the textual structure of the source text.

This study is designed to make both theoretical and practical contributions to SI research and training (Chapter 8). It attempts to explore the role of the interpreter's bodily experience in helping her to achieve coherence, through an empirical study, as advocated by Pöchhacker (1992, 2004), but not previously attempted. Combining the ICM with theories of information structure (Seleskovitch 1986) and mental effort (Gile 1995), this study proposes the formulation of an original, integrated theoretical basis for empirical investigation; initiates experimental analysis on this basis, testing out the hermeneutic power of this approach; and, looking ahead, aims to shed light on SI teaching methods and programme requirements.

1.4 Introducing spelling conventions and terminology

It is necessary to explain my use of some general spelling conventions and certain terminology. In order to distinguish sovereign communicators from secondary receivers and speakers including translators and interpreters, hereafter, I will follow the common conventions as introduced by Setton (1999: 343) and Sperber and Wilson (1986/1995), using 'Speakers' and 'Addressees' with initial capitals S and A. In addition, the feminine pronoun is used for the interpreter and the masculine for both Speakers and Addressees, on the grounds that most conference interpreters are women, and most conference participants are men.

More specifically relevant to this research is my usage of certain terms. The first term that needs to be defined is a concept vs. *concept,* (the latter is italicized), as a cognitive unit of meaning and a unit of knowledge. According to the classical view, concepts objectively exist by themselves, characterized only by their relations to states of affairs in the real world. However, Embodied Cognition theory holds that most concepts are defined and understood only through human embodied experience in given cultures (Johnson 1987). In my research, in order to distinguish the different use of this term by the classical view and Embodied Cognition theory, I hereafter use italicized *concept(s)* and/or embodied *concept (s)* to represent the cognitive unit of meaning and the unit of knowledge directly grounded in bodily experience. Embodied *concepts* refer to *concepts* which are based on our bodily experience without employing any imagination, through perceiving, touching and manipulating, involving basic-level objects, actions and relations in the physical domain, for instance, our understanding of chairs, tables, trees, and water*,* and our bodies and other basic-level objects in our immediate environment, for instance, sitting on a chair, or drinking water. Embodied *concepts* lead to direct understanding.

On the basis of the term *concept(s),* I have synthesized and developed the definitions of the terms: non-embodied concepts and semi-embodied concepts. Those embodied *concepts* have the potential to extend our direct understanding to indirect understanding of abstract concepts, i.e. non-embodied concepts, which are not directly

grounded in bodily experience, or remote from the core of our embodied experience, and need the imaginative capacity to make sense. For instance, we cannot see electric current, but we can understand its concept by comparing it to the flow of water in a pipe. The concepts of direct and indirect understanding are put forward by Lakoff (1987). The embodied *concept* needs least mental effort for understanding, and the non-embodied concept requires more mental effort. Lakoff (1987) and Johnson (1987) have frequently used the terms propositional concepts for embodied *concepts*, and non-propositional concepts for non-embodied concepts. However, there is a layer existing between the embodied *concept* and the non-embodied concept, i.e. the semi-embodied concept, which is accessed and inferred from the normally embodied experience, i.e. semi-direct understanding. In other words, semi-embodied knowledge involves some kind of reflection about embodied knowledge, which can be expressed in words. For instance,

How did you feel about sitting on the shiatsu massager? Comfortable?

The feeling of being comfortable is accessed and synthesized through the communicator's bodily experience, but at a level more general and abstract than that of embodied *concepts*.

In order to stress the essential role of communicators' bodily experience in building coherence, the term, origin of coherence, is used to mean the interpreter's relevant bodily experience for direct understanding prior to interpreting. In what follows, I will use the terms bodily experience, embodied experience and embodiment interchangeably, which conform to the usage in Embodied Cognition theory. Experience in a broad sense is capitalized while the direct bodily experience in a specific sense is lowercased.

The term coherence clue is used to represent the topic theme (Cognitive Reference Point/CRP) in processing a text*,* and the primary focus (trajector/tr.*)* and secondary

(landmark/lm) focus in processing a sentence (Langacker 2008). According to Langacker (2008: 83) the discourse coherence-building process is just like identifying a star in the sky; normally we start to locate a domain where we find the brightest star and then point at the target one. Likewise, communicators often direct attention to a perceptually salient entity as a point of reference (CRP) which helps to find some other entities (*tr.* and *lm.*). Each entity or element accessed is individually salient, forming a coherent structure. In this study the salient elements are defined as coherence clues in terms of CRP, trajector and landmark, and the coherence ratings are measured by the correspondence between the coherence clues indentified in the source text (ST) and the coherence clues appearing in the target text (TT). These details are explained in Chapter 4.

To sum up, this chapter has provided a brief account of the theme and the background to this study: coherence in simultaneous interpreting from an Idealized Cognitive Model perspective; and it has also introduced the major areas of focus, including the statement of the research questions and the objectives, general research hypotheses, and has presented definitions of key terms. With this introduction as a roadmap, let us start by reviewing the fundamental notion of coherence.

Chapter 2 Coherence

Coherence is one of the most general and most broadly discussed concepts in *text* study and *discourse* analysis. Halliday and Hasan (1976: 1) define the text as 'any passage, spoken or written, of whatever length, that does form a unified whole'. de Beaugrande and Dressler (1981: 3) define the text as a communicative event which meets seven text criteria, namely cohesion, coherence, intentionality, acceptability, informativity, situationality and intertextuality. These seven criteria, according to the co-authors, function as a constitutive principle of text studies, analyzed from the textual structure. Based on pragmatics, Cook (1994: 25) defines discourse as 'a stretch of language in use, taking on meanings in context for its users, a discourse is a coherent stretch of language' and further designates discourse analysis as 'the study and the explanation of this quality of coherence'. *Discourse* and *text* are two difficult terms to define. For instance, Harris (1952) sees the two terms as equivalents and Hu (1994: 2-3) regards the two as synonyms and concludes that British and American theorists normally use discourse while continental European researchers adopt text. In this thesis, I will use *text* for analyzing the coherence of the written or oral material and *discourse* for coherence from the user's perspective.

In spite or because of its prominent position in discourse analysis or text study, the concept of coherence has various definitions and connotations. Common to most definitions is that coherence is the underlying functional (Halliday and Hasan 1976, 1985) or semantic connectedness of a stretch of language (de Beaugrande and Dressler 1981; Brown and Yule 1983; Tannen 1984; Richards et al.1985; Crystal 1992; amongst others). Therefore, researchers on coherence have focused on the functional or semantic properties of text, that is, how sentences or utterances are meaningfully linked to form larger chunks of language.

The notion of coherence has been explored by functional and cognitive linguists. In the following sections, I will review three theories on coherence, they are respectively the Functional Linguistics view on coherence proposed by Halliday and

Hasan (1976, 1985), in Section 2.1; the cognitive knowledge-based approach to coherence in Section 2.2, including the theories of de Beaugrand and Dressler (1981), Brown and Yule (1983), together with those that are stereotype based, in terms of frame (Minsky 1974; Fillmore 1975) and script (Schank and Abelson 1975), and finally, in Section 2.3, the mental models theory of coherence of Johnson-Laird (1983, 2001). I review the three theories because they are widely used for analyzing discourse coherence due to their influence and they are representative in the field of discourse analysis, and because they show step-by-step links and development in the discourse analysis on coherence, and particularly because they contribute to the model of this research.

2.1 The Functional Linguistics view on coherence

Halliday and Hasan (1976: 23; 1985), the founders of Systemic Functional Linguistics (SFL), have suggested two types of coherence: (1) coherence with respect to cohesion, and (2) coherence with respect to the thematic structure, and the context of situation. According to Halliday and Hasan (1985: 48) 'an important contribution to coherence comes from cohesion: the set of linguistic resources that every language has for linking one part of a text to another'. In other words, they have employed linguistic forms, cohesive devices, to explain how the text is coherently linked. For this purpose, they published their co-work (1976), in which they analyzed five cohesive devices: reference, substitution, ellipsis, conjunction and lexical cohesion.

In order to expand the preceding scope of research, Halliday and Hasan (1985) classify cohesive devices into those involving non-structural cohesion, primarily the five cohesive devices mentioned above, and structural cohesion, which comprises parallelism, Theme and Rheme organization, and given and new information, or the thematic structure (Halliday and Hasan 1985: 82). The Theme (or topic) is what is being talked about, and the Rheme (comment or focus) is what is being said about the topic. The thematic structure is designed to analyze discourse coherence, showing the way in which the Theme and Rheme are linked within a text, in the form of a graded

structure.

It is worth noting that Danes (1974) has contributed to the idea of thematic organization, using the model of 'skeleton of the plot' (1974: 114) to show the three structure types in terms of thematic progression as follows:

(1) Simple linear progression: each Rheme (R) becomes the Theme (T) of the next utterance:

$$T1 \rightarrow R1$$
$$\downarrow$$
$$T2 \rightarrow (=R1)\ R2$$
$$\downarrow$$
$$T3\ (=R2) \rightarrow R3$$
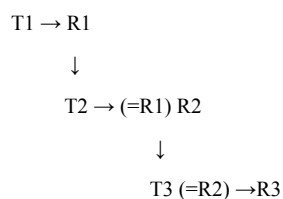
(2) Thematic structure with a constant or continuous Theme: Themes are derived from a hyper theme:

$$T1 \rightarrow R1$$
$$\downarrow$$
$$T2 \rightarrow R2$$
$$\downarrow$$
$$T3 \rightarrow R3$$
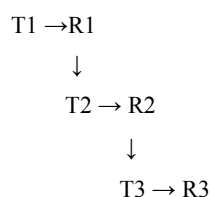
(3) These two types are designed in various combinations. For instance, types 1 and 2 are frequently combined into a linkage pattern as follows:

$$T1 \rightarrow R1 = [T]$$
$$\downarrow$$
$$T2 \rightarrow R2$$
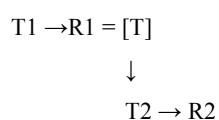
With this thematic structure progressing, the Theme regulates the flow of given and new information. Given information, according to Halliday (1994: 59), refers to 'the old stuff: what is presented as being already known to the listener' while new information means 'what the listener is being invited to attend to as new, or unexpected, or important'.

In addition, Halliday and Hasan have combined text study on coherence with the context of situation (1985: 12). They assume that the context of situation, constituting the field, the tenor and the mode, helps to account for the social context of a text, i.e.

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'the environment in which meanings are being exchanged' (1985: 12). The three features of the context of situation are identified as follows:

(1) The field of discourse: this involves the nature of the current social action: why or for what purpose do the participants communicate? What is going on?

(2) The tenor of discourse: this deals with the issues: who is taking part? What roles and relations put the participants together for the on-going communication? What are the participants' expectations, their statuses and roles?

(3) The mode of discourse: this refers to what participants are expecting the language to do for them in that situation: what part is the language playing? Written or spoken?

Halliday and Hasan (1985) have combined the context of situation with tools, such as cohesive devices, the thematic structure to inform their analysis of coherence. The SFL methods are easy to operate. They have made contributions to discourse analysis in terms of coherence.

Halliday and Hasan (1976, 1985) have claimed that cohesive devices are the key links among and within clauses; cohesion is viewed as the primary determinant in discourse coherence, on the grounds that 'our interest lies in the way in which cohesive relations build up a text' (Halliday and Hasan 1976: 221) in order to 'look closely at the actual words and phrases that enter into cohesive ties' (1976: 221). However, this viewpoint has been challenged by Enkvist (1978), Widdowson (1979), de Beaugrand and Dressler (1981), Brown and Yule (1983: 191) and Wang (2006: 350-357). Halliday and Hasan (1985: 94) claim that 'cohesive ties between sentences stand out more clearly because they are the ONLY source of texture' and 'cohesion is the foundation upon which the edifice of coherence is built'. Nevertheless, as Wang (2006: 354) points out, there is inconsistency in Halliday and Hasan's claim: cohesion ties cannot be both 'an important contribution to' and '*ONLY source*' of, texture.

Wang, as a Chinese researcher in linguistics, is more aware of other forms of coherence, for instance, a more content-based approach to coherence in Chinese. Wang challenges the basic SFL principle of text study – the key elements in

establishing textual links are the cohesive devices. Wang argues that this view of text coherence is applicable and plausible mainly to the English language, primarily written rather than oral, in that English language is hypotactic, where cohesive devices are used frequently to link sentences. Wang uses the following instance to support his viewpoint (2006: 354):

Theories regarding the shape of the earth have changed throughout the ages. <u>At first</u>, it was believed that *it* was flat, although ideas about the exact shape – i.e. whether *it* was circular, oval, square, rectangular, etc. – varied. <u>Later on</u> *this* concept failed to satisfy some observers <u>and</u> <u>eventually</u> the evidence tending to disprove *this* idea grew so large that *it* had to be totally abandoned. An alternative theory was <u>next</u> put forward, resting on a number of observed facts, e.g. that the parts of a ship moving away from the observer were seen to disappear below the horizon in sequence – <u>first</u> the lower parts, <u>then</u> the upper parts and <u>finally</u> the extreme tops of the masts, until <u>at last</u> the ship disappeared from view entirely.

Wang discusses the fact that the cohesive devices, i.e. the words underlined in the text show the sequence of narration, marking the sequencing order of information organization, and also demonstrative pronouns (marked by italic type) work together as functional cohesive ties and contribute to coherence of the text. However, it is the content, he concludes, that primarily puts these chunks of clauses together, and the cohesive devices play the cognitive role of direction.

Widdowson (1979: 29) uses the following case to oppose Halliday and Hasan's view of the role of cohesive devices:

A. That's the telephone

B: I am in the bath

A: OK.

This oral text without cohesive devices is coherent in that the semantic content leads to its coherence. Enkvist (1978: 110) provides another opposing case as follows:

(1) I bought a Ford. (2) A car in which President Wilson rode down the Champs Elysees was black. (3) Black English has been widely discussed. (4) The discussion between the presidents ended last week. (5) A week has seven days. (6) Every day I feed my cat. (7) Cats have four legs. (8) The cat is on the mat. (9) Mat has three letters.

This text is full of cohesive devices, but cannot be considered to be coherent. In addition, Deane (1992: 41) uses the following sentence to oppose the role of pronoun in achieving coherence:

I saw headlights coming straight at me, but I was able to get out of *its* way.

In this sentence, the pronoun, *its*, is not clear about its referent. According to Wang (2006), the text which is short of cohesive devices may be coherent, while the text which is full of cohesive devices might not be coherent, and pronouns are cognitively linked to their referents in the context. According to Cook (1994: 33, 125), cohesive devices are not the determinant of discourse coherence as follows:

It is true that, in principle, cohesion is neither necessary nor sufficient to create coherence, yet, in practice a discourse of any length will employ it. That most coherent texts are also cohesive, however, does not imply that coherence is created by cohesion. Coherence is not signaled by cohesion.

Therefore cohesion is considered to be only an instance of coherence (Van Dijk and Kintsch 1983, Cook 1993: 32 and Wang 2006: 357). Cohesive devices are important to establish a coherent text but not the only way. Discourse coherence should be studied from a cognitive perspective and discourse is based on mental coherence (de Beaugrande and Dressler 1981, Givón 1990, 1995; Wang 2006). In addition, with respect to given and new information, Mathesius (translated by Firbas 1966: 286) argued, on the grounds that information- presented in the text as being already known, might not be that which is known, nor is obvious in the given situation. Likewise, information delivered as important might not be new or unknown to the recipient, or

not previously mentioned in the text. Mathesius has used the terms marked and unmarked information as alternatives. Marked information means contrastive to expectation (e.g. *This* I know), while unmarked information implies that there is no particular reason to choose expression patterns differently in a text (e.g. I know *this*). However, I argue that important information in a text can be further analyzed from a cognitive perspective, in that the information focus or importance is determined by cognition after all. This will be discussed in Section 4.7. The challenges discussed above give rise to further explorations on discourse coherence from a cognition perspective, one of which is the knowledge-based view of coherence.

2.2 The cognitive knowledge-based view of coherence

As an alternative to SFL, linguistic research on coherence shifts its attention to the relations between knowledge or background knowledge and text for attaining coherence (Enkvist 1978; Widdowson 1979; de Beaugrand and Dressler 1981; Brown and Yule 1983; and Wang 2006, among others).

Before reviewing de Beaugrand and Dressler and Brown and Yule, I will briefly provide a chronology of cognitive knowledge-based views on coherence. Garfinkel (1967) maintains that daily conversations rest on endless and unsaid background knowledge. Hörmann (1976) asserts that the coherence building process is not simply the semantic sum of linguistic inputs but linked up and enriched by inferences and associations with prior knowledge.

Brown and Yule (1983) stress the importance of background knowledge for generating and understanding discourse coherence, through their constructive approach. They argue that it is not words or sentences but people who carry meanings which are brought to bear on the linguistic input for the interpretation of a text.

According to Pöchhacker (1992: 94) 'Establishing coherence (making sense) is viewed as a process of providing links (relations) between units of knowledge (concepts) corresponding to the surface of the text'. In building coherence, knowledge is used not only as the starting point and end use of text but also as the prerequisite to

make sense of a text. Cook (1994: 53) holds that coherence involves a combination of background knowledge and text information.

In the following section I will focus on de Beaugrande and Dressler (1981) and Brown and Yule (1983), the most prominent and representative researchers in this field.

2.2.1 de Beaugrande and Dressler: knowledge-based coherence

de Beaugrande and Dressler (1981) define coherence as the outcome of actualizing meanings in order to make sense, and use the term, *knowledge*, to assign cognitive content of all kinds to explain the coherence in discourse. They assume that for the sake of an understanding of human activities with texts, meaning and sense should be studied in terms of procedures for using knowledge. In doing so, de Beaugrande and Dressler (1981: 84-111) have discussed issues relating to coherence as follows:

(1) Continuity. The participants' experience and expectations relevant to the organization of events and situations give rise to 'a certain amount of COMMONSENSE knowledge' (de Beaugrande and Dressler 1981: 84). These text expressions that activate commonsense knowledge are what give the text potential coherence.

(2) Activation. The causal concepts, relations and links in a mental space are activated through expressions in a text.

(3) Strength of linkage. The concepts, once activated, will have their components put together on the basis of their relations through closeness of linking nodes.

(4) Spreading activation. Once an item of knowledge is activated, other items closely relevant to it in the mental storage/memory will become active to a different degree, based on prominence.

In order to activate concepts and build a coherent structure, the following conditions are necessary in relation to the mental storage:

(5) Episodic vs. semantic memory. The record of one's own experience is stored in episodic memory, occurring at usually irregular intervals (*what happened to me*?)

while semantic memory reflects the natural patterns or the organization of knowledge, for instance, the structure of events and situations (*what is true about the world at large and how it all fits together*?) .

(6) Global pattern. Stored as complete chunks in mental space, due to their usefulness in conventional tasks, global patterns, such as frame and script, provide an automatic structure of representations to assume the type of expected information available for a particular situation. This aspect is further explained in Section 2.2.2.

(7) Economy and inheritance. Economy relates to the mental effort expended in searching for any item of knowledge stored in a cognitive system. Inheritance falls under the concept of economy, assuming that, with knowledge stored in a neat hierarchy, in a form of classes and instances, subclasses and super classes, including A to B analogies, inheritance makes predictions possible in building coherence, saving the time invested in accessing certain knowledge (de Beaugrande and Dressler 1981: 92).

Rather than separate language from everything else, de Beaugrande and Dressler have made an effort to build models, in which the use of language in real texts is explained in collaboration with the processes of cognition (Minsky 1975; Miller and Johnson-Laird 1976; Kintsch 1977; Rumelhart 1977; de Beaugrande and Dressler 1981: 93). In addition, de Beaugrande and Dressler (1981: 98-108) have provided a text-world model, to show how the whole text is constructed from cognitive content - knowledge, on the basis of one's beliefs about the real world. Due to the lack of space, I take only the opening paragraph as a demonstration for their text model (de Beaugrande and Dressler 1981: 98).

A great black and yellow V-2 rocket, 46 feet long, stood in a New Mexico desert. (2) Empty, it weighed five tons. (3) For fuel it carried eight tons of alcohol and liquid oxygen.

According to de Beaugrande and Dressler, it is the concepts rather than linguistic forms or surface expressions that are represented. All of these concepts are put into a coherent network according to the relations and links held among them as Figure 1

shows below:
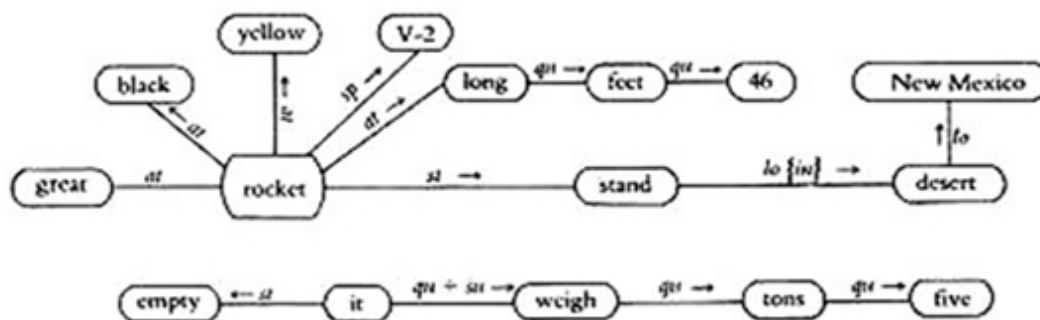
Figure 1 Conceptual network (de Beaugrande and Dressler 1981:100. Fig.7a)

The dominate concept *rocket* serves as the control centre for this text, which gives rise to a set of additions: attributes (marked with *at.* in this figure: *great*, *black*, *yellow*, and *long*), a specification (marked with *sp*: *V-2*), and a state (marked with st: *stan*d), as well as its locations (marked with *lo*: *New Mexico, desert*); the attribute, *long*, has the quantities (marked with *qu*: *46 feet)*. According to de Beaugrande and Dressler, linking labels are used to show how the concepts are associated to each other as the arrows indicate. The mental processor proceeds from a current state to a following one, categorizing the type of the conceptual node to be linked. According to de Beaugrande and Dressler, the pro-form *it* is a covert node, deriving its content from the co-referent *rocket*, helping to link the new relevant concepts (*empty, weigh, five tons*) to the correct node of the co-referent (*rocket*). Therefore, cohesion, the pro-form in this sample case, helps to achieve coherence in an auxiliary way.

According to de Beaugrande and Dressler, concepts are micro-states, contained in a conceptual macro-state which gives rise to a coherent knowledge space, or a detailed conceptual network, as Figure 2 below shows an integrated unit of discourse based on a knowledge space. As mentioned above, the concept *rocket* is the gravity control underlying each stretch of text. Therefore, the additions in this text can involve deriving more sub-contents from the created *rocket* node, around which the links are generated as to the weight (five *tons*), condition (in *empty*) and fuel (*eight tons of liquid oxygen*). The dominant concept *rocke*t is described in terms of states, quantities,

containment, substance, etc:
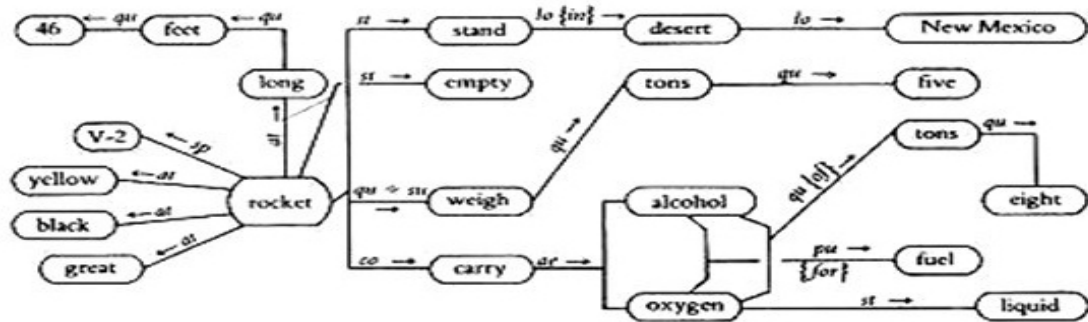
Figure 2 Knowledge space with an integrated unit (de Beaugrande and Dressler 1981:100 Fig.7b)

de Beaugrande and Dressler have aimed to explore the compatibility between language in texts and cognition, taking a great step forward in research into coherence. They have attempted to use this sample case to show the procedures for building coherence by applying knowledge, including continuity, activation, strength of linkage, global pattern, economy and inheritance, all of which are put together into the coherence model of discourse analysis. They have made valuable contributions in explaining how coherence is attained by means of their knowledge-based theories. However, the sample case helps only partially to realize their potential attempt mentioned above. My argument is based on the following grounds: the concepts or linking labels are linked on the surface, but how is the recipient's knowledge used to achieve coherence? In other words, how do the episodic (the recipient's own experience) and semantic memory (the recipient's inherent patterns of the organization of knowledge) or global pattern (the recipient's complete chunk of knowledge) activate the links among the concepts? And how do the activated concepts enable the recipient further to have access to economy and inheritance (the recipient's storage of knowledge)? With respect to spreading activation, de Beaugrande and Dressler did not specify how and what items of knowledge are more activated than others in mental storage, nor what concepts are more strongly linked than others in terms of strength of linkage. In other words, what items of knowledge

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require greater mental effort, and what items of knowledge need less mental effort in processing a discourse? According to Pöchhacker (1992), de Beaugrande and Dressler are still confined to propositional-based bottom-up model, on the grounds that what they described as a coherence representation of a text is 'little more than its transcription into another more or less natural language immediately reflecting the surface of nouns, qualifiers and predicates' (Pöchhacker 1992: 95). According to Johnson (1987: 3-4) this is the typical traditional definition of proposition: something is proposed as a statement; a state of affairs in the world, holding between an entity and its predicates or among a number of entities. A proposition, according to Embodied Cognition theory, 'exists as continuous, analog pattern of experience or understanding, with sufficient internal structure to permit inference' (Johnson1987: 3). This will be further discussed in Chapter 4. The problem with the knowledge-based approach to coherence remains the lack in sufficient empirical evidence of cognitive processes in establishing coherence. In addition, the term knowledge as used by de Beaugrande and Dressler might appear elusive. To compensate for this, Brown and Yule (1983: 236-256) classify knowledge on the basis of the stereotypic approaches to coherence on one hand, frame (Minsky 1974; Fillmore 1975, 1982, 1985) and script (Schank and Abelson 1975; Ungerer and Schmid 1996/2001), and a general approach – Mental Models theory (Johnson-Laird 1981) on the other hand.

2.2.2 Stereotypic approaches to coherence

Stereotypic approaches attempt to interpret discourse coherence by providing conventional representations of knowledge of the world. These predictable representations are used to assume the type of expected information available for a particular situation. Frame and script are representative theories of the stereotypic approaches.

2.2.2.1 Frame

Minsky (1974) gives a systematic account of Frame theory, assuming that frame is an information structure stored in memory, representing a specific situation with a set of nodes and links in the network system. Information in the frame is retrieved from memory as background knowledge to understand new situations. In a general frame there are many slots to be filled in for the specifics in a given situation. Minsky provides a *house* as an example of a frame. A house has conventional information as a general frame, which is used automatically to identify a specific house in terms of the house frame. In the house frame, corresponding slots of the house are filled out, primarily including the sitting-room, bedroom, and kitchen. Further, in terms of the kitchen, we will fit the refrigerator, microwave, and dish washing machine in the slots. Therefore a frame is in a hierarchical and graded form, and the relevant frames are combined into a frame system.

Fillmore (1982: 111) explains a frame as 'any system of concepts related in such a way that to understand one of them you have to understand the whole structure into which it fits.' And he further concludes 'when one of the things in such a structure is introduced into a text, or into a conversation, all of the others are automatically available'. Fillmore's definition of frame echoes Charniak (1980: 62), who takes 'comprehension to be the process of fitting what one is told into the framework established by what one already knows'.

Fillmore (1975: 124) has applied the concept of frame to linguistics to develop the idea of a conceptual structure or experiential space. One word could activate a series of experiences or conceptual structure. From a language structure perspective, he defines his model as a system for language choice for relevant and typical situations, including choice of word combination, grammatical rules, etc. On the basis of his previous findings, Fillmore (1982) has put forward his theory of Frame Semantics, which centres on an interface between knowledge, concepts and language. Later on, in light of research into cognitive linguistics, Fillmore (1985: 223) defines his theoretical model as a specific and consistent knowledge structure or coherent schematization of experience.

Fillmore has applied his cognition-based Frame Semantics theory to lexical meaning and syntactical structure meaning and paid special attention to lexemes, especially verbs, used in cognitive processing, in that verbs are related to the whole situation, and can make some aspects of events more prominent and salient.

Frame theory is used to account for how expectation influences the discourse produced; as a set of structured repositories for our conventional knowledge, the basic concept of frame has provided a useful working model for coherence. However, according to Brown and Yule (1983: 240) limitations remain with the frame theory, in that there are many situations in which a discourse is produced where the audience can be intended or expected, but not guaranteed in terms of the stereotypic knowledge of what is to be communicated. In addition, when a text cue is to activate a frame, several frames may be activated. According to Minsky (1974) the frame takes hierarchical and graded form in mental processing, but he did not provide an account of how this structure is formed in a cognitive sense. Finally, the frame theory is suitable for a static pattern of events rather than for dynamic actions (Schank and Abelson 1994: 75). The other stereotypic knowledge theory is known as dynamic script.

2.2.2.2 Script

Schank and Abelson (1975) have defined scripts as structures that describe appropriate sequences of events in a particular context, a predetermined, stereotyped sequence of actions that defines a well-known situation. Abelson (1976) has used the concept of script to investigate the relationship between attitudes and behavior, and also applied his findings to text understanding, incorporating a particular analysis of language understanding proposed by Schank (1972) as conceptual dependency. In a development of the conceptual analysis of sentences, Riesbeck and Schank (1978) have described how our understanding of what we read or hear is very much expectation-based. The expectation-based analysis presents 'a viable theory of how human process natural language' (Riesbeck and Schank 1978: 290, cited in Brown

and Yule 1983: 244). Ungerer and Schmid (1996: 213-214) define scripts as 'knowledge structures that are particularly designed for frequently recurring event sequences', on the grounds that our knowledge of routine activities can produce experimental results to support the views of Schank and his collaborators who treat scripts as 'action stereotypes' (1996: 213).

According to Wang (2006: 212), life experience tells us that a particular situation will consist of a set of actions. Script refers to a standard and idealized and relatively stable process in a specific activity. Script features dynamics (events in action frame) and process (organic association to time sequence and cause and effect relations). Regarding the functions of scripts, Wang asserts that scripts are used mainly to describe a procedure and plot pertaining to actions and events. With a script in mind listeners will use it as reference for understanding utterances. The script helps listeners to concentrate on exceptional, complex and interesting information processing, rather than overspend effort on the conventional and standard procedures. There are similarities and differences between frame and script (Cook 1994: 20, Taylor 2002: 203, Croft and Cruse 2004: 28, Wang 2006) as follows:

Similarity: Frame includes script, that is, script is one part of frame. First, sequential events and actions take place in a particular frame. For instance, in the frame of being in a library the sequential events and actions would happen in such order as: going to the library, consulting, borrowing a book, finding a place for reading, scanning and skimming. Secondly, any events and actions are linked to a particular frame in a logical chain, for instance, the action of taking a basket in the context of in-the-supermarket frame. It shows both conditional and procedural connection. Third, script is designed to show when, where and by what sequence these typical actions take place. Also script, just like frame, plays a functional role which involves habit, rules and conventions, and both frame and script are constrained by society and culture.

Differences: script is a knowledge structure independent of frame. Charniak (1980), Schank and Abelson (1975: 1977) distinguished script and frame in that frame is a stored system pertaining to the data structure of a template theme; it is static, and it is

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not able to reflect experience. On the other hand, script stresses operational experience in perception pertaining to plot knowledge; it is dynamic and designed for procedural and sequential structure.

According to Brown and Yule (1983: 244) the theoretical and experimental findings discussed have psychological validity. However, the concept of script has been challenged on the same ground as frame. That is, script needs a limiting of the scope of conceptualizations to understand a sentence, in other words, the problem with the script theory remains how to constrain the expansion of any analysis which needs to incorporate extra-linguistic knowledge in its account of the comprehension of linguistic data. These stereotypic models, both frame and script, are challenged by Lakoff (1987), who considers them only applicable to propositional models, but not to non-propositional ones, in that they could not be used to explain the imagery process for abstract concepts; frame and script are only part of the Idealized Cognitive Model (ICM). This will be further discussed in Chapter 4.

Another view of how discourse coherence and experience is interpreted has been put forward primarily by Johnson-Laird who has focused on mental models rather than stereotypic knowledge or fixed storage systems.

2.3 Mental Models theory (MMT) on coherence

Johnson-Laird (1983, 2001) has put forward the cognition-based theory of Mental Models. He emphasizes the structural aspect of mental models in research into discourse coherence. Mental models are assumed to be characterized as being comparable in structure to the state of affairs they represent as opposed to text-based representations. Mental Models theory aims to cover holistic aspects of language processing from a different perspective to those discussed above.

According to Johnson-Laird (1983: 2-3), mental modeling itemizes representations at three levels in language processing, incorporating individual's extra-linguistic knowledge. Mental Models theory attempts to examine how coherence is achieved from conceptual, local and global perspective. The first level is representations at the

conceptual level. Viewed as the basis of semantic structure, concepts are micro units of knowledge structure. From the macro perspective, verbal information is selected, interpreted and integrated on the basis of 'higher-level complex and even conventional or habitual knowledge structures' (Dijk, 1981: 141), in that the conventional knowledge structure acts as 'ideational scaffolding' (Anderson, et al. 1977: 433) – a conceptual framework, which may account for the goal-directed purpose in language processing.

The second level is representations at local level. As semantic molecules, propositions are used to represent the information of a text. A proposition with appropriate units may be perceived as a verbal substrate of language processing, like an ecological surface on which organisms grow or are attached. In a proposition, elementary semantic relations are formed by linking one or more arguments into a predicate. Arranged in a coherent order, propositions can symbolically represent the information content of a text. The third level is representations at the global level: a complex cognitive structure of symbolic tokens that represent the theme of a text is modeled.

Mental Model theory lays the foundation for sense-making or coherent discourse by integrating verbal information and individual knowledge (Reichgelt 1982; Hörmann 1983). In the context of discourse, a mental model is to be understood as a dynamic cognitive representation of the contents of an utterance on the part of the recipient – the listener or reader. In the course of processing, both a model of the text and a model of the world are integrated into the current model of the discourse; the former contains a verbatim or propositional representation of verbal expressions, the latter provides a knowledge structure. This is assumed to be a holistic representation of the state of affairs conveyed by the discourse. In order to achieve discourse coherence, the recipient keeps validating the verbal input against their individual knowledge of the world (Payne, 1993). In other words, the recipient processes his current state of knowledge in a dynamic and creative manner. On the basis of the semantic information available, the recipient keeps updating his current mental

models and creating new semantic information above and beyond what has actually been said (de Vega, 1995). In this way, the recipient is specifying, differentiating, or modifying the information on the basis of his mental models. The mental modeling proceeds like a snapshot of actual proceedings against a motion picture in procedural aspects; the snapshot means an impression of the state of affairs as a definite point in time while the motion picture means a series of stills played onwards in rapid succession (Xu 2004). In order to represent the course of an event, a mental model which represents the initial state of affairs is constantly transformed into a model that represents the final state. At any intermediary stage, the outcomes of previous stages of processing provide the context for the forthcoming modeling development.

Mental Models theory emphasizes two non-verbal aspects in discourse coherence. The first aspect concerns the situation, or the integration of information from various sources, and the second concerns inferencing. The situation in mental modeling includes nonverbal elements or elements which are hard to verbalize. As well as linguistic information, non-linguistic information, such as slides, diagrams, animations, and any elements available and relevant to the topic in question, will contribute to the construction of mental models. This non-linguistic information helps to construct a coherent representation of some state of affairs; in other words, the non-linguistic situational elements assist in coordinating objects or relations that go beyond a particular verbal utterance. With respect to inferencing, making sense and establishing coherence involves not only an exclusively interpretive process but also a constructive process. Inferencing is crucial to the mental modeling.

Mental modeling allows for a richer representation than the stereotypic versions found in frames and scripts. However, the practical details of mental models remain elusive (Brown and Yule 1983: 254); some fundamental issues have not been discussed in detail yet. For instance, what specific knowledge should be accessed to ensure comprehension of the current discourse? How are propositional representations of the verbal expression processed in the mental model? In addition, Mental Models theory puts forward the concept of local and global coherence in discourse, but my

critical view is that it has not built up a systematic and practical model for coherence yet. Mental Models theory ignores the fundamental point of cognition: cognition is based on bodily experience; and it is bodily experience that is the origin of coherence-building process. The so-called holistic structure of discourse coherence proposed by Mental Models theory is not substantial in its content. Like any of the traditional theories reviewed, the notion of concepts and propositions in Mental Model theory were reduced to a set of literal symbols and signs, 'not tied to any of the bodily aspects of human understanding' (Johnson 1987: xiv). Therefore, their patterns and connections remain disembodied, in terms of philosophical and methodological assumptions. This will be further discussed in Chapter 4.

2.4 Concluding remarks

This chapter has presented a literature review of linguistic theories relevant to coherence, including Systemic Functional Linguistics (SFL), the knowledge-based view of coherence, stereotypic models, and Mental Models theory. These theories reviewed show the development in research into discourse coherence, each with its strong and weak points. The weak points of theories reviewed have gradually become prominent, on the grounds that they have not touched on the primary interface between the representation and the world: it is the communicator's interactive bodily experience that links the two parts to achieve coherence.

However, their strong points, which are to be applied to the model of this study, concern functional and cognitive approaches. First, the tools and ideas of SFL, such as thematic progression and cohesive devices are used to analyze the experimental text in terms of cohesion and coherence. I intend to continue to study the role of cohesive devices in the embodied cognition context as an extension of this study (see Section 7.2.2). Next, the cognitive knowledge-based theory of de Beaugrand and Dressler contributes to this research, in terms of the procedures for using knowledge in a wide range of tasks, including continuity, activation, strength of linkage, spreading

activation, episodic and semantic memory, global pattern, economy and inheritance. I will apply these concepts to build up the coherence model in SI and also to analyze the data. Third, the stereotypic knowledge-based frame and script are applied to analyze the data, in terms of how expectation influences the discourse coherence. As structured repositories for our conventional knowledge, frame and script provide a useful working model for coherence. Finally, the theory of Mental Models sheds light on this study's model in terms of its basic principle of representation of the state affairs at the three levels: conceptual, local and global coherence. The relationship between all these theories and models, and the way in which they can contribute solutions to problems that are the theme of this study will be further explored in chapter 4.

At this point, I have reviewed the relevant theories on coherence, which will serve as a platform for this study. In the following chapter, I will move on to the topic of simultaneous interpreting (SI), and provide an account of how the reviewed theories on coherence can help researchers in interpreting with their analysis of coherence in SI, and also of how relevant SI theories and findings contribute to this study.

Chapter 3 Simultaneous interpreting (SI)

This chapter will provide a literature review on simultaneous interpreting (SI) theories primarily relevant both to coherence and to this study. The literature is selected on the basis of two considerations: a) how the theories on coherence, discussed in Chapter 2, have helped researchers in interpreting with their analysis of the process of SI, and/or b) how the reviewed literature on SI contributes to this research. Amongst the literature reviewed there are two SFL-based analytical frameworks for coherence; one is the text linguistic framework of Hatim and Mason (1990), and its relevant empirical researches, in Section 3.1.1, and the other is the General Theory of Translation and Interpreting (GTI) of Pöchhacker (1992, 1994), in section 3.1.2.

Like any other academic disciplines, philosophical methodologies determine basic assumptions, models, values and standard methods and the research approach to SI academic field; this is referred to as the paradigm (Kuhn 1996). Three different paradigms-based SI researches are reviewed in this chapter: (1) empiricism-based versus (2) rationalism-based paradigms; and (3) the paradigm combining empiricism and rationalism. According to Pöchhacker (1994: 67-80), the empiricist view relies on factual evidence, observation and professional experience while the rationalist position is more in favor of theorizing than data-based evidence. The paradigm combining empiricism and rationalism attempts to combine the two methods. It focuses on the professional experience and uses computational approach to analyze and synthesize the data available. However, the three paradigms belong to the philosophical category of Objectivism, as discussed in Chapter 1, which fundamentally ignores those functions of bodily experience or embodiment and the imagery capacity. The empiricism-based paradigm is represented by the Interpretive Theory of Translation (IT) (théorie du sens) (Seleskovitch 1968, 1975 and 1981; Lederer 1981; Seleskovitch and Lederer 1986), in section 3.2; and the rationalism-based paradigm involves two theories: (1) the Cognitive Processing paradigm (CP) of Gerver (1971, 1975, 1976) and Moser (1978) in Section 3.3.1; (2) the Effort Model of

Gile (1985, 1991,1995) in Section 3.3.2. The paradigm combining empiricism and rationalism is represented by the Computational Linguistics Approach to SI Coherence of Dillinger (1989, 1994) in Section 3.4. Finally, in Section 3.5, Pöchhacker (1992) is discussed as a signpost for the next chapter.

3.1 Functional linguistics -based research on coherence in SI

The following section will review the two functional linguistics-based works: the text linguistic framework and its findings in SI coherence and then the General Theory of Translation and Interpreting (GTI).

3.1.1 Text linguistic framework and the findings on coherence in SI

As mentioned above, Hatim and Mason (1990), on the basis of Functional Linguistics (FL) (Section 2.1) set up a text linguistic framework for coherence in translation and interpreting, comprising features such as cohesion, thematic progression and context situation. For instance, they (1990: 224-235) chose as their sample text the opening paragraph of Rousseau's Emile*, to show these features. Hatim and Mason (1990) analysed this French philosopher's work written in the eighteenth century, from a contextual situation perspective (1990: 228):

Field: social/educational philosophy

Tenor: formal addressed to educational reader on an equal to equal basis, authoritive discourse

Mode: written to be read reflectively, but reminiscent of spoken mode as in sermons, etc.

Hatim and Mason (1990) further analyze this discourse coherence in translation from the thematic progression perspective as follows (1990: 234):

Source text: *Tout est bien, sortant des mains de l'auteur des choses: tout dégénère entre 'les mains de l'homme. Il force une terre à nourrir les productions d'une autre ; un arbre à porter les fruits d'un autre. Il mutiles son chien, son cheval, son esclave.*

Target text: God makes all things good; man meddles with them and they become evil. He forces one soil to yield the products of another, one tree to bear another's fruit. He mutilates his dog, his horse and his slaves
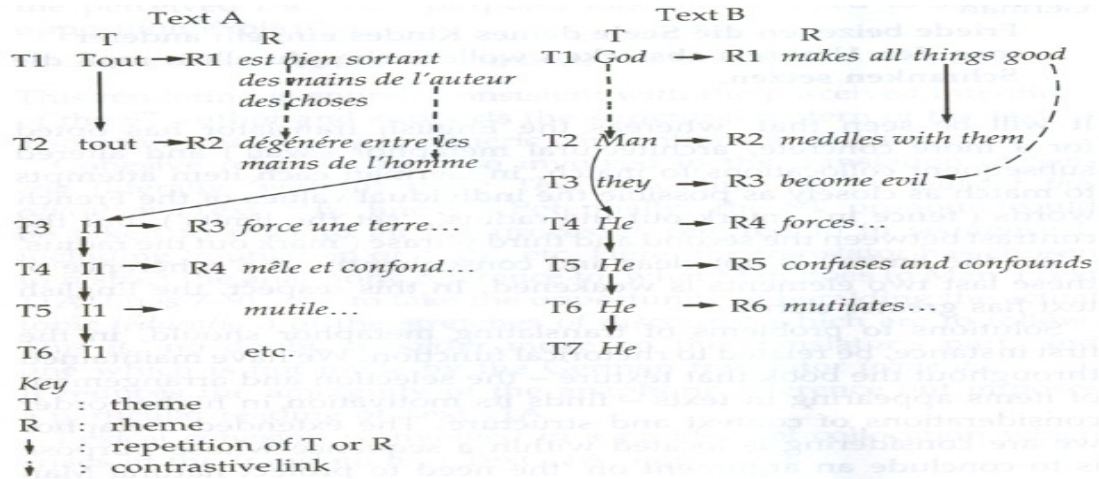
Figure 3 Thematic progressions in translation (Hatim and Mason 1990:234. Fig.11.12)

According to Hatim and Mason (1990: 217) 'if theme-rheme analysis is to have any relevance to translators, it must provide an account of thematic progression in the service of particular rhetorical purposes'. They conclude that it is necessary for researchers in translation and interpreting to analyze thematic progression in different languages over a range of text types, in that this is an aspect of texture, i.e. a unified whole, which is of crucial importance to the translator and interpreter.

On the basis of Hatim and Mason's framework, Taylor (1997), Consorte (1999), Shlesinger (1995), and Tebble (1994) undertook empirical experiments in interpreting and their findings are reviewed in this section. Taylor (1997) attempted to show Theme as the interpreter's path indicator through the unfolding text. Taylor selected a speech by Bill Clinton during his presidential campaign as the testing material, and recruited five professional simultaneous interpreters as subjects. He analyzed the function and linkage of Themes in the speech from a dynamic perspective. His analysis shows that Theme does appear to serve as path indicator. The findings are meaningful for interpreter training, for instance, the need for situation as pre-theme should be valued, and the activities of guessing either thematic segments or rhematic

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portions for testing expectations help the interpreter to build up linkage of the text and achieve coherence.

Consorte (1999) also attempted to show the important part that Theme may play both as a guide to the understanding of the given information and as an orienter to the new information. The experiment involved thirty-seven subjects, who were asked to guess the Rheme for the Theme presented and vice versa and subsequently interpreted simultaneously the text related to these Themes and Rhemes. Consorte checked the results and concluded that Theme acts as an indicator of the direction that the following portion of text is likely to take and as an orienter to the message.

While Taylor and Consorte contribute to coherence in SI from a Theme-rheme analysis, Shlesinger (1995) does so through a study of shifts in the types and density of cohesive ties in SI. Thirteen advanced students of interpreting were asked to listen to an eleven-minute recording of an authentic impromptu speech in English and to interpret it into Hebrew. In her method, several items in each category were selected at random from different segments of the experimental text, so as to access a cross-section of the different types of cohesive devices in the corpus. In other words, not all cohesive devices in the outputs were analyzed. Her study shows that 'shifts do occur in all types of cohesive devices' (1995: 193), ranging from those conceived as not essential to the informational content of the text, to devices whose reorganization requires knowledge which is not available to the interpreter.

I include Tebble (1994) in the literature review. Although Tebble carried out her empirical research into consecutive interpreting rather than simultaneous interpreting as the previous three researchers, her research will contribute to this study in terms of an understanding of the interrupter's mental effort in processing textual structure in achieving coherence. Through her examination of real-life interpreted consultations and role-plays, Tebble has created a model of discourse structure for the interpreting trainees, in order to show how the interpreter makes her way through the various parts of the structure of consultation, activating proper expectations about the function of each new element, and appropriately distributes her amount of mental effort in each

part, according to the importance of the information in the overall structure.

To describe a typical context and situation in consultation, Tebble uses her term prototypical contextual configuration. She attempts to outline the representative context and structure of consultation in dialogue interpreting. She presents her *prototypical contextual configuration* for interpreting professional consultations as follows (1994: 172):

Field: presenting a problem which needs to be defined, and for which a solution is required

Tenor: role relationships – hierarchical: professional, super ordinate; client/patient: subordinate; interpreter: independent; social distance: maximum.

Mode: Constituted by two languages. The process of creating the discourse is via spoken medium, written medium, non-verbal communication, through the channel: phonic, graphic, signed.

Tebbel further separates the consultation into different and sequential stages: (a) greetings and introductions stage, (b) stating/eliciting problem stage, (c) ascertaining facts stage, (d) diagnosing facts stage, (e) stating the resolution stage, (f) client's decision stage, (g) clarifying remaining matters, conclusion, and farewell stage. On the basis of her observations, Tebble suggests that, the interpreter distributes her mental effort in a parabolic shape: slight mental effort from stage a to b, and increasing mental effort from stage c to e, with e as the peak in the process, and decreasing mental effort from stage f to g.

Inspired by FL, Tebble used her contextual configuration model to help the interpreter to predict the important elements of the structure of the discourse, and distribute her mental effort. However, due to the limitation of SFL (Section 2.1), Tebble has not been able to point out why and how some parts are more effort consuming than others. To do this, a cognitive approach might be the better choice.

To sum up, from Hatim and Mason to Schlesinger and Tebble, the researchers have combined SFL to study coherence in interpreting, with respect to thematic progression, cohesive devices and the textual structure. Their methods have useful applications for

quantitative analysis of SI. However, due to the limitations of the SFL framework, discussed in Section 2.1, further efforts are needed to analyze discourse coherence from a cognitive approach. As Hatim and Mason (1990: 218) have claimed 'the associations (between themes and rhemes) is often perceived on cognitive grounds as part of text comprehension'. Further, according to Pöchhacker (2004: 146) more cognitive analysis needs to be done for various textual parameters so as to progress the study of discourse coherence.

3.1.2 General Theory of Translation and Interpreting (GTI)

The other FL-based framework on SI coherence is the General Theory of Translation and Interpreting (GTI) which was based on *Allgemeine Translationstheorie* (ATT), formulated by Reiss and Vermeer (1984). ATT is a skopos-oriented theory to study coherence in translation and interpreting. Its primary assumption is that 'a translation must be coherent, first and foremost in itself, and as far as possible, with the original' (Setton 1999: 44). The term *skopos* comes from Greek, meaning aim, function and purpose. Skopos involves factors, including communicative needs, expectations of the target audience, its situational context and social-cultural environments, and these factors, according to Vermeer (1989/2000), determine the role of skopos theory as the basic principle of translation and interpreting.

ATT assumes that the intended purpose of the participants involved determines the cognitive process in achieving a goal, by linking causal concepts. Basically the purpose or the anticipated outcome dominates participants' decision-making and inferencing in choosing appropriate actions within a range of strategies, in the communicative process. Meanwhile, decision making and inferencing are indispensable for the knowledge which gives rise to the contextualization and actualization of the action. However, there are varying degrees of ambiguity and uncertainty about the knowledge in question. At this point, the purpose serves to make the state of conditions coherent in a particular environment, especially in terms of a perceived set of situations and conditions. The interpreter uses the motivation,

purpose or goal orientation to set up the control centre of the topic, accessing the specific knowledge required for comprehension and coherence.

On the basis of a SI corpus derived from a three-day international conference against the background of the event and local discourse situations, Pöchhacker (1994) has constructed his SI model and named it General Theory of Translation and Interpreting (GTI). According to Pöchhacker (1992, 1994), translation serves as an act of communication, which is set in a coherent web of structured elements. Skopos theory is a holistic approach to analyzing SI, in terms of its interactional, situational and textual features. GTI provides a general framework for SI, from a skopos perspective.

Applying skopos theory to SI, GTI covers a three-level framework, regarding roles and factors in a SI interaction network. The first level of the SI conference is mission, from which the purpose is specified. The situation at the first level is envisaged in a more cognitive sense, and it exists in the mind's eye of the communicators in the interaction. In other words, communicators make sense and achieve coherence, by mediating between the on-line communication and the situation, and assessing continuously the intentional orientation conveyed in other communicators' behaviour. This interaction involves the communicators' knowledge, social-cultural background, and motivation, emotional attitude and expectations.

At the second level is in-conference interaction at a given place and time. According to GTI, the situation develops around a model of the Speaker(s), the listener(s) and the interpreter. The crucial element for the interpreter is knowledge, which determines her comprehensibility and coherent outputs in SI. On a third level in the GTI framework for the interactional process and the product of SI is a semiotic gestalt-based text, which consists of not only acoustic or phonemic information but also the auditory and the visual channel; the Speaker's overhead slides serve as part of the interpreter's source text (ST) as much as his gestures, smiles or intentional patterns.

However, regarding the second level, according to Setton (1999: 44-45), there is a

problem with GTI, in terms of coherence: how to evaluate the equivalence of messages between the inputs and outputs. It is difficult to reliably determine the hearer/interpreter's knowledge and orientations; these are 'volitional variables' (Setton 1999: 44-45). In addition, according to Pöchhacker (2004: 77) the skopos-based theories on SI have been carried out with insufficient empirical research within this functionalist school. Following this point, I will make an attempt to find out, through an empirical study involving the role of bodily experience, how much of the Speaker's knowledge the interpreter should share to ensure coherence; the design of this is explained in Chapter 5, and the results are reported in Chapter 6 and discussed in Chapter 7.

The following section reviews the literature involving three different paradigms in viewing SI, as mentioned above. I start with the empiricism-based Interpretive Theory of translation (IT) (Théorie du sens).

3.2 The empiricism-based paradigm: Interpretive Theory of translation

The Interpretive Theory of translation (IT) (théorie du sens), founded by Seleskovitch and Lederer (Seleskovitch 1968, 1975, and 1981 and Lederer 1981 and Seleskovitch and Lederer 1986), is referred to as the 'bootstrap paradigm' by Pöchhacker (2004: 69), who has claimed IT as a pioneering but limited effort to lead interpreting studies to 'a scientific and academic discipline' (2004: 69). Seleskovitch and Lederer started by using an essential cognitive analysis of interpreting, viewing interpreting as a knowledge-based process to make sense, rather than a code-switch operation between languages. In other words, interpreting is a process of making sense and building coherence by establishing links and relations on the basis of cognitive complements. They view discourse interpretation as a natural process, in which the synthesis between the semantics of an utterance and knowledge relevant to it generates 'states of consciousness' which correspond to the message, or the sense (Seleskovitch 1986: 272; Setton 1999: 39).

The IT account rests on two concepts for discourse analysis: making sense and

vouloir-dire (speaker's intended meaning) (Seleskovitch and Lederer 1986, translated by Wang 1990). The IT asserts that making sense is the aim of translation, and also the key element in communication. Simple or complex, the sense is what translation intends to achieve, in that communication has a purpose, which makes necessary such particular instances as listening, speaking, reading, writing and translation and interpreting.

According to the Interpretive Theory of translation (IT), from the perspective of understanding, the interpreter is the listener, and regarding the interpreter's role in making the audience understand the target language (TL) the interpreter is the Speaker. The interpreter sets out to make sense of utterances by getting at the intended meaning of the Speaker and then faithfully re-expresses the meaning/sense to the listener. IT asserts that the production of a meaningful unit (unit of sense) starts with parsing information, and is followed by combining the fresh input with relevant knowledge to make sense. The parsing of information means the analysis of how a set of grammatical rules and a lexicon of words and phrases are put together and transmitted into well-formed sentences. Next, the exact moment of making sense depends on knowledge, and is therefore assumed to vary between different interpreters working on the same discourse. As the discourse advances, the synthesis of sense units increasingly rests on information from prior discourse.

In order to achieve an understanding of the intended meaning, IT has turned to cognition and formulated the concepts of the context and the situation. The context comprises *cognitive context* (contexte cognitif), *cognitive bank* (bagage cognitif) and *relevant knowledge* (savoir pertinent). IT separates context into verbal context and cognitive context. The former corresponds to the immediate memory and surface of a meaningful unit, the latter corresponds to the sense in cognitive memory, which is activated from the start of the conversation.

IT attaches importance to the context and situation. The situation falls into both visible and invisible categories, including what we see, i.e. gestures and facial expressions, and all the factors relevant to the speech and all elements perceived and

imagined or inferenced in the conference. IT explains that the situation puts the Speaker, the interpreter and Addressees in the same picture. The interpreter can inference the elements and signs, which are indicative of the Speaker in terms of his intended meaning. For instance, what is the conference type? Is it an international conference, or a special committee meeting of an institution, or a corporate board meeting? What are the purpose(s) of this conference? Where does the conference take place? What are the shared interests and conflicts existing between and among the concerned parties? Regarding the Speaker, the interpreter will keep asking: where does he come from? What is his motive? And who is he addressing? What might he expect? The interpreter can use her creative potential to anticipate any possible ideas, directions and terms of the speech. This anticipation will help the interpreter to build up her cognitive context.

The specific and current situation is also significant to the interpreter. Seleskovitch (1986; translated by Wang 1990: 50) provided an instance for this point. While projecting the slides the Speaker said to the electrician "Lumiere, s'il vous plait" (Light, please). If it was dark in the hall, the electrician would turn on the lights. When the conference ended, the same utterance was repeated; the electrician would turn off the lights. The situations help determine different senses and verbal context, eliminating the ambiguity of the language.

Cognitive context is started up from the beginning of speech, being activated and developed along with the communication process to a clear and consistent status. In other words, the interpreter might be initially limited to literal interpreting due to a lack of cognitive context, but gradually move into a smooth track of interpreting, free from any verbal obstacles. IT argues that cognitive context differs from cognitive bank in terms of retention time. Cognitive context helps to retain the immediate message and lasts just long enough to understand the forthcoming speech. Cognitive bank is the knowledge stored in the long-term memory. The relevant knowledge (savoir pertinent) is stored in the cognitive bank and activated by what is being heard.

On the basis of the theories above, IT proposes that the interpreter goes through the

following stages to make sense: first, limiting the scope of semantic potential in terms of verbal context; second, making sense from the current utterances via cognitive context, finally, accessing her knowledge to make sense. IT asserts that in order to make the above-mentioned stages possible, three elements are involved. First, the interpreter should have access to the whole situations. Next, the interpreter is able to recall and retain the elements of the utterances in the cognitive context. Third, the interpreter has required relevant knowledge of the topic. On the basis of the descriptions above IT further postulates three stages in SI: (1) perception and mental complement, (2) conceptualization, (3) expression.

(1) Perception and mental complement. Oral speech flow progresses at full speed in a series of interactive and vibrating sounds with different frequencies. In spite of this, the listener has no difficulty in understanding his /her own native language within 50 to 20000 hertz. The listener will not need to make any effort to make sense of the message and emotions from the series of organized and meaningful sounds (Lederer 1986, Wang 1990: 178). However, in terms of understanding a non-native language a complementary mental capacity is needed to compensate for her deficiency in decoding incoming information. A simultaneous interpreter must be acute in listening, but the listening skill involves both language proficiency and background knowledge. Language competence and background knowledge are complementary and indispensable as well. More background knowledge means more mental complement to facilitate the sense making process.

In order to further address the relation between the background knowledge and language competence, the Interpretive Theory of translation (IT) shifts its attention to target language (TL), in which there are numerous layers of knowledge, ranging from the easy (e.g. ladies and gentleman at the beginning of speech) to the difficult(e.g. figures and subject matters in the speech). This hierarchical knowledge structure requires the interpreter to distribute her attention among corresponding layers. The listening skill is complemented by background knowledge, without which the reception will be incomplete, even unintelligible. So SI hinges on knowledge of the

world (Seleskovitch 1976; Lederer 1990).

(2) Conceptualization. The cognitive combination of background knowledge and language will give rise to conceptualization. In the SI process, making sense is a series of mutually conditional processes, in other words, once the current action stops, the following action starts. The interpreter starts listening in order to retain sounds, and then actualizes semantic meaning, and finally makes sense and achieves coherence. This is an overlapping process in parallel, that is, the listening skill and background knowledge work together all the time.

(3) Expression. On the basis of perception and mental complement and conceptualization, the simultaneous interpreter will have the capacity for pre-comprehension and maintain synchronic expression.

As this study is technical conference based and SI research and training oriented, I would like to review IT with respect to how students can be prepared for interpreting the technical conference to make sense and achieve coherence. Lederer (1986) defines knowledge in terms of what one can do and what one can understand. Her assumption is that, it is difficult for the interpreter to master all the subject matters of specialists in all given fields, but the basic requirement for the interpreter who is to interpret either for a general or a technical conference is to be able to understand what is being talked about, i.e. making sense and establishing coherence. Without understanding the subject, the interpreter would be stuck in a code-switch deadlock, and she would be unable to interpret properly. However, according to Lederer, understanding the subject does not mean being able to perform in that field; and that the interpreter does not need the profound knowledge of a technical specialist. What she needs is the knowledge, which enables her to process information.

At this point, Lederer put forward suggestions on how to obtain this kind of knowledge as follows. First, interpreting students are guided to keep asking not only how but also why, about what they take for granted in terms of the seemingly familiar devices used in daily life, for instance, TV and microwave wave stores. Initially, students of interpreting are instructed to be aware of their ignorance of what seems

familiar, and led to further exploration and improvement of their knowledge to the functional level which enables them to follow the flow of ideas of the technical specialist. According to Lederer we use numerous scientific and technological devices in daily life, which involve the specialized knowledge for the interpreter to make sense of a technological topic, but interpreting students are apt to ignore the channels to this kind of knowledge. For instance, students of interpretation can find out such things as: how is a car driven? What is its driving mechanism? If they know, then a further question: what are the working principles of an internal combustion engine and the gear box? Still further: how are they manufactured? On what kinds of machines are they machined? How are they cast into the moulds? The questions can go on. Lederer asserts that cultivation of curiosity and exploration for this kind of seemingly familiar technical item of knowledge is the primary principle for SI teaching and training, and that curiosity and exploration should become second nature for interpreting trainees.

Next, interpreting students are taught how to make sense and establish coherence of technical knowledge. According to Lederer there are a few basic principles in all disciplines of human knowledge, and many scientific rules can be compared to what is observed in daily life. Inference can be used to link and develop the knowledge system. She also suggests that students of interpreting should read books of popular science to expand their relevant knowledge of the subject matter. Finally, on the basis of the coherent and comprehensive knowledge, interpreting students are guided to gain an understanding of the technical terms, in particular to activate the links among the terms. Technical terms can not be isolated from the context.

The Interpretive Theory of translation (IT) has studied the process of making sense and establishing coherence in interpreting, and provides theoretical and methodological directions for SI research and training. IT has used cognitive concepts, such as cognitive context, cognitive bank, and relevant knowledge to explain how the simultaneous interpreter makes sense and establishes coherence in the SI process. In addition, IT has put forward the theory of information gradation and effort

distribution. However, there are some questions which IT has not answered clearly. For instance, IT claims that there are different layers of knowledge, some of which are easily activated but some are not. So which layers of knowledge are more easily accessible than others? How are the layers of knowledge structured from a cognitive perspective, say, in terms of a technical conference of SI? And further how can an empirical analysis be carried out to identify these layers of knowledge? In addition, in what ways can comparison with what is observed in daily life help us to understand scientific principles? For instance, in what respects can water be compared to electric current? IT postulates that the interpreter makes a specific effort to resist interference from the forms of source language (SL), to which self-monitoring must be specially attuned (Setton 1981: 105). However, the resistance from the SL forms is challenged by Newmark (1982: 98), who comments as follows:

> The basis of Seleskovitch's theory is unsound. Translation and interpretation have to be based on words, sentences, linguistic meaning because they have no other material foundations. Meaning does not exist without words.

Besides the questions mentioned above Gile (1995) pointed out that IT is not 'scientific' (1995: 55) due to the fact that it is only based on professional observation and experience; in particular, it lacks in cognitive psychological research. Therefore this research classifies IT under the empiricism-based paradigm.

3.3 The rationalism-based SI paradigm

As an opposite view to the Interpretive Theory of translation (IT), the rationalism-based SI paradigm in this research consists of two frameworks: Cognitive Processing (CP) including the Effort Model of Gile and the paradigm combining empiricism and rationalism is represented by a computational linguistics approach to coherence in SI. There are two primary rationales to review these two SI paradigms. The first lies in the fact that both paradigms aim to explore how comprehension and coherence is attained in SI, and therefore each of them contributes to this research. The second is

that my research is derived from a different source to the two paradigms mentioned, in that my theory is based on the second generation of cognitive science and theirs is based on the first generation work. There are two conceptions of cognitive science, defined by different philosophical commitments: the first-generation cognitive science ignores the role of bodily experience, viewing thought and language as only the mechanical manipulation of abstract symbols, while the second generation of cognitive science stresses the role of bodily experience, asserting that thought, understanding and language are essentially embodied, that is, they are based in the way our bodies experience the world. This is further discussed in Chapter 4. The two SI paradigms were formed in this context – basically drawing on the information theory and cognitive psychology on the basis of the first-generation cognitive science. With a view to the SI frameworks in this context, according to Pöchhacker (2004), interpreting was conceptualized through a particular set of abstract symbols – digital data processing operations. Just like a computer processor, the interpreter was assumed to perform a number of cognitive skills, such as speech recognition, memory storage and verbal output, and the combination of the respective operations would expect to explain the complex task of interpreting. This concern with cognitive information processing skills is the most widespread paradigm in interpreting studies to date (Pöchhacker 2004: 53).

3.3.1 The Cognitive Processing paradigm

The Cognitive Processing paradigm (CP) of SI was introduced by Gerver (1971, 1975, 1976), and Moser (1978). Gerver (1971: viii) viewed interpreting as 'a fairly complex form of human information processing system involving the reception, storage, transformation, and transmission of verbal information'. His research into interpreting has three main themes: (a) the information processing system; (b) the possibility of dividing attention among multi-tasks, and (c) the structure and function of memory components. To make the complex interpreting task suitable for experimental study, he further broke down the language processing into subtasks, or component skills,

including phoneme, lexical recognition, syntactic processing and knowledge-based inference

Gerver conducted a few experiments with professional interpreters. On the basis of the results, he proposed (1975) a sequential SI model of mental processing in interpreting. This SI model is focused on a short-term storage system for the different stages in text processing. According to Gerver, the source text (ST) was stored in an input buffer, from where it proceeded for further processing. With a segment of the input text stored in the input buffer, the processor was busy processing a current segment. Then the processed segment was transmitted into output via an output buffer, where it proceeded for recognition processing.

Gerver assumed that the actual text processing was performed in co-operation with long-term memory (LTM), which activated the current linguistic units. LTM is 'everything a person knows and remembers' (Kintsch 1998: 217). However, Gerver has not specified in his model which segments in the process are performed by working memory, nor has he considered working memory either to be a structural or a functional entity (Gerver 1975). Working memory is conceptualized as a tripartite system, in which the online interaction between fresh input and knowledge stored in LTM is seen as mediated by short-term storage and processing resources (Pöchhacker 2004: 122).

Another cognitive process model of SI was proposed by Moser (1978), who shifted her attention to the role of working memory. Unlike Gerver, Moser was more explicit as to specific process segments. Moser used a different term, Generated Abstract Memory (GAM), but it was equivalent to short-term memory (Moser, 1978). According to her model, working memory should have both structural and functional components. GAM performed several important tasks. It stored processed chunks of text through lexical, syntactical and semantic levels, and it also performed a recoding task in co-operation with a conceptual system, which helped to transform the linguistic units. GAM was linked to long-term memory, which stored all concepts, lexicons, syntax and grammatical rules, etc.

The concepts of short-term storage/GAM, long-term memory and working memory serve as groundbreaking work in interpreting studies, which can help to analyze the way in which new inputs activate the long-term memory, building up the links in the online interaction net. However, the fundamental problem of this rationalism-based cognitive paradigm lies in the basic philosophical assumption that it 'ignores any ways in which those functions arise from the body and brain' (Lakoff 1999: 75-76). In addition, the way the human processor processes information is different from that used by a computer primarily because human thinking is overlapping in parallel rather than a step by step process; this rationalism-based cognitive paradigm has not addressed the property of cognitive processing – fuzziness. This will be discussed in Section 4.3. Finally, according to Setton (1999: 38), the CP community has yet to present a corpus in support of its theories. In order to find a new way out for CP, Gile proposed his Effort Models theory (1995) for SI comprehension.

3.3.2 The Effort Model

According to Gile (1985, 1991,1995), the interpreter's mental effort may be reduced when she makes sense of the Speaker's utterances, while her mental effort may be taxed heavily due to such factors as her knowledge deficit, or slowness in lexical retrieval, suggesting that she has difficulty in building coherence. The amount of the interpreter's attention to be distributed is determined by the density and difficulty of the information in the source language. If the interpreter distributes more attention to the particular difficult information, she may have less attention to process the rest of the information. On the basis of these observations, Gile (1995) proposed his theory of the Effort Model.

The Effort Model comprises three basic mental efforts: (1) listening and analysis (L/LA), (2) production (P) and (3) memory (M). Gile has assumed that the simultaneous interpreter has a limited amount of mental energy, or rather processing capacity, available for her processing effort in SI; therefore the sum of the three

efforts cannot exceed the interpreter's processing capacity. Based on these three efforts, Gile added the coordination effort (C) to his models, and proposed a set of formulas as SI = L+P+M+C. This means that SI processing capacity should be minimally equal to the total requirement for the four skills.

Gile proposed his next formula: TR = LR+MR+PR+CR. The total processing capacity requirements (TR) refer to a sum of individual processing capacity requirements. Where LR = capacity requirements for L, MR = capacity requirements for M, PR = capacity requirements for P, and CR = capacity requirements for C.

The effort requirement standard varies due to the comprehension of speech content and the flow of current speech. The effort pattern may change over a few seconds. If the interpreter is expected to proceed without difficulty, she must meet the five conditions: (1) LA ≥ LR; (2) MA ≥ MR; (3) PA ≥ PR and (4) CA ≥ CR. In short, the capacity available for each effort must be equal to or larger than its requirements for the task in process; and (5) TA ≥ TR: total capacity available should be at least equal to total requirements.

The Effort Model is designed to describe the way the interpreter selects the appropriate strategy, enabling her to distribute appropriate mental attention to information of varying degrees of difficulty. The Effort Model has been used to account for a number of processing difficulties and failures, including such problem triggers as proper names, numbers and compound technical terms, which may lead to sequences of failure and require special coping tactics (Gile 1995). The Effort Model can be used to explain the failures as Gile claimed in SI performance, however, it cannot serve as panoramic view of SI, in that it is not a structured model of SI, nor is it a flow chart of information processing (Feng 1997: 53-56). Gile has not conducted an empirical study to show how the mental effort is reflected in the information structure in SI, nor did he explain in what conditions his formulas work.

There is another SI paradigm, which attempts to combine the empiricist and rationalist approaches discussed above – the computational linguistics approach to coherence in SI.

3.4 The paradigm combining empiricism and rationalism: a computational linguistics approach to coherence in SI

The initial foundation of this computational linguistics approach to SI research was laid by Dillinger (1989, 1994), who has assumed that the brain uses some kind of computational approach in processing information, and he has used a numerical computation in investigating the process. According to Dillinger, the interpreter's mental processes are all axiomatically defined and indexed to texts and their elements, whose forms can be abstracted. This computational linguistics approach to coherence in SI sheds its light on this study, in terms of (1) the selection of subjects, (2) experimental materials, (3) the manipulation of data, (4) design of the experiment as follows:

(1) The selection of subjects: Dillinger attempted to address his research question: whether there exist qualitative differences in processing between novice and experienced interpreters? He (1994) recruited 16 subjects, with two contrastive groups; one had eight experienced interpreters, and the other eight bilinguals without any interpreting experience. The interpreting subjects were instructed to simultaneously interpret English texts into French.

(2) Experimental materials: Dillinger used two texts with 580 words as experimental materials; one was narrative and the other procedural. He controlled the two experimental texts to assure equivalence at various levels from lexical, syntactic, propositional and cohesive layers, and had the experimental texts read out onto audiotapes. The texts were read at a rate of 145 wpm, deliberately faster than the comfortable range of 100 to 120 wpm as proposed by Selskovitch (1965) 'in order to generate deviations' (Dillinger 1989, 1994; Setton 1999: 31).

Dillinger (1994) compared the outputs of the two contrastive groups in terms of three categories: syntactic, propositional and frame processing. He analyzed how the interpreting subjects made sense and built coherence, on the basis of information density and importance. Syntactic processing is designed to examine the effect of syntactic structure on the interpreter's understanding, on the basis of simple or

complex sentences. Proposition generation is designed to see if the density of propositional information units in the segment has any effect on the interpreter's understanding. Frame processing is designed to examine how propositional information units are linked into frames, scripts or schemas, to help the interpreter to make sense and build coherence.

(3) The manipulation of data: Dillinger assessed the degree to which the response protocols (the transcriptions of the subjects' translations) match or mismatch the input text. He assumed that this is the essential measure of generating data from the observations in SI. Rather than matching entire propositions, Dillinger fits the individual slot-pairs that make up each proposition. According to Dillinger (1989; 1994), stimuli and responses are quantified indexes, on the grounds that texts constructed with their units or segments are all axiomatically defined and indexed to the interpreter's mental processes. He perceived meaning-changing responses as indexes in semantic processing, and regarded paraphrased responses as an indicator of synthetic processing and proposition generation. He used the following ordinal scale of similarity for statistical results (1994: 163-164):

   0 point: if the slot-filler pair was not present in the segment, i.e. absent; least similar.

   1 point: if there was a change of meaning in either the slot or the filler, i.e. semantic change.

   2 points: if there was change in surface form of either the slot or the filler, without a change in meaning, i.e. paraphrase.

   3 points: if the slot-filler pair appeared in the segment verbatim; most similar.

Dillinger designed a database for each of the experimental texts, using Microsoft Excel, in which each record (row) corresponds to a text proposition, and each field (column) fits information about the linguistic properties of the text.

(4) Design of the experiment: Dillinger (1994: 160-161) acknowledges the six deviations from standard interpreting practice as follows:

a) The interpreting experiment was decontextualized, in other words, the text was not interpreted in the context of a particular audience, on a particular social situation, such as a conference of specialists.

b) The speaker was invisible or available, on the ground that there are no differences in accuracy between interpreting with or without a view on the proceedings.

c) The interpreters were not prepared either for the interpreting or for the topic.

d) There was no audience.

e) The subjects were not paid.

f) The production process was not studied.

On the basis of his finings, Dillinger (1989) has formulated his model, 'a computational counterpart to the serial, clause-based clause-processing hypothesis in psycholinguistics' (Setton 1999: 31). This computational model of SI constitutes three stages for making sense and building coherence. In the first stage, words and phrases are put together to form sentences, and propositions are generated for semantic interpretation. At the second stage, the cognitive processor processes propositions (predicate-argument structure), establishing internal links among the elements by inferencing, tracing anaphoric antecedents and prior knowledge. This leads to the third stage: new propositions and propositional components are generated and further linked into a larger conceptual structure.

According to Dillinger, making sense in interpreting is characterized by all of the same components processes as listening; coherence in SI is not a specialized ability, but the application of an existing skill only under more unusual circumstances of conferences. He further concluded that interpreting experience has a weak quantitative effect on interpreting overall. The difference between the interpreting professional and the novice may be that the former may have learned to be more selective in the surface information than the latter.

Dillinger put forward some implications from his research on coherence and comprehension, which are opposed to those of other researchers. For instance, Selskovitch and Lederer assume that the interpreter only needs the relevant

knowledge sufficient to understand the topic (Section 3.2) while Dillinger claims that the interpreter has to have the same level of knowledge as presupposed by the Speaker. He recommends greater specialization of interpreters and the inclusion of specific domain knowledge in their training, therefore, the Speaker/writer should design the text which the interpreter, rather than the Speaker's knowledge peers, can understand. Another instance, Herbert (1978), Mackintosh (1999) and Peng (2006) assert that interpreters are made not born, on the grounds that practice makes perfect, while Dillinger takes opposite stance, i.e. interpreters are born not made, with innate aptitudes; at most, interpreting skill is a function more of general text processing ability than of specific training. More evidence is needed either to support or controvert these ideas through empirical experiments.

Dillinger's study is significant to SI research on comprehension and coherence (1989, 1994). According to Lakoff (1987: 348) the computational approach incorporates an important insight into the study of mind. 'There is flow of thought. It is not just a mushy flow, but rather a highly structured flow. The view of thought as algorithmic computation is presently our best model of a highly structured flow of thought'. However, Lakoff also points out its weak link as the 'lack of what we have called conceptual embodiment', i.e. ignorance of bodily experience in cognition. Dillinger does try to explore the importance of linking together propositional information units into frames, scripts and schemas – the more complex information structures that characterize texts, rather than sentences. However due to the lack of conceptual embodiment in his experimental design, his research on this aspect can not explain how the frame, script or schema could be generated without situation or context, nor does it reveal what is behind the slots and fillers in cognitive terms. In addition, Dillinger did not back up his model by means of any neurolinguistic experimentation; it remains speculative.

Dillinger used a proposition score to study the interpreter's comprehension processes, based on comparison between the source text (ST) and the target text (TT). This *verbal transfer* method is basically fundamental and reasonable in that 'words

contain meaning and serve as the elementary building blocks of a language' (Pöchhacker 2004: 54). However, in terms of Dillinger's data manipulation, his ordinal scale of similarity for statistical results is problematic. The segment verbatim or word for word interpreting is given the highest rating in the scale while paraphrase (change in surface form without changing the meaning) is given a lower rating. According to IT (reviewed in Section 3.2), though, the former normally indicates that the interpreter is stuck in the code-switching condition, unable to follow the idea thread while the latter signals that the interpreter has got rid of the confinement of language surface structure, interpreting properly.

Due to the difficult access to authentic texts (see Section 5.7) Dillinger used simulated or 'artificial' texts (Dillinger 1994: 158). Although the test texts were not excerpted from real-life conference proceedings, Dillinger argues 'no one knows what the differences are (if there are any) between the texts used here and the sorts of texts found in actual conference situations' (1994: 159). Dillinger believes that criticism of the use of simulated texts is 'not only unsupported by any evidence, but also seems entirely implausible' (1994: 159). However, these responses can do nothing to deny the significance of the authentic texts used in real-life conference interpreting. Dillinger's use of simulation as opposed to authentic text allows for greater control of stimulus conditions, as well as comparison and generalizations across data.

There are other limitations in Dillinger's study. For instance, Dillinger did not provide adequate data as examples, which made it impossible to justify the validity of his type-classification of responses or indexes. He supplied neither examples nor any part of the interpreting output protocols, nor an example of evaluation of the responses/indexes to discuss his assumptions. Values were computed statistically for the texts overall without reference to local processing or linguistic events. The basis for calculating inference load is not specified. These weak points are also discussed by other researchers (Setton 1999; Gile 1994).

To sum up, the three approaches to interpreting studies reviewed so far are influenced by first - generation cognitive linguistics, whose philosophical assumption

is that thought is disembodied, ignoring the consideration of bodily experience or physical interaction which has shaped the first generation cognitive linguistics. This disembodied view is the fundamental limitation of rationalism-based view on interpreting.

At this point, it is necessary to find a new way to explore coherence in SI. For this, the work of Pöchhacker (1992) serves as a roadmap for this research.

3.5 From Knowledge to Text: Coherence in Simultaneous Interpreting

Pöchhacker in his General Translation Theory (GTI) (Section 3.1.2) shows the inadequacy of functional text-bound measures of quality in that the notion of functionality in texts is not specified clearly enough to compare equivalence between inputs and outputs. In order to address this issue, Pöchhacker (1992) set out to adopt a knowledge structures approach to coherence in SI to discuss interpreters' use of knowledge structure, and he has studied how SI inferencing is made on the basis of cognitive models to achieve coherence and finally how mental models of message contents are built.

Pöchhacker picks up Gile's question (1991: 15) 'How does interpretation work?' and points out that the view of Seleskovitch and Lederer (1976, 1986,1989, reviewed in Section 3.2) – SI hinges on knowledge of the world – was hardly ever followed by a systematic look at what such knowledge is like, let alone how it could be described. Pöchhacker decides to look at SI not from the word out but from the conference assignment in, not only in terms of micro-level cognitive process but also in terms of the interpreting course of action and its product, that is, his GTI (reviewed in Section 3.1.2). Following this, he further focuses on knowledge, which he sees as the crucial component of the interpreting model in the most general sense of the word, knowledge. Pöchhacker attempts to specify the knowledge, required of the interpreter in terms of socio-cultural knowledge and competence (1992: 90):

  a)   General knowledge and competence (of members of a particular culture),

b) Specialized knowledge and competence (of a given professional or other group)

c) Individual knowledge and competence (of a particular person), and

d) Contextual knowledge and competence (gained in the course of the communicative interaction, i.e. conference).

Pöchhacker has continued to look to cognitive sciences for coherence in SI, He has proposed a theoretical integrated approach to coherence in SI, which consists of the building blocks of knowledge described above, frame (reviewed in Section 2.2.2.1) and script (reviewed in Section 2.2.2.2), and finally the Idealized Cognitive Model (ICM) derived from the concepts of Embodied Cognition (Chapter 4) which, he claims, is 'a new and promising path' (Pöchhacker 2004: 203). According to Pöchhacker (2004), the embodied cognitive paradigm, which has proved fertile in education and training, rejects the concern with mental plans and symbolic structures as put forward in the rationalism-based view (reviewed in Section 3.3), and stresses interactive bodily experience with a particular environment and social context, perceiving the person and the environment as parts of 'a mutually constructed whole' (Pöchhacker 2004: 203). In terms of the role of the ICM for SI coherence, according to Pöchhacker (1992: 94) 'The embodiment of concepts and image-schematic models are irresistible from a psychological point of view'; meanwhile he has pointed out the potential difficulties (1992: 94): 'how to make them work for the purpose of empirical description and assessment of knowledge use in the comprehension?' Therefore, he has pointed out 'This is where we are made painfully aware of the issue of coherence.' Finally he concluded (1992):

> What is sufficient coherence – do we know? I'm afraid the answer must be negative. […] we are hardly in a position to answer the central question of SI practice and theory on an empirical basis.

Pöchhacker has shown a brief roadmap for SI coherence – the ICM; I will follow this roadmap to start my exploration – coherence in SI, from an ICM perspective, through

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empirical research although it requires *painful* efforts.

Pöchhacker provided a specific knowledge structure (1992). However, like any theories reviewed so far, Pöchhacker did not answer the question relating to the concept of knowledge, raised by Lakoff (1987: 297): 'What does it mean to know something and how is knowledge possible?' The answer is 'The best example of knowledge is things that we know about basic-level objects, actions, and relations in the physical domain' (Lakoff 1987: 297), and our basic-level perceptions further help us to attain an understanding of the abstract concepts or knowledge by means of our imagery capacity. This will be discussed in the following chapter.

3.6 Concluding remarks

This chapter has summarized the theories which are relevant both to coherence in SI and to this study. First of all, in terms of the two SFL-based research and findings on SI coherence, the General Theory of Translation and Interpreting (GTI) helps to build this study's model and allows me to analyze the data through its view: the SI situation revolves around the purpose/skopos with a model of the speaker, the listener (s) and the interpreter. Meanwhile I use an empirical study to implement the framework of GTI. The text linguistic framework and its relevant findings provide the theme-rheme structure methods to examine the data of this study from the set of thematically central concepts and various types of cohesive ties. Tebble's model of contextual configuration sheds light on this research into the interpreter's mental effort in processing information contained in the textual structure.

Second, the empirically-based Interpretive Theory of translation (IT) provides this research with its principle of making sense and establishing coherence in SI as cornerstone of this research. IT's theory of cognitive elements, such as cognitive bank, relevant knowledge, the situation and the context in SI helps to build up this SI coherence model. IT's cognitive procedures in SI help to set up the design and analyze the data of this research, which include a) perception and mental complement,

b) conceptualization, c) expression. IT's theory of information distribution is used to help to build up the model of this research into the mental effort, by means of matching the ICM structure and the information pattern. IT also contributes to this study in terms of its basic SI principles and preparation for SI scientific and technological conference.

Third, with a view to the computer processing analogy based rationalist framework, the Cognitive Processing paradigm's concepts of the short-term memory, and long term-memory and working memory are used to analyze failure and success in the data and reveal how the interpreting subjects achieve coherence. The Effort Model, combined with the information distribution theory of IT as mentioned above, is used to formulate the model of coherence pattern pertaining to the mental effort in a technical conference interpreting context. In other words, I use the Effort Model to extend the research into the mental effort which is reflected in the textual structure of the target text (TT), analyzed from the ICM perspective. Dillinger's computational linguistics approach helps to set up the experimental section in terms of data manipulation, design and analyses. In this research, I combine the computational approach with Embodied Cognition to bridge the gap between the two theories. The gap between the two was identified by Lakoff, but has not been solved yet (1987). According to Lakoff (1987: 343) the experientialist approach (outlined in Chapter 4) will 'mesh better with an empirically responsible computational approach' (1987: 343), but how to combine them remains a problem. This study will provide an integrated model of the experientialist and computational approach, explained in Chapter 5, and summarized in Section 7.5.

Finally, Pöchhacker (1992) provides this study with a theoretical 'new and promising path' (2004: 203), i.e. the Idealized Cognitive Model (ICM). Following this way-marker, I will introduce the ICM in the following chapter.

Chapter 4 ICM: an interactive embodied approach to mental coherence

The Idealized Cognitive Model (ICM)-based approach to coherence, developed in this study, draws on Embodied Cognition theory (Lakoff 1987; Johnson 1987; Lakoff and Turner 1989; Lakoff and Johnson 1999; Langacker 1991, 2008 and Wang 2006). Embodied Cognition theory has been derived from the second generation of cognitive science based on the embodied mind. According to Lakoff and Johnson (1999: 78), 'the distinction between first generation and second generation cognitive science is not relevant to the age of any individual or the time when one happened to enter the field'; the distinction lies in disembodied or embodied cognition and the difference is one of philosophical and methodological assumptions. As introduced in Chapters 1 and 3, Objectivism claims that rational thought is independent of the understanding of any particular embodied organism; therefore rational thought only involves the manipulation of abstract symbols, whose meanings could be accessed through a correspondence with things in the external world. The first generation of cognitive science is based on the traditional view Objectivism. By the mid-to late 1970s, an increasingly prominent view of cognitive science, based on Experientialism, developed into embodied cognition theory, challenging the fundamental tenets of the traditional cognition theories. On the basis of a series of empirical studies, the experientialists assert that thought primarily grows out of embodiment, i.e. experience involves individuals and communities in the interaction with both physical and social environments. Experientialism rests on two kinds of evidence as follows (Lakoff and Johnson 1999: 77):

> (1) A strong dependence of concepts and reason upon the body and
>
> (2) The centrality to conceptualization and reason of imaginative processes, especially metaphor, imagery, metonymy, prototype, frames, mental spaces, and categories.

The experientialist view can be summed up by the following six key points (Lakoff 1987: xiv-xv). In the first place, thought is embodied. Our bodily experience gives rise to the mental structure which is used to hold our conceptual systems together, enabling us to make sense and build coherence. In essence, our conceptual systems are fundamentally and directly grounded in our perception and body movement via perceptual organs, such as our eyes, legs and arms, and physical and social experience. 'The term *Body* is used as a generic term for the embodied origins of imaginative structure of understanding' (Johnson 1987: xv) (Section 4.2.5).

In the second place, thought is imaginative. For those concepts which are not directly grounded in our bodily experience, or which go beyond the literal mirroring, or representations, of external reality, metaphor, metonymy, and mental imagery are applied to understand them. According to Lakoff, it is this imaginative capacity that enables us to make sense of abstract thoughts and takes the mind beyond what we can see and feel. Meanwhile the imaginative capacity is also embodied indirectly, on the grounds that metaphors, metonymies, and images are basically based on our bodily experience. Thought is also imaginative in a less obvious way: every time something is categorized in a way that does not mirror nature straightforwardly, imaginative capacities are being applied.

Thirdly, thought has gestalt properties and it is not atomistic but holistic. Concepts have an overall structure that goes beyond merely putting together conceptual building blocks by general rules. Fourthly, thought has an ecological structure, and is far more than the mechanical manipulation of abstract symbols. With respect to learning and memory, the efficiency of cognitive processing depends on both the overall structure of the conceptual system and what the concepts mean. Conceptual system has its own 'internal compulsive force' (Johnson 1987: 2) (see Section 4.2.5).

Next, a conceptual structure can be described using the ICM that has the properties mentioned above. Finally, the theory of cognitive models inherits and incorporates what was right about the traditional view of cognition, including categorization, meaning and reason, while accounting for the empirical data on categorization and

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fitting the new view overall.

Within this experiential framework, the ICM is employed and developed to analyze the understanding process and discourse coherence, due to the fact that the ICM involves the properties listed above. In this chapter, Section 4.1 will introduce the ICM theory, on the basis of the ICM principle: interactive embodiment and mental coherence. Sections 4.2 and 4.3 will provide an account of how the ICM is structured and of what properties the ICM has in processing information structure. Sections 4.4 and 4.5 will deal with the way the ICM works in cognitive process to help communicators to build coherence. Section 4.6 will summarize the role of an ICM in building discourse coherence, and Section 4.7 will present the ICM-based methods for tracking coherence clues.

4.1 An introduction to the ICM

According to Lakoff (1987: 68), the ICM comes from four sources: Fillmore's frame semantics (discussed in Section 2.2.2.1); Lakoff and Johnson's theory of metaphor, (to be discussed in Section 4.2.3) and metonymy (to be discussed in Section 4.2.4); Langacker's cognitive grammar (to be discussed in Section 4.7) and Fauconnier's theory of mental spaces (to be discussed in Section 4.4). The ICM is not only postulated as a mental structure about a certain field but also a general theory about minds. The ICM has the property of an entity as in a frame and script, and further leads to an understanding of abstract concepts through metaphor and metonym in the mental space. The ICM theory is concerned with how knowledge is organized and understood on the basis of bodily experience and imaginative capacity, and how concepts are organized into a structural model. According to Wang (2006), 'the ICM refers to an abstract, unified and idealized understanding of experience and knowledge in relation to a certain field, in a particular cultural context' (2006: 206, translation my own). The ICM theory has provided a hermeneutic, 'complex structured whole, a gestalt' (Lakoff 1987: 68). The word idealized means universality and adaptability; in other words, the ICM might not fit what is true of the world all the

time and 'one would need to allow background conditions to fit partially and to allow partial contradictions' (Lakoff 1987: 202). The ICM has become a prominent concept in the field of linguistics, and is used to analyze discourse coherence. Figure 4 below shows a panoramic view of the relations between the ICM and coherence in cognitive processing:

Reality →← interactive embodiment → image schema → categorization → conceptualization → meaning →← Language

     ↓ Sensation/perception/image ↓ metaphor/ metonym   ↓proposition/reasoning/inferencing

     ↓ Propositional model   ↓ CMs

               ↓ ICM

Origin of coherence	→ ← Global coherence	→ ← Local coherence
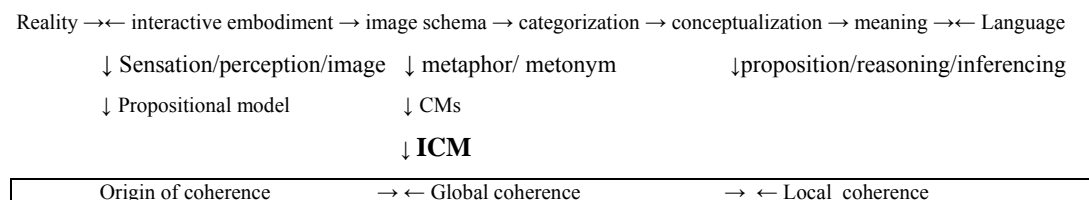
Figure 4 ICM and coherence in cognitive processing

According to Embodied Cognition theory, the cognitive process starts with interactive embodiment via sensation, perception and image leading to image schema – 'a recurring, dynamic pattern of our perceptual interactions and motor programs that gives coherence and structure to our experience' (Johnson 1987: xiv). The basic-level *concepts* which are directly grounded in our perception belong to the propositional model (Lakoff 1987: 285), in which the elements in the cognitive network are basic-level *concepts* – entities, actions, states, properties. Much of our knowledge structure is stored in the form of propositional models; the propositional/embodied *concepts* are the best elements for understanding, on the ground that they are actual mappings or projections of the external world, without the need for imagination to specify the elements, the properties, and the relations holding among the world affairs. The propositional model has the same structure as the properties of the elements and the relations linking the elements.

    To access more complex and abstract concepts, or rather the non-propositional/non-embodied concepts, metaphoric and metonymic processing is used to build up a model covering all the stored cognitive representations of all relevant knowledge, which belong to a certain field. This is how a cognitive model is built. A cognitive model comprises situations and contexts, helping to recognize ideas and objects, i.e.

categorization, and to build up a coherent unit of the relevant knowledge, relating to the ideas and objects, i.e. conceptualization. The relevant cognitive models will constitute an Idealized Cognitive Model (ICM), on the basis of which concepts and propositions are organized, and meaning or sense is made out of language. 'A proposition exists as a continuous, analog pattern of experience or understanding, with sufficient internal structure to permit inference' (Johnson 1987: 3).

The ICM, formed in the communicator's mind, helps to determine coherence via reasoning and inferenceing, in terms of three levels: origin of coherence, global and local coherence. Figure 4 shows how coherence is achieved in this embodied context. A communicator starts with his interaction with the reality – both physical and social environments. His direct and bodily experience helps him to access an optimal understanding of the embodied concepts, and this is where the origin of coherence takes place. His repeated bodily experience gives rise to mental structures of what is experienced – image-schema, in terms of frame and script. On the basis of his embodied experience, the communicator will carry on to understand more relevant abstract or non-embodied concepts. This is where global coherence takes place when he is processing a communication (see particular sections 2.3; 4.1; 4.6.3; 4.7 and 7.5). The ecological overall structure determines efficiency of cognitive processing by reasoning and inferencing, effectively facilitating the communicator. This is how local coherence takes place (see relevant sections 2.3; 4.6.3; 6.4 and 7.5). Figure 5 below shows a brief picture of an ICM structure and will be discussed in Section 4.2 in detail:
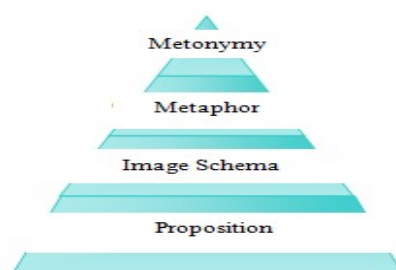
Figure 5 ICM structure

As discussed above, the ICM structure assumes that we get to know the world with

our eyes, noses, ears, and all of such sensory pathways. On the basis of our interactive and bodily experience we form actual mappings or projections of the external world without any need to employ imagination. In other words, when we have done something or have had bodily experience we will have a mental picture and then find it easy to remember, or give an account of what was going on. This leads to the actual *concepts*. The propositional model helps to specify elements, their properties and the relations holding among them. According to Lakoff (1987: 297) 'the things we feel we know best are those that can be most closely related to basic-level experience'. On the basis of this propositional model we have somewhat more abstract and generalized concepts, that is, the image schema, which is the interface between the physically embodied experience and the abstract concepts. This term, image schema, speaks for itself, in that it contains image on one hand and schema on the other. In other words, when we are doing things involving sensation and perception, we will have an essential impression of what is going on, and if we do it over and over again we will form a recurring and dynamic pattern of daily experience, that is, a schema, which also gives coherence and structure to our experience and discourse.

When we need to understand more abstract and rational concepts we will use analogy, or rather metaphors. For instance, we cannot see how electric current moves but we could compare it with water flow in some aspects. When we have sufficient understanding of something, one word will activate the entire cognitive network to make sense and build up coherence. This is one part standing for a whole, which is the metonymic model in the ICM. The non-propositional concepts are indirectly understood, requiring more mental effort for their activation.

In summary, the perceptual experience gives rise to the gestalt structure of the things; and the further we are from the perceptual bodily experience (the propositional *concepts*) the more abstracted (the non-propositional concepts) we are from the world, and the more effort we invest for understanding.

The ICM fits our perception and is reflected in our understanding discourse coherence. According to Lakoff (1987: 455) 'our perception and our mental images

are structured by image schemas and the schemas associated with lexical items are capable of fitting the schemas that structure our perceptions and images'. According to Wang (2006), in order to understand discourse coherence in relation to the ICM, interactive embodiment and mental coherence can be used as two basic principles. I will use these two principles as guides to explore discourse coherence in SI. Furthermore, I will investigate how the interpreter's mental effort reflects the textual structure, analyzed from the ICM perspective. Ultimately I will build up an ICM-based theoretical framework on coherence in SI.

4.1.1 Interactive embodiment

Embodiment: Embodied Cognition theory takes a primary position in both cognitive science and the philosophy of mind, emphasizing the role that the body plays in shaping the mind and believing that the nature of the human mind is largely determined by the form of the human body, that is, all aspects of cognition, such as ideas, thoughts, concepts, categories and understanding are shaped by aspects of the body. These aspects include the perceptual system, the intuitions that underlie the ability to move, activities and interactions with our environment.

According to Lakoff and Johnson (1999) the embodiment hypothesis entails that our conceptual structure and linguistic structures are shaped by the characteristics of our perceptual structures. According to Wang (2006: 288) embodied cognitive linguistics uses bodily experience as a starting point, conceptual structure and meaning as its research focus and employs cognitive models and knowledge structure for a unified cross-disciplinary linguistic description, aiming to reveal the cognitive patterns behind languages. Wang (2006: 288) asserts that embodiment is the corner stone for embodied cognitive linguistics, involving three questions: a) By what do we experience? b) What do we start experiencing? c) How do we experience? These three questions help to conceptualize not only the nature of embodied cognition relating to understanding but also the origin of coherence. a) By what do we experience? We experience the world by our body, sensation and perception. b) What

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do we start experiencing? It is space that we first start experiencing, including location, direction and movement. c) How do we experience? It is in an interactive way that we experience the world. These three points not only point to the origin of concepts but also of discourse coherence. In other words, cognition is built primarily on the basis of interactive embodiment and an understanding of space. The cognitive process proceeds from the near to the far, the specific to the abstract, the bodily and the spatial to the cognitive model, which facilitates understanding and prediction of communication.

To sum up, we use the cognitive process to learn about the world and its contents interactively, and make sense by categorizing, conceptualizing, reasoning and inferencing. At the time of perception and embodiment, body and space take the foremost positions, and then other basic cognitive representations of the world (cognitive models) are gradually formed, on the basis of interaction, giving rise to a variety of basic *concepts* and propositions, from which meaning is generated by inference and coherence is established.

Interaction: The interactionist view of embodied cognitive linguistics emphasizes the role of subjective initiative in understanding the world, and maintains that language is the outcome of subjective and objective interaction. Lakoff and Johnson (1999: 90) have expressed the idea of embodied organism-environment interaction – at the core of embodied cognition is our physical engagement with an environment in an ongoing series of interactions. Further, according to Lakoff and Johnson (1999: 90) 'here is a level of physical interaction in the world at which we have evolved to function very successfully, and an important part of our conceptual system is attuned to such functioning'.

Lakoff and Johnson (1999: 90) further discuss the relations between interaction and meaning: 'Meaning comes, not just from "internal" structures of the organism (the "subject"), not solely from "external" inputs (the "objects") but rather from recurring patterns of engagement between organism and environment'. Regarding the links among interaction, meaning and semantic representations, according to Langacker

(2008: 28) cognition is non-insular but rather grounded in perception and bodily experience. The skills and knowledge acquired are adjusted to the socio-cultural surroundings due to the fact that mental development is stimulated and guided by social interaction. In addition, the conceptualizations taking place in the brain are internal, but reach beyond the brain in that it conceptualizes certain facets of the world. Langacker points out that 'the *world* includes both the real world and the mental world we construct, as well as the body and even our mental experience itself to the extent that we can reflect on it, as opposed to merely undergoing it'.

de Beaugrande and Dressler (1981) put forward a procedural approach to discourse understanding by interactive embodiment, emphasizing that the reader has to turn to his or her own experience to activate relevant knowledge and make inference and interpret his/her reading according to the context. The role of the reader's experience in actively building the world of the text is crucial in procedural approaches (McCarthy 1991: 27). Based on his/her experience of the world and how states and events are characteristically manifested in the text, the reader has to activate relevant knowledge, constantly inferring and interpreting the current text in the light of the situation and the theme of the text. This is a mental coherence based process.

4.1.2 Mental coherence

Embodied cognitive linguistics maintains that discourse coherence can be explained plausibly from cognition. According to Givón (1990: 914) 'the grammatical devices that code referential coherence under various discourse conditions can be interpreted as mental processing instructions', implying that discourse coherence cannot be achieved by either cohesive devices or discourse structures but mainly by mental coherence or 'the coherence in mental text' (Givón 1995: 61).

As discussed in Section 2.2.1 de Beaugrande and Dressler (1981: 85, 88) assert that discourse generation and the apprehensive process should be explained by cognitive process and activation of relevant knowledge. McCarthy (1991: 27) also stresses 'making these cognitive links in the text' on the grounds that 'if we take a text which

is cohesive in the sense described above, we can see that a lot more mental work has to go on for the reader to make it coherent'. Ungerer and Shmid (1996) see situation and context from a cognitive perspective rather than the functional perspective taken by Halliday and Hasan (reviewed in Section 2.1). Situation refers to some state of affairs in the real world or the embodied interaction between objects in the real world; context is defined as 'the set of background assumptions that are necessary for an utterance to be intelligible' (Ungerer and Shmid 1996: 45), and as a mental representation associated with related knowledge stored in long-term memory.

Situation and context are indispensible in an Idealized Cognitive Model (ICM). As the introduction of this chapter explains, cognitive models comprise a variety of situations and contexts and are designed for categorization and conceptualization, and the relevant cognitive models will constitute an abstract, unified and idealized model of understanding knowledge relevant to a certain field, on the basis of the embodied experience and structure. Applying these concepts, Ungerer and Schmid have provided a sample case to illustrate how mental coherence is achieved via an ICM (1996: 48-49). The sentence which they used is as follows:

The boy was building a sandcastle with his bucket and his spade.

In this sentence the situation consists of four objects: *a boy, sandcastle, a bucket* and *spade*, and the four objects are linked, interacting through the activities of the *boy*. When the recipient processes this example sentence, s/he will evoke the corresponding cognitive categories through the words, and activate the mental conceptual links of the objects in the real world. In addition, the recipient forms cognitive representations of the interaction between the concepts; this is how the context is set up; *building a sandcastle* can be characterized as the context for the example sentence.

Each situation, context or its cognitive representation is not an isolated mental experience, but involves related bodily experience and knowledge stored in long-term memory. The recipient has access to context-specific knowledge about the relevant

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categories. For instance, the recipient will turn to the cognitive selection from *bucket* to *plastic bucket* as the most typical member of the context and from *spade* to *children's spade* as the most conventional member of the context-dependent category spade and so on. Meanwhile, the recipient will activate the immediate context from long-term memories via experiences about other aspects of sand and sand-castles, therefore, more concepts such as *water*, *hands*, *shells*, *turret* or *moat* and relevant corresponding interactions like *digging sand* and *shaping turrets* will also be activated for such related contexts.

In terms of a variety of phenomena, the recipient, through daily life experiences, has stored a large number of interrelated contexts. Cognitive categories involve not only the current context, in which they are immersed but also this whole bundle of contexts that are relevant to it, which is referred to as gestalt. In this way mental coherence is achieved via cognitive models.

According to Ungerer and Schmid (1996) cognitive models are open-ended. The context, *building a sand-castle*, can be set in the cognitive model *on the beach* and further extended into more contexts which are relevant and selective, as Figure 6 indicates. According to Ungerer and Schmid, cognitive models are interrelated. Figure 6 illustrates how the categories *people*, *sea*, *sand* and others thread through various contexts, which are put into the model - *On the Beach*:
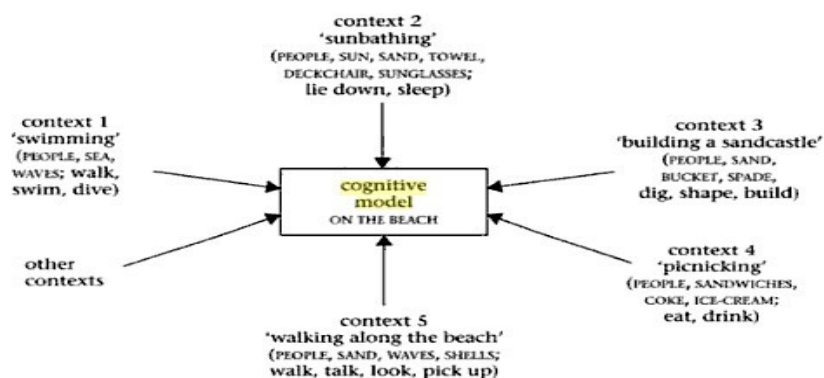
Figure 6 Schematic illustration of the cognitive model *on the beach* (Ungerer and Schmid 1996:48. Fig. 1.14)

The stored cognitive representations of *people*, *sea* and *sand* on this occasion are

closely related to the model *On the Beach*. Figure 7 below shows a network, where various cognitive models are linked through multiple connections:
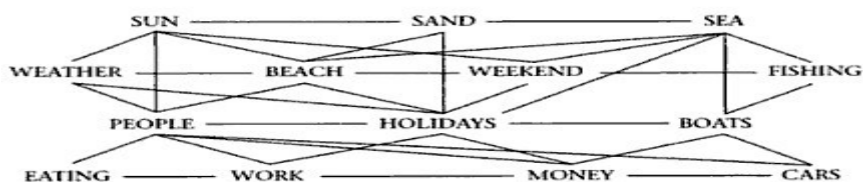
Figure 7 Exemplary network of the cognitive model (Ungerer and Schmid 1996: 49. Fig. 1.15)

According to Ungerer and Schmid, cognitive models are omnipresent. When meeting with a completely strange object, situation or new knowledge, we will call up our similar experiences as a cognitive model for making sense and building coherence. For example, the teacher of chemistry normally explains to his pupils the orbit model of the atom consisting of nucleus and electrons, by comparing the arrangement of nucleus and electrons with the interaction between the sun and the planets.

An ICM applies to an understanding of scientific knowledge. According to Lakoff (1987: 297-299), scientific theories are coherent with our basic-level perceptions; making sense of scientific knowledge largely depends on the technological extension of basic level conceptions. In other words, much of our technology is designed to expand basic level experience, such as telescope, microscope, photography, and television, which all extend basic-level perception in the visual domain. When scientific knowledge becomes part of our knowledge, it is like 'ordinary knowledge' (Lakoff 1987: 299). Scientific knowledge is also based on a basic-level understanding of experience. This cognitive process for comprehension of science and technology is open-ended, interrelated and omnipresent as discussed above. This point of view provides a more cognitive focus on how to understand scientific and technological matters to complement the view of the Interpretive Theory of translation (IT) (Section 3.2).

At this point, it is necessary to pick up the questions on the definition of knowledge, raised by Lakoff (1987: 297), and discussed in Section 3.5: 'What does it mean to

know something and how is knowledge possible?' Simply speaking, 'we get our basic knowledge of our immediate physical environments, from our basic-level interactions with the environment, through perceiving, touching, and manipulating'; the things we know best are 'those that can be closely related to our basic-level experience' (Lakoff, 1987: 297). This is the *concept* of knowledge, defined from the Experientialism perspective, different from any of the Objectivist theories reviewed in previous chapters.

To sum up, cognitive models are put together into an ICM, which gives rise to an abstract, unified and idealized understanding of the world, including science and technology, and discourse coherence. Therefore, in the process of understanding discourse, we will access embodied experience, the ICM and background knowledge for global coherence, which further determines the local coherence. The following section will give an account in detail of the constituents of the ICM.

4.2 The constituents of an ICM

The ICM is constructed on the basis of the four cognitive models (Lakoff, 1987: 68, 113, Wang 2006: 206) as Figure 4 above indicates: the propositional model, the image schematic model, the metaphoric model, and the metonymic model. The propositional model is objective in relation to the contents derived from embodied interaction with the environments and the other three are subjective in relation to their imaginative capacities for an abstract and unified understanding. The first two models are designed to explain the contents and foundation of the ICM while the latter two models are used as extensions of the ICM. All four models provide the orientation for this study.

4.2.1 The propositional model

The propositional model is the most fundamental among the four cognitive models and is developed on the basis of Minsky (1974) and Fillmore (1975, 1982, and 1985)

and the script theory of Schank and Abelson (1975), who all give an account of the propositional structure of the coherence of basic-level *concepts* (reviewed in Section 2.2.2). According to Lakoff (1987: 285) much of our knowledge structure is stored in the form of propositional models. The propositional model is defined as the actual mappings or projections of the external world; in this process, imagination is not needed to specify elements, the properties, and the relations holding among the world affairs. In other words, the propositional model has the same structure as the properties of the elements and the relations linking the elements.

The elements in the cognitive network may be either basic-level *concepts* – entities, actions, states, properties, etc. or they may be abstract concepts, indirectly grounded in bodily experience and characterized by cognitive models of other types.

4.2.2 The image schematic model

The image schema is formed via interactive embodiment with the objective world, by sensation, perception and image. Sensation and perception are based on the immediate on-line elements and properties. Image is the impression made in the mind without the presence of objective elements, in other words, the image of the elements and properties can be called up through imagination without any presence of the actual things. The mental process develops from image to schema. The schema refers to the conventional and cognitive structure processed and organized on the basis of experience and information, stored in long-term memory.

According to Lakoff and Johnson (1987: xix) the image schema is the conventional recurring pattern projected through embodied interaction with the objective reality and the image schema primarily has an abstract function. As the term suggests, image schema contains both image and schema. On one hand, image suggests dynamic, specific, and embodied mental representations (Fillmore, 1975: 123; Croft and Cruse, 2004: 44; Wang 2006: 175), on the other hand, schema suggests that it is not limited to a specific experience or activity and is focused on generalization, abstractness and convention of the image; it is not associated with the context and it is not conscious.

Therefore, the image schema helps to construe our bodily experience by analogy and also non-bodily experience by metaphor, and also by indefinite cognitive models, categories, concepts, meaning and mental coherence (Lakoff, 1987: 453, Wang 2006: 175). The propositional model and the image schematic model are primary models for the rest.

According to Lakoff (1987: 267) image schemas are relatively simple structures that constantly recur in our everyday bodily experience, giving coherence to our experience and discourse as well. Image schemas function primarily as abstract structures of images. According to Johnson (1987: xix) 'Human bodily movement, manipulation of objects, and perceptual interactions involve recurring patterns without which our experience would be chaotic and incomprehensible'. There are a range of properties of the schema (Lakoff 1987), but the most basic five are reviewed here as follows (Lakoff 1987: 272-275):

(1) The container schema: throughout our lives, we experience things both as containers and as things in containers. The internal structure of a container is inherently arranged in a way to generate a basic logic: everything is either inside or outside a container. The container has structural elements, such as exterior, interior, boundary, hierarchical and graded.

(2) The part-whole schema: throughout our lives, we experience things as wholes with parts. In order to get around in the world, the basic-level perception has evolved so as to tell apart the fundamental part-whole structure. This gives rise to structural elements: a whole, parts, and a configuration.

(3) The link schema: through bodily experience, things as string, rope, or any other means of connections are used to secure locations or two things related to one another. This leads to structural elements: two entities, A and B, and a link connecting them.

(4) The centre-periphery schema: the centres are more important than the peripheries, for instance, the heart versus hair, the root of a tree versus its trunk, showing the

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relations of structural elements in terms of an entity, a centre, and a periphery.

(5) The source-path-goal schema: throughout our lives, we experience departure places to start from, places to wind up at, sequences of next locations linking the starting to end points, and a direction. The term *destination* is used as opposed to goal when a specifically spatial end point is determined. This gives rise to the structural elements of a source (starting point), a destination (end point), a path (a sequence of adjoining locations linking the source and the destination), and a direction (toward the destination).

According to Lakoff (1987), image schemas provide particularly important support for the assumption that abstract reason is a matter of two things: a) reason based on bodily experience, and b) metaphorical projections from the concrete to abstract domains. The image schema theory is designed in such a way to explain not only how we perceive and organize the world cognitively but also how we establish discourse coherence and grammatical structure as well.

4.2.3 The metaphoric model

The metaphoric model involves mappings from a propositional or image-schematic model in one domain to a corresponding structure in another domain. This model is used for conceptualization, inference and understanding for a wider ranger of events, especially abstract concepts.

According to embodied cognitive linguistics, metaphors are conceptual, not linguistic. A metaphoric mapping involves a source domain and a target domain. The source domain is assumed to be structured by a propositional or image-schematic model. The mapping is typically partial; it maps the structure of an entity in the source domain onto a corresponding structure in the target domain. The metaphoric model serves as an inferential mechanism. Rather than one part of rhetoric, metaphor is fundamentally a cognitive process. It plays an important role in shaping categorization, conception, and inferencing. Metaphor is viewed as a cognitive tool and outcome; it is

not confined to the concept of similar comparison between two entities. According to Langacker (2008: 98) the term entity is defined as anything, including ideas and concepts, relations, quantities, sensations, changes, locations, dimensions, and so on. In metaphoric processing, a conceptual domain is mapped and projected into another conceptual domain by cognitive entities through inferencing, and different entities are linked to each other to access an understanding of the world and knowledge in question. In this way sense is made and coherence is established.

Metaphors are what we live by (Lakoff and Johnson 1980), and ubiquitous in science (Boyd 1993; Ungerer and Schmid 2001: 147). Metaphors have primarily been introduced not only for explanatory but also for constitutive purposes. With respect to the former, this appears true of most metaphors used in computer science. For instance, many user-friendly programs provide a surface screen which establishes a metaphorical link with the category of *office*. The screen is a *desktop* that can be tidied up; there are f*olders* to file items, a *clipboard* for items to be temporarily stored, *windows* to be opened and closed, and *trash bins* into which unnecessary items are dropped. With respect to the latter, constitutive purpose, according to Kuhn (1993: 538), there are fields of natural science where metaphors seem constitutive not just for popular or explanatory, but also for scientific models. As the example shows in Section 4.1.2, by virtue of the metaphor, the orbit model of the atom, consisting of nucleus and electrons, can be naturally explained by comparing the arrangement of nucleus and electrons with the interaction between the sun and the planets; the atom is a miniature solar system. The explanatory function of metaphors and their constitutive function in scientific theories are evident.

4.2.4 The metonymic model

According to Lakoff (1987: 41, 288) the metonymic model means that the part which is easy to perceive in the same cognitive domain is used to understand the whole or another part. For instance, a typical member in a category is used to explain the whole category. A metonymic mapping occurs within a single conceptual domain, which is

structured by an ICM. Given two elements, A and B, in the ICM, A may stand for B. The stand-for relation is represented structurally by a source-path-goal schema. If B is a category and A is member, or subcategory of B, the result is a metonymic category structure, i.e., A is a best example in the cognitive status, and referred to as metonymic prototype (for example, Shakespeare stands for literature). This metonymic model is not only comparable with discourse analysis in terms of the concept of inheritance and economy (de Beaugrande and Dressler 1981: 90-91, discussed in section 1.2.1) but also provides a framework for the two concepts.

At this point, a question is arising from the account of ICM constitutes: how does the propositional structure change into a non-propositional one to generate meaning and make sense? The answer is explained through the concepts of direct understanding, indirect understanding and compulsive force, according to Johnson (1987) and Lakoff (1987).

4.2.5 Direct understanding and indirect understanding

Johnson (1987: 2-4) gives an account of this by 'compulsive force' schema (1987: 2), which 'exists as a continuous, analog pattern of, or in, a particular experience or cognition' (1987: 3-4). He compares this compulsive force to the perception of a jet aeroplane being forced down the runway, and further to the understanding of forces acting on continental plates, and furthest, abstractly or metaphorically to the felt sense of being forced by peer pressure in competition. Johnson provides the figure as below to show his point:

Figure 8 Compulsive force (Johnson 1987: 2. Fig.1)

Figure 8 shows that meaning and understanding, concepts and propositions come from bodily experience (the solid arrow), and are processed through image schema

(bracket), and changed into abstract concepts through metaphorical and metonymic processing. Therefore, the cognitive processing has bodily experience as a compulsive force vector which leads to 'a more abstract pattern that can be manifested in rich images, perceptions, and events' (Johnson 1987: 2).

Lakoff (1987: 292-294) uses direct understanding and indirect understanding to describe this understanding process. Direct understanding requires characterizations of directly understood sentences and directly understood situations; the kinds of information experienced bodily and directly are more understood than those less and least experienced on the ground that some aspects of cognition are more prominent and salient than others:

- A sentence is directly understood if the *concepts* associated with it are directly meaningful.
- Aspects of particular situation are directly experienced if they play a causal role in the experience. For instance, one could not directly experience everything in the room s/he is sitting in: the chair is put together by glue; s/he directly experiences the chair but not the glue. The chair plays a causal role in his/her experience. The glue's causal role involves the chair, but not his/her direct experience of the chair. It also shows that some aspects of cognition are more prominent and salient than others.
- An aspect of a directly experienced situation is directly understood if it is pre-conceptually structured.

Lakoff (1987: 294) concludes that the direct understanding of the sentence accords with the direct understanding of the situation via basic perceptions. However, sentences and situations are not all understood directly. Indirect understanding of sentences and situations is more difficult and needs more explanation. Metaphors are used to understand abstract thoughts and knowledge, but more research is needed to give a full account of how we understand situations indirectly

In summary, the propositional, image schematic, metaphorical and metonymical models are used to analyze how information is processed so as to make sense, and

build up coherence. A further question is arising from this stage: what properties does an ICM have in processing a chunk of discourse so as to build up coherence? And further what underlies these properties?

4.2.6 Five properties of an ICM

The ICM is the cognitive process of categorizing information, characterized by five properties, respectively (1) idealization, (see Section 4.1), (2) fuzziness, (3) gestalt, (4) hierarchy, and (5) gradience. The five properties of an ICM are reflected in processing the structure of texts.

Fuzziness: the cognitive boundaries of neighboring categories are not separated by rigid boundaries, but merge into each other (Ungerer and Schmid 1996: 19); in the case of a graded category, concepts of different categories merge into each other (Lakoff 1987: 454). The cognitive model is idealized in that the basic level categories have fuzzy boundaries centred on their best examples – prototypes. According to the ICM theory the discrete and homogeneous categories can be established by an act of definition, classifying things or concepts according to their established natural relationship, i.e. taxonomies. According to Ungerer and Schmid (1996: 83) even if ordinary taxonomies are inconsistent, they can be set up by an act of definition, by consciously selecting one or several attributes which are established as salient.

Gestalt: according to Lakoff and Johnson (1980), Lakoff (1987: 489-490), categorization has two stages: perceiving an object or event as a whole is the first step, and decomposing the perceived whole into individual properties or attributes is a second step. Such a gestalt can be represented by an ICM. The ICM is understood as being psychologically simpler and more entire than its parts, hence the term gestalt.

Hierarchy: the cognitive categorization of the knowledge of the world is divided into up-down classes (Ungerer and Schmid 1996: 61). According to Langacker (2008: 207) 'Constituency is observed in symbolic assemblies when a composite structure at one level of organization functions in turn as component structure with respect to a higher

level'. There is hierarchical organization in every area of human cognitive functioning, in perceptual grouping, in the apprehension of whole-part hierarchies, including the mental analysis of discourse.

Gradience: Most cognitive categories are matters of degree, with graded concepts characterizing degrees along some scale with different layers in structure. The cognitive model characterizing a concept contains a scale (Lakoff, 1987).

At this point, following questions arise: how does the ICM work in cognitive processing to help to establish coherence? How is the structure of an entity in the source domain mapped onto a corresponding structure in the target domain for making sense? The answer is Mental Space Blending theory.

4. 3 The ICM in cognition: Mental Space Blending Theory

The Mental Space Blending theory (Fauconnier 1985, 1994; Fauconnier and Turner 2002) is used to explain discourse construal and coherence. Fauconnier put forward Mental Space theory in 1985, aiming to find out how utterances activate the semantic frames, how representations and the reality-based knowledge space is related, how language is connected in different spaces, and how knowledge floats in the different spaces. Fauconnier and Turner (2002) developed the Mental Space theory into Mental Space Blending theory or Blended Space Theory. The Mental Space Blending theory sees language as a series of complicated cognitive processing triggers, which gives rise to generation of meanings and coherence. This theory explores the way cognition works in processing information in communication. Figure 9 below shows that the Blended Space theory postulates four spaces: two input spaces, one generic space, and one blended space. The cognitive entities process the selected pieces of information from the two input spaces and these are matched in generic space and projected into blended space. The generic space contains all shared frame structures to ensure the mappings or projections needed to process without any effort. The blended space accesses the corresponding links with those from the two input spaces and further integrates the relevant events into a more complicated and unified structure:

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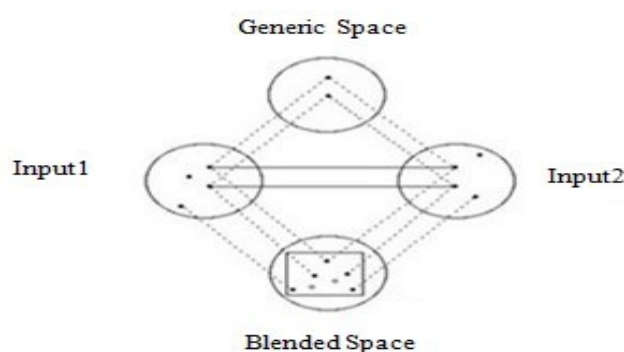
Figure 9 Mental Space Blending (Fauconnier and Turner 2002: 7. Fig.3)

The blended space is the platform where the internally linked spaces are organized and developed. Inside blended space is the emergent structure, from which can be produced new information and meanings, and emerging knowledge, which is not available in the previous input spaces. The four mental spaces are linked to each other through a series of mappings and projections, and further constitute a Conceptual Integration Network (CIN). Language is the outcome of concept blending. For instance, to make sense of the notion of electric current, the embodied knowledge on water flow in the pipe, stored in the source space (input 1), is projected into the target space (input 2), where the non-embodied concept of electric current is contained. The shared elements between the two concepts are linked in the generic space, and a derived understanding of the term, electric current, is attained in blending their comparable features.

The Mental Space Blending theory is designed to construe mental processing spaces for understanding. The mental spaces of inputs 1 and 2 can also be used to represent communicators, who apply their ICM – assumptions about the given context in the generic space, and process the current information in the blended space. The ICM consisting of contexts and pragmatic elements, such as roles, motivations, purposes, attitudes, and relations of participants in the generic space, are all involved to generate sentences and utterances with the proper concepts and meaning in the blended space. I argue that the blended space plays a role of reactor in the chemical-

change-like cognitive process. The raw material (interactive embodiment) and semi-raw material (image schema) are initially stored in the generic space, and the local coherence elements, concepts and propositions are reacted via inferencing in the blending reactor of the whole plant, and finally conveyed into the output. For this viewpoint, an exemplary case is provided in Section 7.1, Figure 23.

At this point, this study uses the Immersed Experiencer Frame (IEF, Zwaan 2004, 2005) to explain further how the blending space functions to achieve discourse coherence.

4.4 The ICM in discourse: Immersed Experiencer Frame (IEF)

Zwaan (2000, 2004, and 2005) has built up the Immersed Experiencer Frame (IEF) model for language comprehension and coherence. IEF is based on embodied cognitive linguistics, and centres on interactive embodiment to comprehend the process of discourse construction. According to IEF, in order to establish coherence the situational representations are simulated, renewed and retrieved in a continuous cyclical way, in processing the text. IEF sees apprehension of language input as indexing clues and representations of bodily experience via meshing and sequence tracing. Meshing means the process of associating words and phrases in terms of the potentially interactive relations between the body and the objective matters to constitute a coherent action model. For instance, the word chair suggests its purpose of a seat on which one sits. To the comprehender, language is a set of clues to help to simulate what is experienced in the sense of context. The comprehender is an immersed experiencer.

IEF separates the comprehension process into three basic elements: activation, construal and integration. The three elements correspond to linguistic categories in three processing units: (1) language processing unit, (2) representation unit and (3) reference unit. This is illustrated in Table 1:

Table 1 The three elements corresponding to the language in three units

3 elements / 3 units	Activation	Construal	Integration
Language processing	Word/phoneme	Clauses /Intonation	Discourse
Representation	Functional web	Meshing net	Sequencing web
Reference	Object and action	Events	Events sequence

According to Zwaan (2004, 2005) the processing of the three elements does not take place sequentially but in parallel, to a large extent; however, given the purpose of operational research, cognitive processing is divided into the three stages as Table 1 shows.

The following section will move on to the way the three elements correspond to three units of a language and particularly how coherence is established.

4.4.1 Activation

Input words will activate the functional web. In other words, this functional web is activated when the words are associated with the referents. The functional web spreads through the whole cerebral cortex, accessing the preliminary sensory zone. Therefore, the initial activation is dispersive and the activated functional web is multi-overlapping, in other words, the word will not only activate its own experience (for instance, the word, chair suggests its purpose for seat in sense of audio-visual experience) but also any relevant experience of the referent (for instance, the chair is used as a weapon to beat someone, involving the audio-visual and touch experience). In short, language input activates the traces and reconstructs the experience model.

4.4.2 Construal

Construal is the multi-functional web meshing process for the psychological simulation of a specific event. The grammatical unit in the construal operation involves the intonation. Zwaan sees language comprehension as attention adjustment for the events in question. In the construal, the representations of events are generated

through the initial activation of functional web. Construal is an immediate and compounding process.

Every construal comprises a time frame and a space frame for processing in the brain. In the time frame is a perspective. Normally perspective means the perception of the protagonist. Every construal also includes focal entity and relational background entity, and the entities might have explicit features. Therefore, entities, time, space, perspective, and features constitute the elements of construal.

4.4.3 Integration

Once a representation of an event is construed, the mental process moves on to the next one. The previous relevant construed element will be turned into a part of working memory, and affect the current construal along with the functional web activated by the current words. Integration means transfer from one construal to another. IEF assumes that the transfers are based on bodily experience.

Zwaan draws on Langacker's attention frames (Section 4.7.3) for language comprehension and coherence, and views language as attention control for what is described of the event. Therefore the match between language and experience, the prospective and retrospective degree of matching, prediction and coherence indexing clues on the basis of the ICM will all affect the integration from the beginning to the end.

Zwaan speculates that input words would activate the functional web based on the communicator's bodily experience. His Immersed Experiencer Framework (IEF) shows a speculative but plausible scenario for mental processing in language comprehension, to illustrate a possible mechanism for this theory. This research will provide some supporting evidence, by using his IEF for the experimental framework.

At this point, I review the theory of the cognitive world theory proposed by Wang (2006), on the grounds that this theory attempts to make the ICM more complete in analyzing discourse coherence.

4.4.4 The ICM+ Background knowledge = Cognitive World

On the basis of Lakoff (1987, 1989, and 1999), Wang puts forward his Cognitive World theory to present a complete picture for discourse coherence, which is separated into the following two parts (2006: 360-361):

(1) The Idealized Cognitive Model (ICM). The ICM is bodily experience based, which leads to an understanding of discourse coherence in that discourse coherence primarily depends on embodied perception and recognition of the reality. Knowledge contained in an ICM is conventional and prototypical, setting up a framework for discourse coherence.

(2) Background knowledge: this refers to unconventional and specific knowledge, not necessarily universal or representative, either mutually shared knowledgeable or acquired through the on-line and immediate communication, changeable and dynamic in a specific context to compensate and confirm, or adjust, modify and even change both the communicators' assumed knowledge and the course of the current communication.

The Cognitive World theory attempts to explain discourse coherence on the basis of the conventional (ICM) and background knowledge. Wang refers his Cognitive World to general knowledge, acquired via interactive embodiment, internalized and stored in mind and background knowledge, either shared or accessed from the current discourse. According to Wang (2006: 360) this Cognitive World theory is consistent and plausible and it is the pre-requisite for discourse coherence. When the information in question is activated in the mind, a consistent and plausible cognitive world is recalled correspondingly via both the ICM and background knowledge so as to make sense of the discourse and establish coherence.

   In a communication, coherence depends primarily on the access to the Cognitive World: ICM + background knowledge. Conventionalized phenomena and prominent information will stand more chance of being activated, becoming topics, and also will narrow the scope of concepts to be activated. In other words, concepts which might be activated are on different levels in terms of salience: the concepts at frontier and

remote levels are less likely to be activated than those at a prominent level. In addition, communication has complex scenarios due to the fact that it is changing all the time, not always predictable, so the background knowledge is used for the unexpected discourse.

Wang's Cognitive World theory echoes the findings on the analysis of discourse flow (Bartlett 1932; Chafe 1986): the discourse navigation process is often guided by a schema, some familiar pattern that provides a path for a speaker to follow. It may also be driven, alternatively or simultaneously, by the less predictable interaction between conversational participants (Chafe 1994: 120-36).

At this point, the descriptions of the ICM above point to the question: exactly how does the ICM play its role in achieving coherence in discourse?

4.5 The role of the ICM in achieving coherence

Three roles of the ICM are summarized: 1) activating the cognitive world to fill in the missing links, 2) mapping iconicity, and 3) achieving local coherence.

4.5.1 Activating the cognitive world to fill in the missing links

Knowing more than one is told is a characteristic of human communication (Lindsay 1963: 219). When looking at an object, we cannot see its back surface, but we can use our ICM to guess what it is like and we are sure of our guesswork. This phenomenon is referred to as default values. In other words, default values are 'values for a slot that are used if no specific contextual information is supplied' (Lakoff 1987; 116), (for instance, frames and scripts are equipped with default values, reviewed in Section 2.2.2). Communicators cannot normally deliver their ideas as fully as it is, they will have to make selection out of the whole information and express it mostly in verbal form. In other words, the listener turns to his cognitive world to access relevant information by activating some elements of the utterances, and further understand the whole discourse. The default values also show the feature of metonymy/economy in

communication (Section 2.2.1), in that utterances connote more information than the literal meaning and default values help the listener to construct cognitive models for understanding discourse and access various coherence clues.

Discourse coherence relies on the cognitive world – the ICM and background knowledge. For instance, when a certain word activates a certain frame and script, the relevant information is retrieved to supply the default values to access the whole discourse meaning. As discussed above, the amount of information expressed by language is less than that required of communication; communicators put linguistic forms into a given cognitive world for mental processing and compensate for what is lost out of the default information through activation of the cognitive world to maintain introspective and retrospective bridging for coherence.

According to Wang (2006), although apparently irrelevant on the surface, some utterances are linked mentally to form an integral semantic whole. In other words, the utterances have different degree of omission in communication due to the principle of language metonym and economy. Take Widdowson's case (1979: 96) for an instance:

A: Can you go to Edinburgh tomorrow?

B: B.E.A. pilots are on strike.

The two utterances are linked by activation of an ICM as Figure 10 shows below:
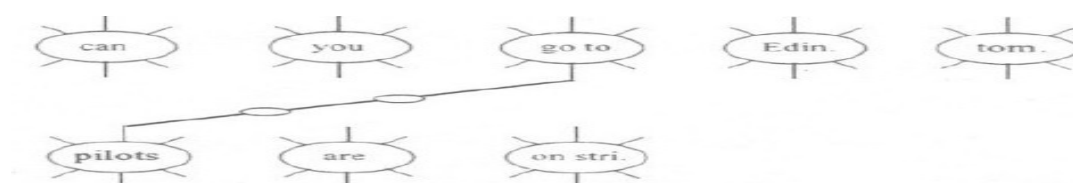
Figure 10 Activating the cognitive world and filling in missing links (Widdowson 1979; 96. Fig 1)

The verb *go* uttered by Speaker A might activate an ICM, relevant to *go*: either on foot or by transport vehicles, such as coach, train or airplane. The word *pilots* uttered by Speaker B might activate an ICM of flight. Between *go to* and *pilots* are two small circles, indicating the default values to achieve links, that is, *transport* and *aeroplane*,

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the two utterances are connected by mental coherence. According to Widdowson, Speaker A will get at the meaning of Speaker B through inferencing: a) Pilots are on strike and aeroplanes stop taking off, and/or b) aeroplanes stop taking off, B could not go to Edinburgh tomorrow. In terms of default values in neighbouring utterances, more default values mean more mental effort. In this case, coherence is affected negatively, giving rise to incoherent or unintelligible utterances. According to Wang (2006: 367), theoretically any word in a clause may activate any information relevant to the cognitive world and turn out to be a starting point for the following utterances to achieve discourse coherence. Due to the fact that communication is restricted to the existing ICM in the communicator's mind, and social, cultural and experiential contexts and situations, some items of information are more prominent and salient, and tend to be more easily activated than others. Based on the notion of salient/prominent information, this study classifies different levels of concepts in the source text into sections including embodied, semi-embodied and non-embodied knowledge. Further, within each section, concepts in Subsection A are assumed to be more salient than those in Subsection B (see Section 5.2). This role of activating the cognitive world can be further explained by the iconicity theory.

4.5.2 Mapping iconicity

The ICM gives rises to iconicity: similarities between the structure of language and the structure of the world (Ungerer and Schmid 2001: 251). Iconicity plays the role of reference for both the objective world and language structures, including world structure, conceptual structure and embodied experiential structure. According to Wang (2006: 544-562), when a kind of mapping similarity between objective externals and mental internals is matched, the discourse coherence will emerge automatically in the chunk of discourse or a group of sentences; this is iconicity. According to Sperber and Wilson (1986), iconicity helps communicators to access the desired maximum relevance in the current utterances, serving the requirement of

cognition processing: 'the greater the processing effort, the lower the relevance' and vice versa (1986: 124). Sperber and Wilson (2001: F32) argue that coherence mostly depends on relevance; only relevant utterances can be coherent. This is further discussed in Section 8.6.6.

The cognitive process is imprinted in natural language forms and structures the former (cognition) is reflected in the latter (language) like the trees reflected in the pond nearby, but the reflective process is more active and more kinetic rather than passive and static. Iconicity, from an embodied cognitive linguistics perspective, stresses that language forms are outcomes of a variety of external and internal integrations of embodiment, cognition, semantics and pragmatics; 'as a primary instrument of thought and communication, language is grounded in both cognition and social interaction' (Langacker 2001: 261). Sperber and Wilson (1986: 227) have made these thought-provoking remarks on iconicity: 'in appropriate conditions, any natural or artificial phenomenon in the world can be used as a representation of some other phenomenon which it resembles in some respects'. On the basis of this, they have concluded that 'Utterances can be used as representations in another way, too: not in virtue of resembling some phenomenon, but in virtue of having a propositional form which is true of some actual or conceivable state of affairs'.

Regarding the research into iconicity, this study will focus on iconic sequencing similarity between language sequence and the thinking process. Several previous experiments on sequencing iconicity have been carried out. For instance, Clark and Clark (1968), from their experiment, concluded that information, organized according to natural language sequence, is easier to remember. The data of Smith and Mclin (1970) showed that subjects tend to analyze and store events according to the natural sequence. The principle of iconic sequencing is confirmed by the experimental data. Sentences, which are organized according to natural sequence or the storage process, are easier to retrieve relevant information from, in that it takes less cognitive process. On the other hand, when sentence sequences go against the natural action sequence, the sequential information will not be accessed straightforwardly from memory

because it has difficulty in converting the language sequence to a different time sequence, and it also requires more mental effort invested in time and inference. In addition, the unmatched sequences will give rise to errors or misunderstanding of action or event sequence.

In summary, this section has explained how the ICM-based cognitive framework helps to understand a stretch of discourse, in that the mental structures in the form of mappings or projections give rise to global coherence, and further to local coherence as reasoning and inferencing are brought into play in the context.

4.5.3 Determining local coherence

In order to explain how local coherence is achieved, two linguistic terms are discussed here: bridging reference and bridging inference. Bridging means connecting or reducing the distance between concepts. Bridging reference (Clark 1977) refers to the cognitive and pragmatic process in determining the referents or antecedents through inferencing. Bridging inference is the process to associate the referents or antecedents for pragmatic interpretation. Examples are cited for the two terms (He and Ran 2006: 490):

I went into *the room*. *The window* was open.

We can understand these two sentences by bridging reference: the narrator entered into *the room*, *that room's window* (referent) was open. In this way, the concepts in the two clauses are linked by expending a little mental effort. Another example is taken for bridging inference (He and Ran 2006: 488):

I met *a man* yesterday. *The nasty fellow* stole all my money.

There are no syntactic or semantic links between *a man* and *the nasty fellow*; their association is built through inferencing the particular context, investing a little more mental effort than the case above. Coherence building is proportional to cognitive

distance: the closer the cognitive distance in bridging the concepts in pairing utterances, the shorter the time to trace the propositional references.

4.6 ICM-based methodology

So far, this research has provided the ICM theory relevant to coherence from a top-down approach, i.e. comprehension of the topic from the larger units of relevant general description – from a global to local perspective. The following sections will deal with the method for discourse coherence, from a bottom-up perspective, to show how the coherence is realized, or rather materialized in the discourse. Bottom-up processing means employment of smaller units to fit in the frame of larger units, i.e. from local to global. There are three ICM-based methods, derived from Langacker's cognitive grammar (2008), including (1) Cognitive Reference Point (CRP), (2) Trajector-Landmark, (3) Current Discourse Space (CDS), all of which are used as tools for tracking coherence clues in data (Section 5.6).

4.6.1 Cognitive Reference Point (CRP)

According to the centre-periphery schema explained in Section 4.2.2, our bodily experience tells us to locate the control centres not only in daily life but also in discourse. According to Langacker (2008: 64), the Reference Point Principle is a fundamental cognitive ability, universally existent in life experience all the time. The world is conceived as being populated by countless objects of diverse characteristics. Langacker takes salience of stars in the night-time sky as illustration: some stars are immediately apparent to the viewer, while others become apparent only if special efforts are made for this purpose. That is, if the viewer knows that a non-salient object lies near a salient one, he can find it by directing his attention to the latter and searching in its vicinity. This common sense can be used for Reference Point Principle as Figure 11 shows below:
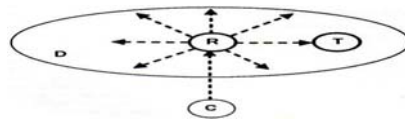
Figure 11 Reference point relations (C: conceptualizer. R: reference point. D: domain T: target. Langacker 2008: 64. Fig. 3.14.)

In the cognitive world are numerous mental entities and concepts, where once one concept in the cognitive world is determined a corresponding domain is laid out. According to Langacker (2001: 21), to establish a mental contact (dotted lines in the diagram above), a cognitive reference point (CRP) is initially located, and further the domain is narrowed to access a concept (target). In linguistic terms, normally once a descriptive scope is determined, the cognition processing moves to the contents inside. This theory is applied to analyze coherence in discourse. In terms of a chunk of discourse, a theme is determined as a reference point, serving as a central control. A discourse or a chunk of utterances, either spoken or written, will focus on one or more than one theme to achieve the central role.

4.6.2 Trajector and landmark

In addition to the centre-periphery schema, the source-path-goal schema and the link schema (explained in Section 4.2.2) give rise to the trajector and landmark. Cognitive reference point (CRP) is further reduced into trajector (tr.) and landmark (lm.) to analyze individual utterances/clauses. According to Langacker (2008: 70), as we profile a relationship of participants, we start looking for the most prominent and salient ones. The most prominent participant is called the *trajector* (tr.), which is the entity construed as being located, evaluated, or described. It can be characterized as the primary focus within the profiled relationship. Often some other participant is made prominent as a secondary focus; this is called a *landmark* (lm.). For instance (Langacker 2008: 211):

a) Alice *(tr)* → admires Bill *(lm);*   b) near *(tr)* the door *(lm)*.

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He concludes that expressions can have the same content, and profile the same relationship, but differ in meaning because they make different choices of trajectors and landmarks. In Figure 12 as below, trajectors and landmarks in clause and utterance (Langacker 2008) are illustrated. Figure 12a shows an utterance, in which point A represents a trajector (tr.), normally acting as the subject in the sentence for its primary focus and B, the landmark (lm.), as predicate for its secondary focus. Figure 12b and 12c represent a chunk of utterances where trajectors and landmarks are processed in a linear and constant form:

Figure 12a
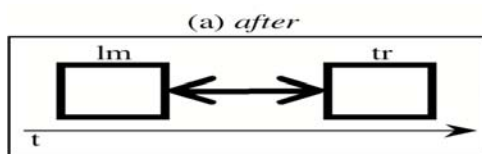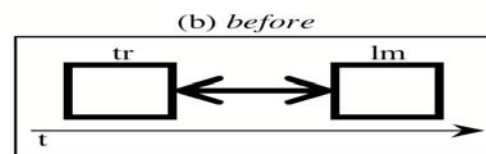
Figure 12b   Figure 12c

Figure 12 Trajector and landmark in clause and utterance (Langacker 2008:72. Fig.3; 10)

However, according to Langacker (2000: 331, 359; 2008: 68-69) an expression structure is a cognitive construal, mental focus or prominent concept rather than logical or grammatical elements that are involved in analyzing the discourse. In other words, mediating the shift in profiling a discourse is a cognitive domain by establishing some connections between and among the entities. During this cognitive processing, metonymy (Section 4.2.4) makes itself felt due to the fact that 'A single expression is susceptible to any number of metonymic extensions, reflecting different associations' (Langacker 2008: 69). Langacker uses this theory to analyze the individual utterances/clauses from a cognitive perspective and shed a cognitive light on the formalist sentence patterns.

In summary, cognitive reference point (CRP), trajector and landmark are used as coherence clues. The application of these concepts will be laid out in Chapter 5 and combined with current discourse space for analysis of discourse coherence

4.6.3 Current Discourse Space (CDS)

According to Langacker (2001; 2008) a discourse, consisting of series of utterances, developing in linear form, provides new information by completing and regenerating the ICM and supplementing background knowledge. The discourse semantic flow is in constant dynamic cognitive motion, which determines dynamic strategy for discourse analysis. Based on this concept, Langacker (2001) has put forward the concept of CDS for discourse analysis. A clause in actual discourse corresponds to a space in the mind; each mind space represents the scene and action, in which the recipient is involved on the special occasion. Accordingly, an actual discourse consists of continuous spaces, which clauses are fitted into. With actual discourse developing linearly, in a forward direction, mind spaces keep renewing as Figure 13 shows below:
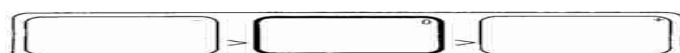
Figure 13 A brief overview of CDS (Langacker 2001: 18. Fig.1)

When the listener follows the Speaker's output in linear form, he will find new information coming out and into the given information. According to Langacker, individual utterance corresponds to mind space and new information, with clause as unit, enters into the mind space for processing, so the visual space could be separated into three discourse frames according to time sequence as Figure 13 above shows: a minus frame, corresponding to input, in the middle CDS and being processed or renewed, is the focus frame, or zero frame; a third is called the plus frame. The focal information, once processed as discourse develops, will turn out to be given

information. With continuous utterances being renewed, the listener will follow the information from the minus frame to the current zero frame, via integration and store the complete information in memory. In the light of the cognition-based time experience, Langacker proposes the CDS flow process as a dynamic description of discourse coherence. A chain of trajectors and landmarks as a unit enter into the zero frames for processing, and once the process is finished, each will flow into the plus frame as given information and thus utterances in minus frame will follow into the current space, in an introspective and retrospective process.

Langacker's concept of Current Discourse Space (CDS) shares the view of conceptual activation of Chafe (1987/1994: 25) on discourse analysis. Chafe classifies his concept of conceptual activation into three forms: an active concept, a semi-active concept, an inactive concept. An active concept refers to the information in the focus, which is being processed. A semi-active concept refers to a concept between the activated and the inactivated status, stored on the brink of consciousness, which is available in the short-term memory. An inactive concept refers to a concept, which is out of focus and beyond the brink of consciousness, stored in the long-term memory. According to Chafe, when a discourse is generated, a given concept is chosen as the starting point in order to elicit the new and inactive information, which will enter into the focus to be activated. As the discourse develops, more information will enter into the active focus. However, due to the limitation of the capacity of memory storage, some of the given information will be reduced into semi-active status, and finally move out of the active status. The interpretation of discourse proceeds in this sequential order as an introspective and retrospective process.

Up to this point, this chapter has provided a whole picture of the ICM. Philosophically and fundamentally, the ICM, derived from Embodied Cognition theory, emphasizes the interactive embodiment approach to mental coherence in analyzing discourse coherence. According to the ICM theory, our best understanding is the embodied *concepts*, i.e. the direct understanding while non-embodied concepts involve more mental effort for processing. Interactive embodiment is used as platform

for analyzing coherence of discourse. The distinction of the different layers of propositional *concepts* and non-propositional concepts, direct and indirect understanding, is used as guidance to classify the test material in terms of the textual structure. The ICM plays a crucial role in helping to achieve discourse coherence, activating the cognitive world and filling in missing links.

4.7 Summary of the underlying theoretical framework of this research

At this point, it is necessary to show how all the key elements of these models, theories or approaches, reviewed in Chapters 1, 2 and 3 are related to one another, and fitted into the ICM-based theoretical framework. The puzzle for a reader might be that this theoretical framework is complex, involving several subject areas with diverse and apparently competing theories. Although this concern might be justified, the nature of interpreting studies requires an exploration by *convergence*, an interdisciplinary approach (Pöchhacker 2004; Munday 2006) inevitably making the research into interpreting more complex. Pöchhacker (2004: 197) points out that the study of interpreting is becoming increasingly convergent and researchers should be encouraged to forge interdisciplinary ties with other fields like cognitive psychology and neurophysiology, while maintaining a sense of identity for their own field. The study of interpreting is a small and specialized field, at an early stage in its institutional development; growth is initially a matter of growing together rather than growing apart. The construction of an interdisciplinary methodology is not straightforward (Munday 2006: 189), in that a wide range of subject areas with different theories, models and approaches has to be applied to explain interpreting phenomena.

Following the concern above, more specific confusions might arise: how is the origin of coherence, related to global and local coherence for an interpreter? How are the cognitive and textual coherence linked with this methodology to be adopted? How does the interpreter control her EVS/synchronicity? In what ways do the techniques of SI benefit from the presence of the ICM? To summarize these issues, I

use a graphic representation, Figure 14 below, illustrating how this integrated model is formulated to explain how coherence is achieved in the embodied context:
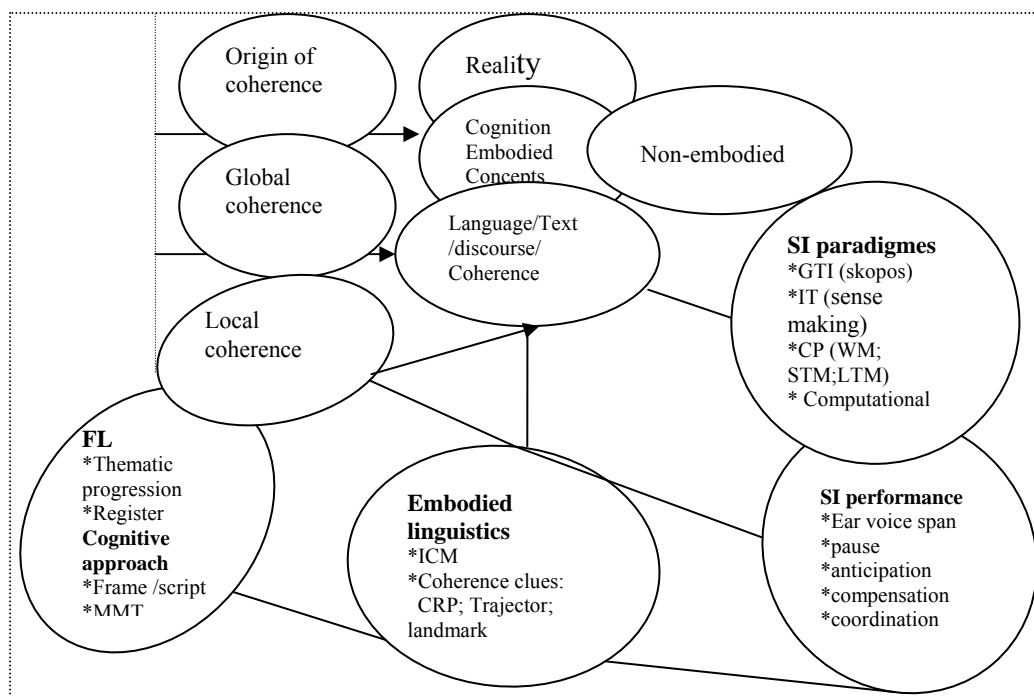
Figure 14 An integrated map of the theoretical framework

An interpreter starts with her interaction with the reality – both physical and social environments in which she is engaged for her interpreting task. This existing direct, bodily experience helps her to access embodied concepts to the best of her understanding. This is where the origin of coherence takes place, and her bodily experience gives rise to mental structures of what is experienced – image-schema, in terms of frame and script. On the basis of her embodied experience, the interpreter will carry on to understand more relevant abstract or non-embodied concepts. This is where global coherence takes place when she is interpreting. The overall ecological structure of thought and knowledge determines the interpreter's efficiency of cognitive processing through working memory, facilitating the interpreter in managing her EVS, anticipating the forthcoming information, making a final, appropriate choice of the message (judgment), using contextual or topical knowledge to summarize (compensating), and dividing attention (coordinating), as discussed in

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Chapter 1. This is how local coherence takes place. The ICM provides a platform for functionalist linguistic theory (reviewed in Chapter 2), and the SI paradigm (reviewed in Chapter 3). Functional linguistics focuses on the textual structure, adopting notions of theme, rheme and thematic progression to study the coherence of a text; embodied cognitive linguistics provides a cognitive approach to analysis of a discourse, from a user's perspective. The embodied methods of achieving coherence (CDS, CRP, trajector and landmark) are complementary to those described by functional linguistics. The SI paradigms have contributed some constructive work to coherence in SI, but their problem is that they have not got down to the core of the issue of understanding and coherence-building process: it is bodily experience that underlines cognition, and gives rise to coherence in text and discourse. (I will use *text* for analyzing coherence of written or oral material and *discourse* for coherence from the user's perspective).

The immersed Experiencer Frame (IEF) has suggested the procedures for an interpreter to achieve discourse coherence − activation, construal and integration − which will be used as the framework for the experimental procedures. The ICM-based concepts, CRP, CDS, trajector and landmark are used as makers to trace the coherence clues achieved by the interpreter. In terms of the text, tools based on functional linguistics, such as theme, rheme, and thematic progression, are used to analyze local coherence in the form of textual structure.

4.8 Concluding remarks

So far, all the elements discussed in Chapters 1, 2 and 3 have been put into the ICM-based framework, but a transitional, fundamental question occurs: 'how to make the ICM work for the purpose of empirical description and assessment of knowledge use in comprehension?' (Pöchhacker 1992: 94; reviewed in Chapter 3). In other words, how is the ICM, the interactive embodied approach to coherence, applied to SI? And how is the ICM used to analyze the interpreter's mental effort? In the following chapter, I will combine theories relating to the ICM and SI to design the method.

Chapter 5 Method

This study aims to investigate coherence in SI from an ICM perspective, by observing two points: a) the role of the interpreter's relevant bodily experience in helping her to achieve coherence in the source text (ST) and target text (TT); b) the interpreter's mental effort, expended in achieving coherence, reflecting the textual structure of the source text (ST). The principle of the methodology is based on the ICM overview of discourse analysis – the interpreter's exposure to interactive embodiment is the cornerstone for her to achieve coherence, and influences her mental effort in interpreting. The method is designed to address the two points, by formulating two relevant research questions and positing the hypothesis in Section 5.1.

In order to answer these questions, the theoretical framework constructed in the previous chapters is applied to set up the method of the experimental sections. To examine the role of the interpreter's interactive embodiment in helping her to achieve coherence, a test material which in some of its aspects engages the subjects in personal bodily experience was devised (Section 5.2), involving the interpretation of a demonstration of a shiatsu device. Thirty selected subjects were divided into experimental group and control group for the comparison; the former underwent the bodily experience of installing the shiatsu massager, whereas the control group did not (Section 5.3). The experimental procedures (Section 5.4) are designed on the basis of the Immersed Experiencer Frame (IEF) (reviewed in Section 4.5), which separates cognitive processing into four sequential stages: (1) accessing previous bodily experience, (2) activating working memories, (3) construing and (4) integrating the mental structure of the bodily experience and memory. To mirror the IEF framework, the experiment is divided into four procedures: (1) an interactive embodiment stage in which the subjects in the experimental group will engage in installing the shiatsu massager, for direct understanding (Section 5.4.1); (2) an activation and construal stage in which the subjects in the experimental group will recall their cognitive procedures, by filling in *concepts*/slots and relations/fillers in the propositions

(Section 5.4.2), to activate the working memory; (3) an integrating stage in which both experimental and control groups start interpreting the testing material (Section 5.4.3). Additionally, (4) the undergraduates in the control group will interpret the test material for a second time, to examine the contribution of the interpreter's full preparation where there is no previous embodied experience. In other words, two kinds of familiarization are compared, one involving bodily interaction, the other based on preparation via previous exposure to the text and diagram (Green 2011, personal communication) (Section 5.4.4).

On the basis of the collected interpreting recordings, a corpus is structured with transcriptions, annotations and analysis (Section 5.5). Specifically, the tools of embodied cognitive linguistics are used to track coherence clues, by means of cognitive reference point (CRP), trajector (tr) and landmark (lm), and discourse current space (DSP), (reviewed in Section 4.7). Finally, Dillinger's traditional computational approach to coherence in SI (reviewed in Section 3.4) is used to manipulate and analyze the data. The data and findings in the corpus demonstrate both the role of the interpreter's bodily experience and the interpreter's mental effort invested in building coherence.

In order to examine initially the feasibility and validity of the theoretical framework and the experiment mentioned above, a pilot test was previously conducted as a trial experiment, described below in Section 5.6, where the consistencies and variations of the present main study versus the pilot test are presented. Finally, looking back at the experiment, the deviations of the research method from standard interpreting practice are evaluated (Section 5.7).

With respect to the methodology of interpreting research, according to Gile (1994: 39-54), special attention should be given to three items, namely test materials, subjects and experimental conditions and procedures. Section 5.1 will lay out the research questions and propose a hypothesis. Sections 5.2 and 5.3 will give an account of the selection of the materials and subjects respectively. Section 5.4 will show how the ICM-based framework, reviewed in previous chapters, is used to design the

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experimental conditions and procedures, and further to format the corpus (Section 5.5), and design and manipulate the data (Section 5.5.1). Section 5.6 will give an account of the present main study versus the pilot test. Section 5.7 evaluates the deviations of the research method from standard interpreting practice.

5.1 Research questions and hypotheses

Figure 15 below shows how the research questions are formulated:

Increasing mental efforts

Embodiment - origin of coherence
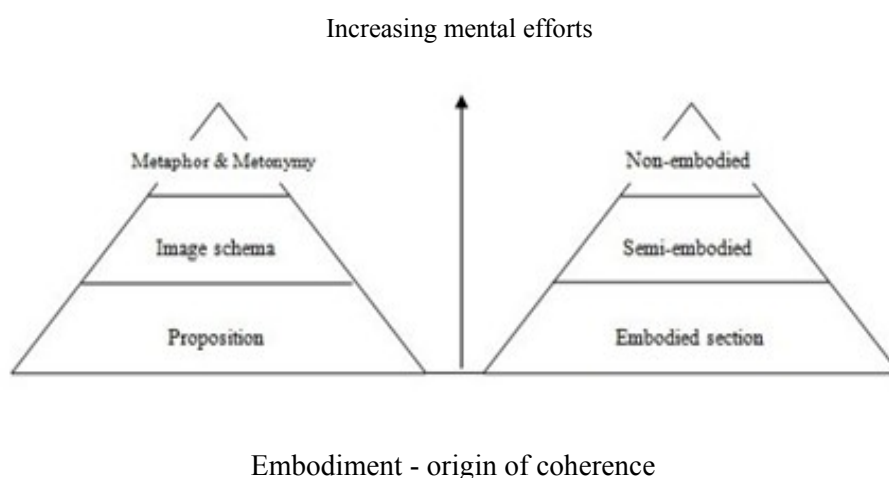
Figure 15a ICM   **Figure 15b Textual structure**

The role of embodiment is the cornerstone of the ICM in the embodied cognition theory, as opposed to any traditional view on cognition, discussed in Chapters 2 and 3. The communicator's exposure to bodily experience gives rise to the initial link among the *concepts*, so I will use the term origin of coherence to describe the interpreter's bodily experience prior to her interpreting. The first research question is:

(1) *Does the interpreter's relevant bodily experience help her to achieve coherence in following the source text (ST) and hence in producing target text (TT)?*

This exploration is conducted to find out if the interpreter uses her bodily experience to achieve coherence in the ST and TT, by means of the embodied, semi-embodied

and non-embodied knowledge. According to Lakoff (1987) (reviewed in Chapters 1 and 4), the propositional model is used to analyze the propositional *concepts*, which are based on bodily experience without employing any imagination, through perceiving, touching and manipulating. The propositional *concepts* are immediately grounded in direct understanding, involving basic-level objects, actions and relations in the physical domain. I prefer to use the term embodied *concepts* instead of propositional *concepts*. Lakoff (1987) has used metaphor and metonym to analyze the non-propositional/abstract concepts, while I use the term the non-embodied concepts instead of non-propositional concepts. I have synthesized and developed its definition as: those concepts which are not directly grounded in bodily experience or remote from the core of embodied experience, including the subject matter-based knowledge. However, I have found that there is a layer existing between the embodied *concepts* and the non-embodied concepts, which consists of the concepts whose meaning is accessed and inferred from the normally embodied experience, for which I would use the term semi-embodied concepts.

According to Lakoff (1987) and Wang (2006) (reviewed in Chapter 4), embodiment gives rise to direct and best understanding, suggesting that the communicator's mental effort will take an uphill direction in the stages beyond embodiment, as Figure 14 shows. Therefore the following question is formulated:

(2) How does the interpreter's mental effort expended in achieving coherence reflect the textual structure of the source text (ST)?

From the perspective of Systemic Functional Linguistics, Tebble (1994) (reviewed in Section 3.1.1), has tried to show how the interpreter needs to activate proper expectations about the function of each new element, and distribute the amount of mental effort in each part of the overall textual structure. However, Tebble does not offer an analysis of the way the interpreter distributes her mental effort into the different sections of the discourse structure. Next, the Interpretive Theory of Translation (IT) (reviewed in Section 3.2) provides the concept of the interpreter's

mental effort in processing an information structure, claiming that there are different layers of knowledge, some of which are easily activated but some are not, but IT did not explain what and how some layers of knowledge are more easily activated than other layers of knowledge. The Effort Model (1995, 1997, 2002) (reviewed in Section 3.3.2) has been used to account for a number of processing difficulties and failures, including such problem triggers as proper names, numbers and compound technical terms, which can affect the interpreter in attaining coherence. According to Feng (2002: 458) the Effort Model could be used to explain the failures in SI performance, as Gile admitted (1995), but cannot serve as a panoramic view of SI, in that it is neither a structured model of SI nor is it a flow chart of information processing. This second question is designed to compensate for these deficiencies in the theories of the interpreter's mental effort, from the ICM perspective. On the basis of theories of Gile (1995) (reviewed in Section 3.3.2) and Sperber and Wilson (1986) (reviewed in Section 4.6.2), relating to coherence and mental effort, we can make this assumption: coherence ratings stand in an inverse ratio to the interpreter's mental effort – more coherence clues' score, less mental effort, vice versa. The coherence rating is measured by the correspondence between the coherence clues indentified in the source text (ST) and the coherence clues appearing in the target text (TT).

On the basis of the previous discussions in this literature review concerning the theoretical framework, the following hypotheses are postulated as follows:

(1) The interpreter's relevant bodily experience helps her to achieve coherence, on the grounds that coherence stems from interactive embodiment, which is the origin of coherence. The ICM which the interpreter has stored in her mind helps her to fill in missing links and access the cognitive world, to realize coherence.

(2) The interpreter's mental effort expended in achieving coherence reflects the textual structure of the source text (ST). A higher number of coherence clues stand in inverse ratio to the mental effort; more coherence clues suggest less mental effort in the interpreting performance, and vice versa. The embodied *concepts* (that is, those units of knowledge directly grounded in bodily experience) are directly understood,

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and the interpreter is expected to achieve the highest coherence clues score with the least mental effort in the section of text, which primarily represents embodied knowledge, followed by the section which represents semi-embodied knowledge, and finally by the section which represents non-embodied knowledge.

With the research questions and hypothesis laid out, the following sections will deal with the topics of the test material (Section 5.2), subjects (Section 5.3) and the experimental procedures (Section 5.4), and corpus (Section 5.5).

5.2 The test material

An episode of my own bodily experience helped me to devise this test material. Due to much time sitting at a desk for my PhD work, I had bought a shiatsu massager cushion, made by Hömedics Company, from John Lewis in Edinburgh. When I started to read the installation instructions, I found the literal descriptions vague. But when physically installing the parts of the shiatsu device while referring to the installation instructions, I felt my understanding of the descriptions was getting clear, in that the *concepts* of the parts and actions are naturally linked. This bodily experience suggested to me an understanding of a text, so I used the installation steps of the original *Installation Instruction* of the shiatsu device (sentences 9 to 15 in the test text), for the subjects' immersion into the physical actions (Zwaan's term, reviewed in Section 4.5), so as to examine the role of their bodily experience for direct understanding. I used the section of *Warnings* in the Instruction (Sentence 16 to 19) and simulated other sections of the text, so as to observe the subjects' indirect understanding. The direct understanding is based on the interpreter's bodily experience, basically comprising embodied knowledge; and the indirect understanding contains the knowledge which is not based on direct bodily experience. In other words, in the case of understanding the text concerning the shiatsu device, the embodied knowledge makes use of specific remembered body movements and sensations to perform some task (such as assembling the shiatsu parts), and the non-embodied knowledge involves warnings against misusing the shiatsu device, and

some special technical terms. My further classification shows that, between the direct understanding and the indirect understanding lies a semi-direct understanding, or semi-embodied knowledge, which involves some kind of reflection about embodied knowledge, which can be expressed in words (such as feeling of the massager's comfort) (Green 2011; personal communication) (Sentences 5 to 7). In each section representing the embodied *concepts*, semi-embodied and non-embodied concepts, there are two subsections A and B, where the contents in Subsection A are closer to the core of the interpreter's bodily experience-based actions than Subsection B. It is assumed that the interpreter's mental effort expended in achieving coherence will reflect the textual structure in the ST. The text is classified in terms of these basic attributes (direct understanding versus indirect understanding) (see Sections 4.2.5)

The situation and context of the ST which I devised is as follows: Mr. Craig, the sales manager from Hömedics promotes a new product, the Shiatsu Massage Cushion, to an audience of potential customers at Guangzhou International Trade Fair. Mr. Craig first greets the audience and introduces himself (S1-S3), then establishes the purpose – promoting the product, a Shiatsu Massage Cushion (S4). He goes on to explain the meaning of word, shiatsu (S5) and its purposes (S6). In order to achieve an interactive response from the audience, he asks the potential customers for their feelings about the product after their bodily experience (S7). Following this, he concentrates on three points: the structure of the appliance (S8), installation procedures (S9-15) and warnings about storage (S16-19). Finally he ends his promotion, with another sales strategy – offering a favorable price (S20), and inviting the potential customers to try the shiatsu massager again (S21) and thanks the audience (S22).

The invited speaker, an English native, playing the role of Mr. Craig, rehearsed his performance before the interpreting recording, read from a script while making his speech sound oral and natural, and had his speech recorded into the tape in the audio-visual room. The speech lasts 4.5 minutes with approximately 100 words per minute, a comfortable input rate and speed (Seleskovitch 1965) (reviewed in Section 1.1). For

the purpose of this study, the 450-word English ST was divided into 22 sentences and 44 segments (Appendix 3 Transcript). Segmentation of the ST was carried out according to both syntactic constituents of the source text and the comprehension of the interpreter (Goldman-Eisler 1972).

This test material fits in the theme of interpreting English for science and technology (EST). According to Trimble (1985: 10-21), an EST communicator basically uses a special process or *rhetoric* (1985: 10) in choosing and organizing information, in terms of 4 levels. Level A gives the purpose of the total discourse in the introductory section. Level B consists of broad and generalized information. The rhetoric of an EST discourse is best seen operating at Levels C and D. At Level C general functions of Level B is developed; information is concerned with physical structures (physical description), with the purpose of a device and how its parts work (function description), and with processes and procedures (process description). At Level D relationships are provided within and between the rhetoric units of Level C, and presented according to the natural structure of orders (e.g. time, space, and causality and result), and patterns (e.g. analogy, exemplification and illustration). Technical communicators have no choice but to use these rhetorical techniques because the nature of the material requires it. The test material shares the functions of EST discourse, on the grounds that it involves the physical structure of the shiatsu device, with its purpose of massage, and how the parts of shiatsu work, with their procedures. The textual structure of this test discourse fits in that of an EST discourse.

The rationale for the selection of the EST-based experimental material is that, in 2006 the China Education Ministry approved of the request of three universities (Beijing Foreign Studies University, Shanghai International Studies University, Guangdong University of Foreign Studies) to launch the MA programme in translation and interpreting, aiming to train specialized and application-oriented translators and interpreters. However, the challenge to this objective is how to design a programme and syllabus, on the basis of specialized knowledge structure, particularly in the field of technology and business. This study contributes to this

topic by designing an ICM-based interpreting programme for technical and business English (Section 7.4).

This experimental material is designed to answer the research question: Does the interpreter's relevant embodied experience help her to achieve coherence? This material enables some of the subjects to physically and perceptually experience the installation process and the purpose of the machine before the interpreting task (Section 5.4). Therefore, this material reflects the role of interactive embodiment in relation to the ICM, in that it can be used to observe the way in which the subjects have built up propositional structures and image schemata of the fixing procedures via mental space blending, mostly in terms of frame and script, and also formed the mappings and projections of sequential iconicity of the installation steps in the mind. Therefore, it is a suitable tool to observe the role of the interpreter's bodily experience in achieving coherence in SI.

The textual structure of the ST is designed to address the question: How does the interpreter's mental effort which is expended in achieving coherence reflect the textual structure of the source text (ST)? Some aspects of this test material are designed to show the way the interpreter processes the textual structure in terms of mental effort, analyzed from the ICM perspective; the section representing embodied *concepts* is analyzed from the propositional model perspective; the section representing semi-embodied concepts is viewed from an image schema perspective; and the section representing non-embodied abstract concepts is analyzed from the metaphorical and metonymic model perspective, as reviewed in Section 5.1, and shown in Figures 15a and b above.

In cognitive processing, the interpreting subjects will use their relevant bodily experience for understanding knowledge, as we have noted throughout, which consists of embodied *concepts*, together with semi-embodied and non-embodied concepts. This cognitive processing is made manifest in making sense, and building up coherence in the textual structure. It is assumed that the interpreter's mental effort tends to increase from processing the embodied knowledge to processing the non-

embodied knowledge. The embodied *concepts* relevant to the installation procedures of the shiatsu device are the control centre of understanding this text (S9-15). From the embodied section, the interpreter's understanding is extended to the meaning and purpose of the ST (S5-6), forming the semi-embodied concepts by means of her sensation through massage experience, further non-embodied concepts – warnings about storage (S16-19) – concepts remote from the subjects' bodily experience, and the abstract concepts including six technical terms and numbers (*PVC, 230 V, AC main outlets, short circuit, 30 pounds and 69 pounds*). The interpreter was predicted to spend mounting mental effort, which reflects the textual structure with respect to the varying degrees of difficulty of messages.

By analyzing the textual structure from the ICM perspective, this text is roughly divided into five sections in order: (1) the introductory section (Section 5.3.1); (2) the section representing semi-embodied concepts (5.3.2); (3) The section representing embodied *concepts* (5.3.3); (4) the section representing non-embodied concepts (5.3.4), (5) the concluding section (5.3.5). The classification of Subsections A and B depends on the closeness to the core of the embodied experience in the installing actions. The full source text (ST) used in the experiments is presented here.

5.2.1 The introductory section

The Speaker greets the audience and introduces himself (S1-S2):

S1: Good morning, ladies and gentlemen

S2: Welcome to our product promotion fair of Hömedics. I am Craig, sales manager.

S3: I would like to recommend a good product to you.

S4: Now look at this. This is a Shiatsu Massage Cushion.

This introduction provides the contextual situation, especially the purpose, as a prelude to the main body of the speech.

5.2.2 The section representing semi-embodied concepts

The related segments are presented below:

S5: As you know, 'shi' in Japanese means finger and 'atsu' means pressure, put them together and you've got Shiatsu, meaning 'finger pressure'.

S6: In this day and age of bad backs due to much office work, labor and sitting too long for your studies,

The Shiatsu Massager is the perfect relaxation gadget for every occasion.

S7: Just now all of you have sat on it and have had a positive personal experience.

How do you feel about it?

Comfortable?

Yes, - I think you will agree.

This section, ranging from sentence 5 to 7, segment 4 to 14, is divided into two subsections. Subsection A (S7) includes the testing of the listeners' feelings about the bodily massage, and Subsection B (S5-6) includes the explanation of the Japanese word, *shiatsu* and its purpose. The concepts here involve some kind of reflection about the physical actions relating to the installation. This section is used to see the way the interpreter processes the semi-embodied knowledge, and her mental effort reflects the textual structure, analyzed from image-schema perspective (Figure15).

5.2.3 The section representing embodied concepts

This embodied section is provided here

S8: The structure of Shiatsu Massager is simple.

Two kneading heads, rotating, travel up and down,

along the PVC guides, relieving pain and fatigue on your back.

S9: I would like to talk about how to use this Shiatsu Massager.

Briefly there are six steps you should remember:

S10: One. Attach the massage seat to almost any chair,

   using the integrated strap at the back of the seat,

   Ensure it is held firmly in place by adjusting the strap as necessary.

S11: Two. Connect the power supply lead from the adapter with the corresponding lead in the

   side of the seat.

S12: Three. Plug the adaptor into a 230V AC mains outlet T3 -and switch on.

   By the way, remember to finish steps 1 to 3 before switching the appliance on at the

   mains.

S13: Four. Once seated, use the remote control to operate the appliance.

   Press the 'Power' button once and select the desired massage zone- to start the massage.

S14: Five. For an intense massage, remove the flap from the back of the cushion.

   For a gentler massage, keep the flap on and you can soften the massage further by

   placing a towel between your back and seat.

S15: Six. Press the 'Power' button for a second time to stop the massage.

This section refers to what the subjects in the experimental group are physically engaged in, involving interactive bodily experience-based aspects. This section, ranging from sentence 8 to 15, segment 15 to 33, can be further divided into two subsections: Subsections A and B. Subsection A includes the fixing steps (S9-15), in which sequencing iconicity (Section 4.5.2) is displayed; Subsection B (S8) includes information about the structure of the massager, which is one part of the bodily experience but not so prominent and salient in terms of cognition, and needs more careful observation by the interpreting subjects. In this section we can observe how the physical actions are mapped and projected into the minds of the interpreter through the relevant frame and script (Section 2.2.2) and iconicity (Section 4.5.2), serving as the control centre for understanding the whole text; and how the process of the interpreter's mental effort is reflected in processing the embodied information, from the perspective of the propositional model in the ICM (Figures 14).

5.2.4 The section representing non-embodied concepts

This section is as follows

S16: Always remember to store it properly.

   Place the appliance in its box or in a safe, dry, cool place.

S17: Water or any liquids that come into contact with the appliance are dangerous

S18: Avoid contact with sharp edges or pointed objects which might cut or puncture the
   fabric surface.

S19: To avoid breakage, DO NOT wrap the power cord around the appliance.

   DO NOT hang the unit by the cord. This will cause short circuit.

S20: Ladies and gentlemen, you could have it now at 30 pounds, in John Lewis, Edinburgh, it

costs 69 pounds.

The non-embodied section, ranging from sentence 16 to 19, segment 34 to 43, can be separated into two subsections: Subsection A (S16-19): warnings on the use of the shiatsu device, and Subsection B: technical terms listed below. This non-embodied section is not embodiment based, and/or is remote from the core of embodied experience, including the subject matter-based knowledge. This section is used to study how the process of the interpreter's mental effort expended in achieving coherence is reflected in the understanding of the non-embodied or abstract knowledge, from the perspective of the metaphorical and metonymic processing in the ICM (Chapter 5, Figures 19a and b). It is worth noting that Subsection B also includes the technical terms and numbers: *PVC, 230 V, AC main outlets, short circuit, 30 pounds and 69 pounds*. These six items are selected and observed, on the grounds that technical terms and numbers cannot be isolated from the context (Section 3.2); and that, to activate the links among the terms and numbers, interpreters need to understand contexts of technical terms and numbers. This challenges the Setton's assumption (1995: 253) (discussed in Section 6.2.3) that names (for instance,

Hömedics. Craig, in Section 5.2.), technical terms and numbers cannot be associated into the mental model, but this research argues that bodily experience makes a difference in helping the interpreter to build up the links among the concepts in terms of names, terms and numbers. Interpreting them (names, terms and numbers) needs more mental effort (Gile 1995) (Section 3.3.2). This will be discussed in Sections 7.2.1 and 7.2.3.

5.2.5 The concluding section

The Speaker ends his speech with sentence 21-22:

S21: If you are interested, feel free to try the Shiatsu massager again before you buy it.

S22: Thanks.

The structure of this test material reflects cognitive properties in processing and categorizing information from the ICM perspective: idealization, hierarchy, gradience, fuzziness and gestalt (reviewed in Section 4.3), which also influences the interpreter's mental effort. Idealization means that the textual structure does not fit into the ICM structure either perfectly or all the time (see Figures 15a and b; Section 5.1). Fuzziness means that there is not a rigid boundary in the case of a graded category. The boundary between the embodied, semi-embodied and non-embodied sections is not clear cut. For instance, in the section representing embodied *concepts* emerge the semi-embodied and/or non-embodied concepts, and vice versa. Another obvious instance is that, in this test text there are some basic technical abstract concepts, such as *high voltage* and *short circuit*, emerging in the embodied section. In spite of fuzziness of the distribution of the embodied, semi-embodied and non-embodied concepts, they can be categorized according to the attributes of direct and indirect understanding. Hierarchy means 'a composite structure at one level of organization functions in turn as component structure with respect to a higher level' (Langacker 2008: 207). Gradience means that categories contain a scale or degree, with graded

concepts characterizing degrees along some scale with different layers in structure (Lakoff 1987). This test text shows hierarchic and graded layers from the embodied *concepts* as the foundation, and further upon which are built up the semi-embodied and non-embodied concepts. Gestalt means that categorization has two stages: perceiving an object or event as a whole as the first step and decomposing the perceived whole into individual properties or attributers as a second step. The installation procedures of this test text (S9-15) were initially used for the interpreting subjects to have a bodily experience so as to acquire a whole perception for the first step, and then put the perceived whole into individual properties by filling in the two cognitive diagrams with slots and pairs, this is described in Sections 5.4.1 and 5.4.2.

To sum up, this text displays both textual and cognitive structure, which starts with the introduction, gradually progresses to the sections representing semi-embodied, embodied and non-embodied knowledge, and finally ends with farewell and conclusion. The experimental text is intended to make it possible to observe these effects when it is interpreted: (1) the role of bodily experience in achieving coherence; (2) the interpreter's mental effort invested in achieving coherence reflecting the textual structure in the ST (Figures 14a and b), analyzed from the ICM perspective. The findings of the interpreters mental effort provides a case for the *contextual configuration model* (Tebble 1994) (reviewed in Section 3.1.1), and a flow chart for the process of the interpreter's mental effort expended in achieving coherence reflecting the textual structure of the ST, in contrast with the Interpretative Theory of translation (Section 3.2) and the Effort Model (Section 3.3.2).

5.3 Subjects

This section gives an account of the selection of the subjects, involving their related background information, and provides the rationale for their selection. Thirty interpreting subjects were recruited for this experiment, from the School of Foreign Languages, Lanzhou University of Technology (LUT), based in Lanzhou, China. These thirty subjects were divided into two contrastive groups: one was the

experimental group who were to undergo bodily experience, and the other the control group who were not. Each of the two contrastive groups comprised 15 subjects with five teachers, five postgraduates and five undergraduates. The five teachers in the experimental group are labeled T^{+1} to T^{+5}, the five postgraduates PG^{+1} to PG^{+5}, and the five undergraduates UG^{+1} to UG^{+5}; while in the control group the five teachers are labeled T^{-1} to T^{-5}, the five postgraduates PG^{-1} to PG^{-5}, and the five undergraduates UG^{-1} to UG^{-5}. There were 7 male subjects and 23 female subjects. The average age was 33 for the teacher's group, 25 for the postgraduate group, and 22 for the undergraduate group. Here are the detailed background of the selected subjects and the rationales for their selections.

5.3.1. Teacher's group

Tables 2a and 2b provide a background description of the teachers in the groups. This combination represents a full *academic echelon team* within the institutional structure – in both the experimental group and the control group, there are two associate professors, two lecturers and one teaching fellow:

Table 2a Background information of the five teachers in the experimental group

Subject	Date of birth	gender	academic status
T^{+1}	1968	Female	Associate professor
T^{+2}	1969	Female	Associate professor
T^{+3}	1973	Female	Lecturer
T^{+4}	1980	Female	Teaching fellow
T^{+5}	1977	Female	Lecturer

Table 2b Background information of the five teachers in the control group

Subject	Date of birth	gender	Academic status
T^{-1}	1970	Female	Associate professor
T^{-2}	1980	Male	Lecturer
T^{-3}	1969	Female	Associate professor
T^{-4}	1983	Male	Teaching fellow
T^{-5}	1980	Male	Lecturer

They all have some practical interpreting experience and teach interpreting courses, mostly consecutive interpreting. All these teachers from the same academic echelon

would therefore be expected to have a similar high level of language proficiency.

5.3.2 Postgraduate group

Tables 3a and 3b present the background of the postgraduate group. The ten postgraduates were second year MA students in interpreting and translation. They each were admitted by the ratio 50:1 as candidates through the China National Postgraduate's Entrance Examination in 2006. They all have some interpreting experience; the precise selection of who went into either of the experimental or control group is based on his/her entrance examination score at an equal level, i.e. the groups consist of candidates with matched scores:

Table 3a Background information of the five postgraduates in the experimental group

Subject	Date of birth	gender	Academic status
PG^{+1}	1983	Male	Second year MA
PG^{+2}	1984	Female	Second year MA
PG^{+3}	1983	Female	Second year MA
PG^{+4}	1982	Female	Second year MA
PG^{+5}	1984	Female	Second year MA

Table 3b Background information of the five postgraduates in the control group

Subject	Date of birth	gender	Academic status
PG^{-1}	1984	Female	Second year MA
PG^{-2}	1983	Male	Second year MA
PG^{-3}	1982	Female	Second year MA
PG^{-4}	1983	Female	Second year MA
PG^{-5}	1984	Female	Second year MA

5.3.3. Undergraduate group

Tables 4a and 4b provide the background of the two contrastive undergraduate groups. The ten undergraduates were fourth-year students in English language, selected according to their scores of the Test for English Majors (TEM) (see Appendix 2), Band 4, their commitment to an interpreting career and the recommendation of the

interpreting teachers regarding their potential. TEM is mandatory for English majors in Chinese universities. For these students, passing the TEM at Band 4 is a graduation requirement. As with postgraduate students, the composition of the experimental and control groups is matched for examination scores (see appendix 2):

Table 4a Background information of the five undergraduates in the experimental group

Subject	Date of birth	gender	Academic status
UG^{+1}	1987	Female	Fourth year student
UG^{+2}	1987	Female	Fourth year student
UG^{+3}	1985	Female	Fourth year student
UG^{+4}	1987	Female	Fourth year student
UG^{+5}	1986	Female	Fourth year student

Table 4b Background information of the five undergraduates in the control group

Subject	Date of birth	gender	Academic status
UG^{-1}	1986	Male	Fourth year student
UG^{-2}	1986	Male	Fourth year student
UG^{-3}	1987	Female	Fourth year student
UG^{-4}	1987	Female	Fourth year student
UG^{-5}	1986	Female	Fourth year student

In addition, the five undergraduates in the control group in Table 4b were asked to interpret the ST for a second time, considering that a further observation of the role of bodily experience was to be carried out, in the context where the subjects were not physically involved in the experience. The five undergraduates in the control group, engaged in the second interpreting, were labeled UG^{-1-1} to UG $^{-5-5}$.

The sample T test is used to examine whether the means of the undergraduates' scores both in the experimental group and the control group on some outcome differ. On the basis of the TEM achievements of the selected undergraduates, the sample T test was conducted to ascertain the difference as Table 5 shows below:

Table 5 The sample T test to evaluate the effects of language proficiency on interpreting

Score ⟍ Subject	TEM 4:Exp	TEM 4 control
mean	70.5	70.6
Standard deviation	7.5256 < 5.466	
T value -0.04105< 2.604, $p<0.01$		
Difference	No	No

With respect to the sample T test, a comparison of this sort aims to evaluate the

effects of the intervention of language proficiency upon the two comparative groups. The t-value is compared to determine whether the t-statistic reaches the threshold of statistical significance. The sample T test in Table 5 above suggests that the two groups of undergraduates have a comparable level of English language proficiency; therefore observation can focus on the role of bodily experience to achieve comprehension and coherence.

The rational for the division of the two contrastive groups is provided from the perspective of the research and design method: the experimental group underwent the bodily experience and received instruction and training in the use of the shiatsu device, whereas the control group did not. This experiment had a one-way design, in that it had one related measures *independent variable* (IV). An IV is the event manipulated independently by the experimenter; the *dependent variable* (DV) is the result we observe. This IV thus basically has three levels: embodied, semi-embodied or non-embodied. This one related *IV* gives rise to the number of coherence clues of the discourse, interpreted by the subjects, in terms of the DV. This experiment has controlled the selection of the subjects in the different groups in order to hold other factors (e.g. academic background and experience, age) constant across the conditions so that any relevant elements cannot account for any changes observed in the DV. In this way, it ensures both *external validity* and *internal validity*; the former refers to the relevance of the findings to situations beyond or external to those used in the study, that is also referred to as generalizability; the latter means the extent to which we can relate changes in the DV to the manipulation of the IV.

There are other rationales for the selection of the subjects. Firstly, this study is interpreting education and training oriented, as Gile (2000) claimed that interpreting education and training is one of the most important fields in the world of conference interpreting research. The actors in interpreting education and training are teachers, postgraduates and undergraduates in interpreting studies in universities. According to Mu (1999: 88), the teachers in translation and interpreting in Chinese universities are commonly engaged in translating and interpreting research and practice, translating

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academic works for publication as well as interpreting for the local governments, enterprises and other economic entities. The teachers in translation and interpreting studies are the main force in China's interpreting market; also they form so called *academic echelon teams* according to professional posts and ages, in applying their theoretical and practical knowledge to teaching the students of interpretation.

Next, the China Education Ministry made the interpreting course compulsory for undergraduates majoring in languages in Chinese universities in 1999. This stipulation aims to meet China's fast-growing development in exchange with other countries in the fields of science and technology, the economy, culture, and international affairs. According to Mu (1999: 61-82), there is increasing doubt on the feasibility of offering undergraduate courses or programmes in interpreting due to their deficiency in second language proficiency. But according to the Interpretative Theory of translation (IT) (reviewed in Section 3.2) background knowledge can be used to compensate for this weakness. Also according to Mu (1999), language majors in language schools of Chinese universities are trained mostly in consecutive interpreting, scarcely ever in simultaneous interpreting (SI) which is considered to be impractical, and SI becomes a challenge for interpreting training. There is, therefore, an immediate need for research on SI, in order to inform the development of interpreter training. Mu argues that the interpreting course and program is necessary for undergraduates in languages, on the grounds that interpreting training can help them to acquire the interpreting skills and psychological competence as well, which they would have to spend longer accessing in their future career otherwise. I argue that empirical research is needed to confirm if it is feasible to engage undergraduates in languages in SI training, in the context where embodied experience can help interpreting trainees to compensate for their language insufficiency, as IT asserts (Section 3.2), and that the researchers into interpreting should not take the hypothesis for granted, but rather, like those engaged in any other academic fields, conduct experiments to testify any point. Therefore, the outcomes of the two undergraduate groups will be significant when compared not only with each other but also with those

of the postgraduates and teachers.

Finally, according to Dillinger's experimental outcomes (1989; 1994) (reviewed in Section 3.4), interpreting is not a specialized ability regarding comprehension and coherence, but the application of an existing skill under more unusual circumstances and also, comprehension in interpreting is characterized by all of the same components process as listening; second language proficiency is crucial in interpreting performance. It is assumed that the teacher subjects are more academically competent than student subjects in both English language and interpreting. We will see if bodily experience makes any difference to the subjects, given their interpreting and academic background (including their English language proficiency). In terms of gender difference, only three percent of the subjects are male, confirming the fact that most of interpreters are female; this study will not involve gender effects on interpreting. The category of age also points to the factor of academic and interpreting background – there is an 11 year difference between the average ages of teachers and the undergraduates, and an 8 year difference between the teachers and the postgraduates. This section is designed to eliminate the variables in the subjects' academic background and interpreting skills, by ensuring these elements are approximately equal, so that the effect of the interpreter's bodily experience is foregrounded. As for the question: should the interpreter acquire a comparable level of knowledge of the topic to the Speaker? This will be addressed in Sections 7.2.3.

Having explained the selection of the test material and subjects, the following section will describe design conditions and procedures of the experiment.

5.4 Procedures

The subjects' equipment was a standard laboratory with SI booths used for teaching SI. The subjects had interpreting lectures and slots in the lab, and they were familiar with this environment which thus had no negative effect on them. This experimental procedure is based on the framework of the Immersed Experiencer Frame (IEF) (Zwaan 2000, 2004 and 2005) (reviewed in Section 4.5). According to the IEF

framework, comprehending the processing of discourse construction and coherence needs to start with the communicator's bodily experience, further separating the comprehension processing into three steps: activation, construal and integration. Activation means that a language input will activate its relevant traces to construct the communicator's experience. Construal means the psychological meshing process for simulating a specific event. Integration means previous relevant construed elements which are turned into a part of working memory. On the basis of the IEF framework, the experiment is divided into four procedures: (1) interactive embodiment stage in which the subjects in the experimental group will engage in installing the shiatsu massage (Section 5.4.1); (2) activation and construal stage in which the subjects in the experimental group will recall their cognitive procedures by filling in *concepts*/slots and relations/fillers in the propositions, and construing their ideas by role-play (Section 5.4.2), (3) integration stage in which both experimental and control groups start interpreting the test material (Section 5.4.3). Additionally, (4) the undergraduates in the control group will interpret the testing material for a second time to examine the interpreter's full preparedness without embodied experience (Section 5.4.4). In short, the experimental group goes through stages 1 to 3 while the control group only undergoes stage 3, and the five undergraduates in the control group undertake stages 3 and 4.

The subjects in the experimental group were guided to do the experiment separately, considering effective management and space availability as well, and in order of the teachers group, postgraduate group, and undergraduate group. When the subjects in the experimental group finished their interpreting performances, the subjects in the control group started to conduct their interpreting test in the same order. Finally, the undergraduates in the control group were asked to interpret for a second time to examine the effect of familiarization when preparation for interpreting was based on the text and diagram only.

Before the experimentation, the experimenter distributed a diagram of the shiatsu device (see Fig. 16 below) and a list of assumed new words, especially technical

terms, to all the subjects in the experimental group and the control group, including *shiatsu, PVC, 230Volt, AC main outlet, short circuit,* and provided the subjects with the situation and context: a sales manager from Hömedics was to promote his shiatsu massager in the Guangzhou Trade Fair. The reasons for choosing the Shiatsu massage equipment as the vehicle for the direct bodily experience and subsequent translation experiments were that it was not likely to have been previously used by the subjects and was not likely to be too difficult in technical terms as a translation task. When asked if they had ever had direct, physical contact with this type of shiatsu device, none of the subjects in either group said 'Yes'; when asked if they felt it would be particularly difficult to understand and interpret a speech about the shiatsu product, all the subjects in both groups said 'No'.

5.4.1 Interactive embodiment stage for direct understanding

The experimenter brought the shiatsu appliance (Figure 16 below) into the lab, and organized the subjects of the experimental group to put the parts of the shiatsu massager together, on the basis of installation procedures (S9-15) (Section 5.2.3), according to the experimenter's oral instructions in Chinese:

Figure 16 Shiatsu massage device (The same shiatsu device was used in the pilot test and the present experiment)

Then each subject in the experimental group sat on it and used the remote control to

experience the massage. The subjects were guided to discover its physical structure, purpose, process, installation procedures and how its parts work. The subjects were encouraged to ask any questions about what was going on. In order to observe the subjects' cognition and motivation, the experimenter did not give any special hints. This is based on the IT's method of developing the interpreter's motivation and curiosity (Interpretive Theory of translation, Section 3.2), Seleskovitch and Ledere (1986) have pointed out that interpreting students are trained to keep asking not only how but also why, for what they take for granted; and that they are initially guided to be aware of their ignorance of what seems familiar, ultimately motivated for further exploration and improvement of their knowledge to the functional level which enables them to follow the ideas of the technical specialist. The shiatsu device is a technical appliance, used in daily life; it seems familiar, but needs more observation and understanding. The interpreting trainees need to be aware of the fact that Isaac Newton's discovery of the universal gravitation was triggered by the seemingly familiar scene of a falling apple.

Having finished the step of interactive embodiment, the experiment moved to the second step – activation and construal for coherence in SI.

5.4.2 Activation and construal stage for the activation of working memory

This procedure is designed to observe whether the interpreting subjects, immersed in bodily experience, had their working memory activated, construing the mental structure of the shiatsu device and its installation steps according to the sequential order, i.e. sequence iconicity (reviewed in Section 4.5.2). Having gone through their physical experience of installation of the parts of the shiatsu device in the open space of the interpreting lab, the subjects in the experimental group entered into the booths and sat down. The experimenter distributed the two pages of the cognitive processing diagrams, as illustrated in Figures 17 and 18 below, in which only the two *cognitive reference points* (CRP) were filled in, i.e., *kneading heads* in top row of Figure 17 and *fixing step* in the top row of Figure 18. Here are the samples of the subjects:
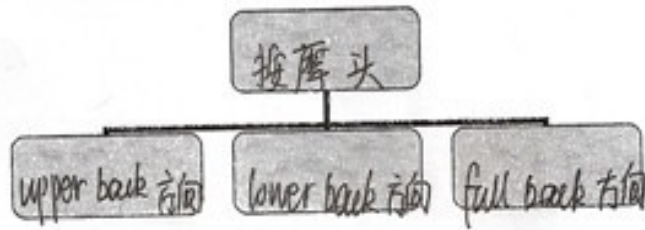
Figure 17 A subject's sample (UG^{+1})**: the structure of the shiatsu massager**

The experimenter explained the requirements: *please recall what you had done with the shiatsu parts in terms of its installation steps, and fill in the two cognitive diagrams (Figures 17 and 18) with slots and pairs*. The experimenter gave some props if necessary. For instance, with a view to the structure of shiatsu massager, the experimenter asked the subjects: *how and where do the knead heads of the massager move?* Regarding the fixing steps, the experimenter asked the subjects: *in which sequential order did you install the massager?* And then the experimenter told the subjects to fill in the slots and fillers by recalling what they had experienced physically. In order to have a better understanding, the subjects were encouraged to use their native language Chinese, but both Chinese and English are acceptable according to the subject's preference:
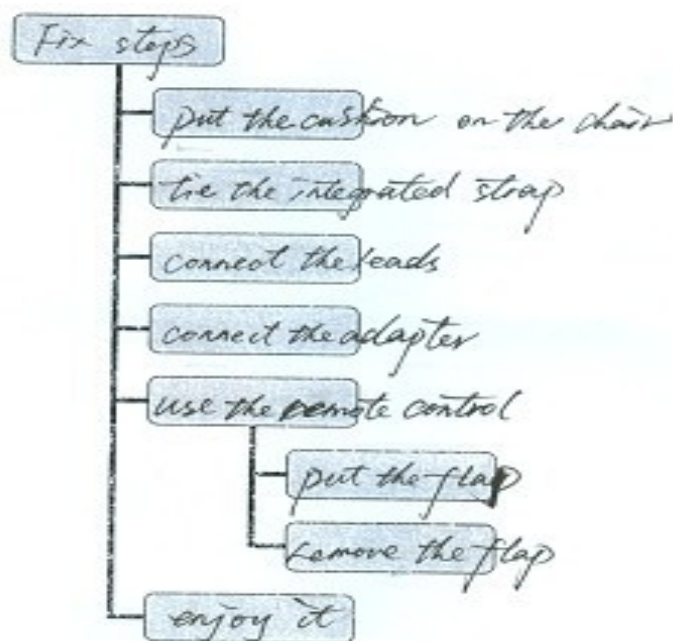
Figure18 A subject's sample (PG^{+1})**: installation procedures of the shiatsu device**

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Having filled in the cognitive processing diagrams (Figures 17 and 18) the subjects were given five minutes to mentally construe the items by themselves by rehearsing the speech in the Speaker's role. The instruction is: *if you were the Speaker in the Guangzhou Trade Fair, how would you promote your product of shiatsu? Please remember to introduce how to install the shiatsu parts based on your physical experience.* The subjects' rehearsal speeches were recorded. This was to enable the experimenter to observe how the construal activities help the interpreter to share in the Speaker's mental pattern of image-schema in one domain, connected via their shared purpose on this occasion with shared structures and situations, chains of actions and events within the frame and script. The experiment was intended to examine how the interpreter relies on mental mappings projected from her physical actions to activate her working memory for understanding and coherence.

5.4.3 Integration stage for coherence in SI

When the subjects of the experimental group had finished the activation and construal step, the control group was brought in. When the subjects were sure that the recording was working properly, the recorded speech was played. At this point, the subjects in both the experimental group and the control group completed the interpreting assignment. The subjects' outputs were recorded and timed on the machine, and their recordings were collected.

5.4.4 Interpreting for a second time by the undergraduates of the control group

Now the five undergraduate subjects in the control group were asked to go back into the booths for the second interpreting performance. Only this group was selected on the basis of the principle of sample investigation, especially due to the feasibility of manual annotation (Section5.6). The rationale for the second performance by the undergraduate subjects in the control group is that, according to the research design,

there are ways in which we can attempt to minimize the impact of individual differences upon the experiment. However, there is only one way in which we can actually eliminate this source of *extraneous variation*, or the amount of background that we have to cope with – variation other than that arising from our manipulation of the *independent variable* – bodily experience. This is by employing *related samples*, which means that when we use related samples, we do not compare the performances of different people. Instead, we compare the performances of the same people on different occasions. In the case of this repeated procedure, we would assess the interpreting performances of the undergraduates in the control group both in terms of less preparedness (for the first time interpreting) and full preparedness (for the second time interpreting), but without changing the independent variable due to the fact the repeating group still did not have the bodily experience. So, we can safely assume that any differences in performance under the two conditions cannot stem from individual differences in interpreting ability because it is the same person in both conditions. Interpreting for a second time is impossible in SI but it can be assumed that the interpreter has made a full preparation based on the text and diagram.

The experiment was repeated by the undergraduate subjects in the control group as a way of varying the results. This aims to answer the sub-question: how does the preparation work without embodied experience? This will further answer the questions: do all interpreters need to have physical experience of everything that could be talked about in the conference? Which parts should be physically experienced? Does an interpreter draw on some sort of indirect experience? These questions will be discussed in Sections 6.4 and 7.4 through the empirical data, in combination with the ICM.

At this point, it is useful to summarize the sequence of events and timing in the experiment as Tables 6a and 6b show below:

Table 6a The procedures of the Experimental group

events	1st step – interactive embodiment	2nd step – activation and construal	3rd step – interpreting
Time	10 mins →	5mins	5 mins

Table 6b The procedures of the Control group

events	1st step – preparation with diagram, the term list and the given topic	2nd step – interpreting	3rd step – second time interpreting performed by the undergraduates
Time	10 mins →	5mins	5 mins

After the experiment was completed, it was a time to sum up the present main study vs. the pilot test

5.5 The main study vs. the pilot test

The pilot test was tried out first to see whether the aspects concerning the difficulty of the text and procedures make sense, and to expose any weak points, flaws or problems that might have been unnoticed at the design stage, and to modify the procedure generally. Pilot testing also enabled me to familiarize myself with my role as experimenter so that I was practiced and professional by the time I proceeded to the present main experiment. The pilot test helped to reveal whether I had a potential floor or ceiling effect in my data. In other words, the subjects would find the material neither so difficult that few could do it (floor effect), nor so easy that more or less everyone could (ceiling effect). The pilot test was carried out with the same test material (Section 5.2) and same experimental procedures (Section 5.4), and same recruitment rational as for the main study: comparing experienced simultaneous interpreters with the less and/or non-experienced, in the context of the interpreter's bodily and/or non-bodily experience, analyzed from the ICM perspective. Apart from the consistencies mentioned above, however, there are four variations between the pilot test and the present main study as follows:

(1) The scale of the study. In the pilot test, there were only three Chinese subjects of conference interpreting, one PhD candidate in conference interpreting (Interpreter A), female, 30 years old, with 180 hours of actual conference interpreting experience, and two MSc trainees in conference interpreting, one male, the other female, both 23 years old without any conference interpreting experience (Interpreters B and C). The three subjects were from the Department of Language and Intercultural Studies, Heriot-

Watt University, based in Edinburgh, the United Kingdom.

(2) The division of the experiment group. In the pilot test, there was only one group subjected to bodily experience, i.e. the three subjects were physically engaged in installing the shiatsu device. There was no contrastive group.

(3) The focus of the research. The pilot test was only confined to the exploration of the role of the interpreter's bodily experience, involving the analysis of the effect of bodily experience on the interpreting skills, such as anticipation, judgment, compensation and coordination, as reviewed in Chapter 1.

In addition, I found a difference involving the motivation of the subjects. In the pilot test, interpreting subjects tended to follow the instruction in installing the shiatsu device, and tried to remember what the experimenter said, rather than actively ask questions.

After the test was carried out, the questionnaire shows that the three subjects thought that this test material is neither difficult nor easy in terms of the degree of difficulty. When asked about the procedures of the experiment, Interpreter C suggested that each subject should be fully engaged in the installation of the shiatsus device so as to 'have a deep impression of what has been done', rather than rush through the procedures.

The pilot test was presented in the International Conference on Corpus-based Translation and Languages Studies (ICCTS), Zhejiang University, China, September 2008. Later on, it was adopted by Dr. Richard Xiao as a chapter in his edited book *Using Corpora in Contrastive and Translation Studies* (Cambridge Scholars Publishing. Newcastle. 2010: 109-142). The pilot test has been further expanded and refined into the present study, and comparisons between them are made. Apart from the consistencies there are four variations between the present main study and the pilot test as follows:

(1) The scale of test. Unlike the pilot test with only three subjects, the present main study involves thirty subjects, as detailed in Section 5.3.

(2) The division of the experiment group. The selected thirty subjects were divided

into two contrastive groups: experimental and control group, i.e. the former were physically engaged in installing the shiatsu device while the latter were not (Section 5.4). The pilot test only had one experimental group who all received the embodied experience.

 (3) The focus of this research. The research scope of the present study is broader than that of the pilot test. Both the present study and the pilot test are focused on the fundamental research question: does the interpreter's relevant bodily experience help her to achieve coherence? However, from the result of the pilot test, I further found out the way interpreter's mental effort expended in achieving coherence reflects the textual structure of the source text (Gao 2010).

In terms of the motivation of the subjects, the interpreting subjects in the experimental group in the present main study seemed more active and keen on the physical engagement and in collecting information before interpreting than those in the pilot test. For instance, in the interactive embodiment stage (Section 5.4.1), while hearing the general introduction to the warnings on the usage of this device, they immediately asked: *could you please tell us the specific warnings about the usage of this massager?* This is used to examine how the interpreter's curiosity and motivation affect her interpreting performance. After the experiment, the subjects were provided with their respective outcomes, with both transcriptions and analysis, in a form of text corpus.

5.6 The corpus

In linguistics, a corpus (plural corpora) or text corpus is a structured set of texts used to carry out statistical analysis for hypothesis testing, checking occurrences or validating linguistic rules. A corpus may contain texts in a single language (monolingual corpus) or text data in multiple languages (multilingual corpus). Multilingual corpora, specially formatted for side-by-side comparison, are called aligned parallel corpora. Corpus research has a number of methods, including

transcription, annotation, glossing, back-translation, and parsing – analysis of the relationship between language forms and reader/listener's understanding.

Considering the complexity of this study I used a small corpus for an investigation of the working hypothesis. This small sized corpus approach is supported by corpus experts. According to Leech (1991: 8-29) the corpus size is not all important: small corpora may contain sufficient examples of frequent linguistic features. According to McEnery and Xiao (2006: 72), corpora that need extensive manual annotation, such as semantic, cognitive and pragmatic annotation, are necessarily small. In addition, Gile (2000) and Pöchhacker (2004: 74) have consistently encouraged *practisearchers* (an interpreter engaging in research or a researcher engaging in interpreting practice) and PhD students preparing graduation theses to pursue small-scale empirical studies within their methodological reach. The viewpoints above are supported by the process of designing and annotating the present corpus, on the grounds that the annotation covers over fifty thousand words, and nearly five months full time work (Appendix 2). However, larger sized, comparable and multilingual texts can be used for future studies. This point will be further discussed in Section 8.4.

5.6.1. Data design and manipulation

The data design and manipulation is based on both ICM-based methodology (Section 4.7) and the computational linguistics approach to coherence in SI for data manipulation (Dillinger1989, 1994) (reviewed in Section 3.4). As discussed in Section 3.4, Dillinger's propositional score is measured on the basis of matching between items identified in the ST and those appearing in the TT. This verbal transfer approach is somewhat basic but reasonable to analyze the coherence-building process in interpreting. The method based on verbal transfer is complemented by the ICM-based approach to discourse coherence. The concept of current discourse space (CDS) is used to analyze the discourse progression in a dynamic way (Section 4.6.3). The cognitive reference point (CRP) is used to determine the theme as a cognitive

commanding role in building coherence of a discourse. Trajector and landmark are used to track the detailed cognitive coherence clues. In coherence and comprehension research some assessment is made of the degree to which the response protocols – in this case, the subjects' translations – match or mismatch the input text; the units of comparison were the individual slot-filler pairs that constitute each proposition by the slot (tr.) and the filler (lm), and further, in which trajector and landmark, or the concept (slot) and relations (fillers) are bold-typed and /or underlined rather than match entire propositions. This is the general approach to generate the data for the corpus. Two types of corpus annotation systems were designed for examination of (1) the subjects' direct understanding through their bodily experience prior to their interpreting (Sections 5.4.1 and 5.4.2), and (2) their interpretations (Sections 5.4.3 and 5.4.4).

5.6.1.1 The corpus for the activation and construal

Sections 5.4.1 and 5.4.2 described how the subjects in the experimental group went through the embodied stage and how they activated their working memory and construed their mental structure by filling the slot (trajector) and the filler (landmark). As Figures 19 and 20 indicate below, the structure of the shiatsu device contains four frames, and the installation procedures have seven frames in the diagrams in terms of cognitive prominence via trajector and landmark. The top two frames where *kneading heads* (Figure 19) and *fixing steps* (Figure 20) are designated as cognitive reference points are not taken into account since they have already been presented. The three landmarks in Figure 19, *up and down, rotating, and PVC guide*, are scored one point each:
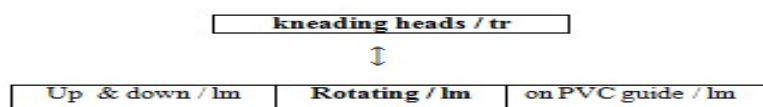
Figure 19 The corpus annotation of the structure of the shiatsu device

The six steps in Figure 20 are double scored because every frame has two slots (coherence clues) in the form of a trajector and landmark; for instance, *attach* (tr.) the *seat to any chair* (lm), in terms of concepts/slots and relations/fillers:
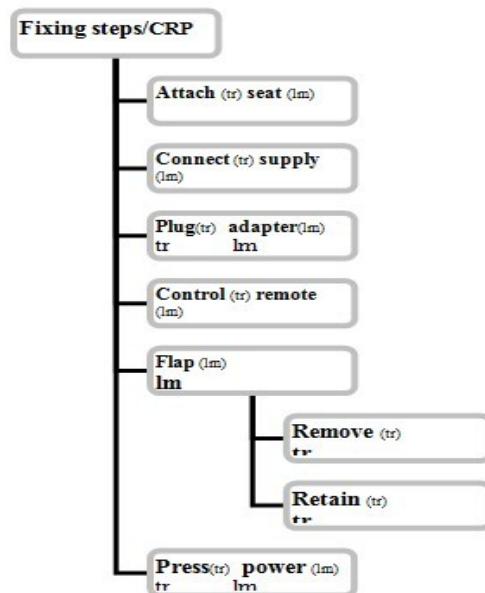
Figure 20 The corpus annotation of the installation procedures

For the installation sequences, no score is given if a step is mismatched, but the mismatches will be observed and analyzed in the following chapters.

The annotation and analysis of the activation and construal stage (Figures 17, 18; 19 and 20) is based on the assumptions on processing information proposed by Lakoff and Johnson (1999: 20) (reviewed in Section 4.2.2), in that when the interpreting subjects conceptualize categories in this way, they envision them using a spatial metaphor, as if they were containers, with an interior and exterior, a boundary, and a part and whole. When they conceptualize categories as containers, they also impose complex hierarchical systems on them, with some category-containers inside other category-containers. In addition, according to Lakoff and Johnson (1999: 20) 'Conceptualizing categories as containers hides a great deal of category structure. It hides conceptual prototypes, the graded structures of categories, and the fuzziness of category boundaries'. These assumptions underlie the information processing. The

filled diagrams are analyzed to find out how the subjects use the image schemas, including the container schema, the part-whole schema, the link schema and the source-path-goal schema in cognitive processing as reviewed in Section 4.2.2. This shiatsu device has two kneading heads mounted inside, and the heads move up and down, rotating in operation, along a pair of PVC guides, representing a compulsion schema (Figure 8), which appears as a 'continuous, analog pattern of, or in, the particular experience or cognition' (Johnson 1987: 2). This compulsion schema has internal structure with embodiment as force vector (Johnson 1987: 3) in terms of a given magnitude and direction, and develops in a coherent link and source-path-goal mode (see Figures 17, 18; 19 and 20). It is an example of how metaphorical processing works in shaping categorization, conception and inference in building coherence, as reviewed in Sections 4.2.2 and 4.2.3.

5.6.1.2 Corpora for the interpretations

With both the ST and the interpreted TT available, aligned parallel corpora were formatted (Appendix 3). The representations of the textual features are classified primarily in accordance with the theoretical framework as Table 7 shows below: (1) Coherence, (2) the Idealized Cognitive Model; these two frameworks act as the piers to support the bridge – Simultaneous Interpreting. The tools used for analyzing the corpus in terms of coherence include Theme and Rheme, cohesive devices, contextual situation, skopos, frame and script, and mental model theory. Theories relevant to the ICM involve propositional model, image-schema model, metaphorical model and metonymic model as the macro framework, and further the cognitive reference point, trajectory and landmark. With a view to simultaneous interpreting, relevant strategies involve anticipation, compensation, coordination, inference, and also some symbols are used as labels for pause, information loss and affective values. These representations put SI coherence in the global and local discourse frame, observing coherence in SI, by combining all the illuminating elements in the theoretical

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framework. Table 7 shows symbols and abbreviations used for transcription, annotation and analysis:

Table 7 Symbols and abbreviations for the interpreting discourse transcriptions

1) Coherence	THeme, RHeme. Cohesive devices: CT- temporal; CS- spatial; CP- process; ∵ ∴ -cause and effect; rep- repetition; >F- focusing device; ref: reference; elip: ellipsis; # condition; ÷ contrast; Situ: situation; cont: context; purp: purpose /skop: skopos; fr: frame & sc: script with S&C: situation & context; thematic role: goal; I: initial; MMT: mental model theory
2) ICM	PM: propositional model; MM: metaphoric model; Mnm: metonymic model; IS: image schema; CDS: p-1/p0/p+; CRP: Cognitive Reference Point; tr: trajector, lm: landmark; D: dominion, T: target; ic: iconicity; Ω Embodied section; Φ semi-embodied section; *non-embodied section;TP: Topical (most salient) propositions- Ptru: Shiatsu Massage Cushion; structure; use step
3) SI	ø anticipation; ∞ compensation; ≒ coordination; >>pragmatic inference; ? unclear syntactic attachment, semantic scope or pragmatic domain; @, fp filled pause; +long pause;-pause; [], information loss; ☺ ☻ affective values

An assembly of these symbols is used to represent the formulation by combining all the elements described above. The transcripts were annotated with top-down and bottom-up marks on the basis of the theoretical framework. Literal back translation is supplied to allow readers to follow the course of assembly of semantic and cognitive representations from the morpho-syntax of the input. Analysis is provided to primarily observe how the subjects follow the coherence clues. The quantitative indicators were calculated in terms of coherence clues achieved by the interpreting subjects. The English source text appears in Times New Roman bold face and the Chinese interpretations are in SimSun. Coherence clues are marked with underlines both in source and target texts. These details are provided to enable readers to follow the coherent course of assembly of semantic and cognitive representations, facilitated by analysis. The back translation is not a central issue of this research, and only acts as a window on the assembly of meaning and coherence clues for expository purpose. In addition, an English gloss is used to accompany the interpreted text for readers to follow synchronization (Table 19). Table 8 below is used as a partial example to show how this corpus was annotated. The words underlined in the source text are examined

to see if they are matched in the target text:

Table 8 a segmented example of transcription with assembly, back translation and analysis

p^{-1},p^0,p^{+1}prepositions(previous,current&subsequent); D domain; tr trajector; lm landmark; CRP cognitive reference point; Ref reference ; F focus; T target ; ☺ ● affective values; @, fp filled pause; +long pause;-pause; [], information loss; ∵∴ -cause and effect; >>pragmatic inference

No	English input	Assembly	T^{+1}	Back translation	Analysis	clues/ score
1	S1: @ Good morning, ladies and gentlemen.	SA formula +	早上好,女士们，先生们！	Good morning, ladies and gentlemen!	Context and situation are specified from no.1 to no.4	
2	S2: @Welcome to our product promotion fair of Hōmedics.	Polite formula +S: time/occasion	欢迎大家来到产品展销会.	Welcome to the product promotion fair	The purpose/skopos for the speech	0
3	- I am Craig, sales manager	Polite formula	我是销售经理	I am sales manager	Name is not mentioned but ok	0
4	S3: @ I would like to recommend a @ good product to you.	P^{-1} ø D (product) No.4-6 is an adjacent embodied section	在这儿，我要向大家推荐一款好产品	In here, I would like to introduce a good product to everyone	Follow the dominion: product	2/2
5	S4:+ Now look at this. (Pointing to the gadget)	P^0 Ref >F	请大家来看这款产品	Please look at this product	Concentrate on the focus as a further link	1/1
6	- This is a Shiatsu Massage Cushion.	P^1 CRP Rep >F T (Shiatsu Massage Cushion) rep	这是一个手指式按摩垫.	This is a Shiatsu Massage Cushion	Confirm the target: shiatsu	1/1 4/4
7	S5: @As you know, shi in Japanese means finger - and atsu means pressure,	Tr.(shi),lm(finger) Tr.(atsu),lm(pressure)∴ No.7-10 is an extended embodied section	你们都知道，shi在日语中意思是手指，iatsu 的是意思按摩	As you know, shi in Japanese means finger; iatsu means massage	Further track the sub-links: shi & iatsu	4/4
8	put them together and you've got Shiatsu;- meaning 'finger pressure'	Ref(them) :finger & pressure ∴	把它们放在一起，就是指手指式的按摩垫	Put them together (it) means finger pressure cushion	prgamatic inference based on the meshing net	3/3
9	S6: + In this day and age of bad backs- due to much office work.₁, labor.₂ and sitting too long for your studies.₃	P^{-1} >> ∴:work,labour, sit too long Traj Pᵢ	今天，很多人在办公室工作，太多时间的学习，那么经常的背都不好	Today, many people work in the office, or study most of the time, so giving rise to frequent backache	Two out of three factors for backache are mentioned, But it is ok	4/3

As the source text develops, any concept can be processed introspectively and retrospectively in terms of primary and secondary focuses. In other words, any

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concept or element in the current discourse can be activated and turned into a prominent point, i.e. trajector. For instance, the two proper names, Craig and Hömedics, in Sentences 1 and 2, are underlined as coherence clues, and are analyzed in order to testify the notion that names, terms and numbers are 'classic examples of items difficult to associate into the mental model, and are notoriously vulnerable to error or omission' (Setton 1999: 253). The scores on the right side in Table 8 show how the statistical results are produced. In terms of calculation of the coherence clues, for each of the testing texts a database was constructed by means of Microsoft Excel, in which each record (row) corresponded to a text proposition, and each field (column), to information about the cognitive linguistic properties of the text. This made it simple to generate information about propositions with a given property (e.g. CRPs, trajector and landmarks). The numbers of coherence clues were calculated, and generated with the database calculation functions through Microsoft Excel. According to Dillinger (1994; Section 3.4), each slot-filler pair of each proposition in the ST received a score according to the degree of similarity between it and the segment of the subjects' response being analyzed. Rather than use Dillinger's ordinal scale of similarity, I basically use a nominal scale as follows due to the facts that are discussed in Section 3.4:

0 if the slot-filler pair was not present in the segment (absent);

0 If a sequence of the slot is mismatched with the SL. It is interesting to observe how any mismatch sequences affect the upcoming interpretation.

1 if there was a change in surface form of the filler without a change in meaning (paraphrase).

1 if the slot-filler par appeared in the segment verbatim.

The design of the whole standard scale of the coherence clues is represented in Table 9 below, in which the total numbers of coherence clues in each section are presented in the top row, and then subdivided into Subsection A and B respectively, according to the distance to the core of bodily experience:

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Table 9 The total number of coherence clues for each section

Section 1	Base number x 5		Section 2	Base number x 5
Activation & construal	19 x5 = 95		Embodied	34 x 5 = 170
Segment A sequencing steps	13 x5 = 65		Segment A sequencing steps	23 x 5= 115
Segment A structure	6 x 5 = 30		Segment B: structure	11 x 5 = 55

Section 3	Base number x 5		Section	Base number x 5
Semi-embodied	22 x 5 = 110		Non-embodied	26 x 5 = 130
Segment A near embodied	9 x 5 = 45		Segment A non hand-on	20 x 5 =100
Segment B embodied extension	13 x 5 = 65		Segment B subject matter	6 x 5 = 30

Now it is time to step back and have an evaluative look at the deviations of the method from standard real-life interpreting practice.

5.7 Deviations from standard interpreting practice

This experiment involves deviations from standard interpreting research practice. The subjects are not full-time professional interpreters, having neither an interpreter certificate granted by any Chinese national interpreting professional institutions, nor membership of the International Association of Conference Interpreters (AIIC). However, according to the AIIC in 2008, there were only twenty-two members from the Chinese mainland registered with this association, out of whom seven are based in Shanghai, fifteen in Beijing. In addition, according to Gile (1994), the difficult access to professional practitioners makes the research into real interpreting problematic due to such factors as geography, lack of physical availability, confidentiality of translated material, and even the personal reasons – many interpreters do not appreciate having their work scrutinized. On the other hand, both interpreting teachers and students are resourceful and available as subjects, even though they only work part-time for the local interpreting and translation organizations or agencies.

Next, the situation is simulation based. However, simulation is recognized as experimental research in the case of role-plays in a quasi-authentic environment

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because simulation comes close to fieldwork. In the quasi-authentic environment, the interpreting trainees are not subjects, but protagonists who aim to enhance their interpreting performance, 'in a given social setting – classroom settings' (McDonough 1997, Pöchhacker 2004: 63).

This research also shares the deviations from practice of Dillinger's work (1979) (Section 3.4) in that there were no audiences. According to Anderson (1979) and Dillinger (1994), the consequences for processing without an audience are unknown; no major qualitative difference might be expected in the interpreter's overall performance. Subjects were not paid. According to Dillinger (1994) the consequences of this difference are unpredictable, and might entail a slight decrease in the interpreting performance; however, it is impossible that subjects can perform the complex interpreting task 'in more than one way' (Dillinger 1994: 162).

5.8 Concluding remarks

This research adopts embodied experientialism as the base for the framework, and embodied cognitive linguistics for the method, combined with the traditional computational approach to coherence in simultaneous interpreting, to set up the experimental design. The experimental procedures are designed on the basis of the framework of Immersed Experiencer Frame (IEF). The Idealized Cognitive Model (ICM) is used to analyze the source text through cognitive processing, and Dillinger's computational approach to coherence in simultaneous interpreting is used to access valid and reliable tools for data manipulation. The pilot test helped to uncover any serious flaws or problems that might have been overlooked at the design stage, and to generally fine tune the material and the procedure for the present experiment.

On the basis of the research questions and hypothesis, a detailed account has been given of the design, in terms of the three items, namely subjects, materials, experimental conditions and procedures to ensure the replication, validity and reliability of this study. This experiment has described precisely what happened to the

subjects from the moment that they arrived to the moment they left. This subsection has provided a detailed account of what the experimenter said and did to the subjects in the order in which the experimenter did it, aiming to provide all the information necessary for any other researchers to be able to repeat precisely what this experiment did – to undertake what might be called an exact or direct replication of this study.

However, upon reflection, it is apparent that there are some flaws in the design of the experiment. Firstly, in Section 5.3 I undertook the sample T test only for the undergraduates, in both control and experimental groups, to evaluate the effects of language proficiency, but not for the teachers group or the postgraduate group, on the grounds that the undergraduates in the control group interpreted for a second time; this was because information about the test achievements of the teachers group in language proficiency was not available and also because the small quantity of data (involving only five subjects) made a T text appear insignificant or unnecessary for the two contrastive postgraduate groups. Next, in Section 5.4, I overlooked a fact that the procedures were orally given in Chinese to the experimental group, which might add an extra factor when comparing the results of the control and the experimental group. Thirdly, individual differences may exist within the control groups that would affect their performance. For example, some individuals, in this experiment, might have a better visual imagination, or some other individual trait, which would enhance their performance of the task even when they have had no previous embodied experience. These problems will have to be addressed in future work. However, the results do seem indicative of the influence of bodily experience and therefore support my recommendations to consider incorporating more opportunities for this in interpreter training and also more research into this aspect of the basis of coherence. This study will further proceed to the results in the following chapter.

Chapter 6 Results

With the method described in Chapter 5, this chapter examines the results to explore the research questions in the light of the ICM: 1) Does the interpreter's relevant bodily experience help her to achieve coherence in the source text (ST) and target text (TT)? 2) How does the interpreter's mental effort expended in achieving coherence reflect the textual structure of the source text (ST)? In order to explore the two questions, results are provided according to the procedures described in Section 5.4. With a view to the first question, we will examine the results of the activation and construal stage when the interpreting subjects in the experimental group went through their bodily experience of installing the shiatsu device, by filling in *concepts*/slots and relations/fillers in the propositions, prior to their interpreting performance (Section 6.1). We will see the statistical difference between the two contrastive groups: the experimental group with exposure to bodily experience and the control group without any bodily experience (Sections 6.2.1 to 6.2.3). With respect to the second question, a pattern of the interpreter's mental effort emerges on the basis of the statistic indicators of the sections representing semi-embodied, embodied and non-embodied concepts (Section 6.3). In order to explore the role of full preparedness in achieving coherence, we will examine the results of the second interpretations made by the undergraduates in the control group (Section 6.4).

Section 6.1 starts with the results of the embodied activation and construal stage before interpreting; Section 6.2 provides a set of comparisons of the performance of the contrastive groups with and without embodied experience in the experiment, focusing on different factors involved in building coherence, in order to address Question 1. With respect to Question 2, on the basis of these total data and findings, Section 6.3 summarizes the role of the interpreter's relevant bodily experience, in particular, observes how the interpreter's mental effort expended in achieving coherence reflects the textual structure of the ST. Section 6.4 deals with the issues relating to the interpreter's preparation in the context of no bodily experience.

Because of the small size of the corpus, only percentage results were used to indicate trends rather than show what results reached statistical significance.

6.1 Activation and construal stage before interpreting: direct understanding

At this point, the subjects in the experimental group had completed the stage of their bodily experience in installing the shiatsu massager, so how they activated and construed the mental structure to attain coherence, through filling in the slot-pair cognitive diagrams, was examined. Table 10 below shows the number and percentage of the total coherence clues (Table 9, Chapter 5), which each individual group in the experimental group achieved after their embodied activation and construal stage. The three individual groups in the experimental group are listed on the left column: teachers, postgraduates and undergraduates:

Table 10 Number and percentage of coherence clues achieved for activation and construal by the experimental group

Group	Number/% out of total	Number/% in subsection A	Number/ % in subsection B
Teachers	49/51%	45/69 %	4/13 %
Postgraduates	55/58%	47/72 %	8/27 %
Undergraduates	50/53 %	40/62 %	10/33 %
Total number of clues	95	65	30

Table 10 indicates the outcomes of the interpreting subjects of the three individual groups in the experimental group after their bodily experience with the shiatsu device. Success rates for filling the spaces with the coherence clues were 51% for the teachers, 58% for the postgraduates, and 53% for the undergraduates. The overall performance is not satisfactory, in that none of the three groups achieved the threshold of 60 points, according to the research and design (Harris 2008). This *seemingly familiar* device is not as easily conceptualized as it seems, as the Interpretive Theory of translation asserts (reviewed in Section 3.2). However, the bodily experience stage makes its significance felt in helping the interpreter to achieve coherence. In particular, a closer look shows that in terms of the information in subsection A, the installation

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procedures of the shiatsu device, the three groups have achieved significantly more than the basic threshold: 69% of coherence clues for the teacher's group, 72% for the postgraduate group, and 62% for the undergraduate group. The primary issue arises from the data: what is the link between the interpreting subjects' bodily experience and coherence processing in their interpreting? The basic issue will give rise to questions under an umbrella: Will the interpreting subjects basically have the fixing procedures mapped into their minds via mental space blending? Will the activation and construal activity help them to form the basic mental links in the action sequence? Will the interpreting subjects have their working memory activated through their bodily experience, which would help them have access to coherence in their interpreting? I leave these questions to the following chapter for discussion, by means of examination of the detailed corpora.

The findings relating to the six fixing steps show that the subjects in the experimental group can basically arrange the sequential order according to the natural sequence without mismatching the installation steps even though a few steps were missed somehow. Table 11 below shows this point by choosing the interpreting postgraduates in the experimental group to access a micro view as follows:

Table 11 Six fixing steps sequential order arranged by the postgraduate group

Group No.	Six fixing steps sequential order					
	1st	2nd	3rd	4th	5th	6th
PG^{+1}	ok	ok	ok	ok	ok	ok
PG^{+2}	missed	ok	ok	ok	ok	missed
PG^{+3}	ok	ok	missed	ok	ok	ok
PG^{+4}	ok	ok	ok	ok	ok	missed
PG^{+5}	ok	ok	ok	ok	ok	missed

PG^{+1} matched the six steps order totally, PG^{+2} missed two steps order, the rest (PG^{+3}, PG^{+4} and PG^{+5}) missed only one. This interesting result leads to questions: will the iconicity of the process basically be projected into the interpreters' minds? Can the experimental interpreting subjects have the sequential actions entered into their mental spaces? Alternatively, will they have natural chains of action stored in their minds, avoiding obstacles in generating the sequential discourse? This will be further

explored in the forthcoming chapter for discussion in line with the conclusions on iconicity by cognitive linguists (Section 4.6.2). On the other hand, the data pertaining to the structure of the shiatsu massager in subsection B in Table 9 above demonstrates that the subjects only found the coherence clues at rates of 13% for the teachers, 27% for the postgraduates, and 33% for the undergraduates. Specifically, in terms of the shiatsu structure (Figure 21), the subjects could access the action of kneading heads, *move up and down*, but how (*rotating*) and where (*on the guide*), and what material (PVC) of the guide are less activated in memory. Therefore, the findings will give rise to questions on more specific and detailed cognitive processing properties involved in building up an ICM structure to make sense and establish coherence. Specifically, will the prominent *concepts* be activated more easily than the obscure ones as the theoretical framework postulates in Chapter 4? If it is true, how does it affect the interpreter's performance? In addition, the data interestingly indicate that in the experimental group, the undergraduates have achieved 2% more coherence clues rating than the teachers, and 5% less than postgraduates; and the postgraduates had a slight upper hand overall among the three (up to 7% more than the teachers, 5% than undergraduates). Issues keep arising from the data; considering that the young novices engaged in interpreting seem to have a more inquisitive mind and careful observation during their bodily experience activities – will this facilitate their interpreting? Does this phenomenon suggest that the interpreters should do their utmost to access any information available so as to have any nodes activated? According to the Interpreting Theory of translation (IT) (reviewed in Chapter 3), observing carefully and trying to absorb relevant knowledge and information in the current situation and context are important abilities for interpreters to build up the detailed coherence. This issue is still to be further discussed in the following Chapter 7 along with the detailed corpora.

In summary, these observations have led straight to the main research issues in question: Does the interpreter's bodily experience help her to achieve coherence? This question will be initially explored by comparing the two contrastive groups in the following sections, on the basis of the coherence clues ratings which the subjects

achieved during their interpreting performance, in the sections representing embodied, semi-embodied, and non-embodied knowledge. This will lead to exploring the second question: how does the interpreter's mental effort expended in achieving coherence reflect the textual structure in the ST?

6.2 Integration stage: coherence clues achieved in interpreting each section

The findings in the following sections show how interpreters, both with (the experimental group) and without (the control group) bodily experience, achieved coherence in SI. In order to investigate both the role of the interpreter's bodily experience and her mental effort reflecting the textual structure, analyzed from the ICM perspective, the following findings are presented according to the discourse sequence as described in Section 5.2: the sections representing the semi-embodied, embodied, and non-embodied concepts in the ST. From the perspective of the ICM, the propositional model is used to analyze the embodied *concepts* based section; image schema is used to examine the semi-embodied concepts based section; the metaphorical and metonymic model is used to evaluate the non-embodied and/or abstract concepts based section.

6.2.1 The section representing semi-embodied concepts

This section includes sentences 5 to 7, segments 4 to 14 in the corpora (Appendix 1). The concepts in this section basically involve some kind of reflection about the physical actions relating to the installation, and general ideas about the shiatsu device, therefore, it also includes the Speaker's introduction to his speech.

Tables 12 and 13 below provide the number and percentage of coherence clues achieved by the two contrastive groups, for the section representing semi-embodied concepts. The findings in the contrastive tables show that the experimental group with their bodily experience followed more coherence clues than the control group without any bodily experience. Each individual experimental group achieved significantly

more coherence clues than their respective peer group: 85% vs. 75% for the teachers' groups; 87% vs. 71% for the postgraduate groups, and 85% vs. 38% for the undergraduate groups. That represents 10% difference between the paired teachers groups, 16% between the paired postgraduates groups, and most strikingly, 47% between the paired undergraduates groups:

Table 12 The experimental group: number and percentage of coherence clues attained in the section representing semi-embodied concepts

Group	Number/% out of total clues	Number/ % in subsection A	Number/% in subsection B
Teachers	93/85 %	42/93 %	51/78%
Postgraduates	96/87 %	45/100 %	51/78%
Undergraduates	93/85 %	44/98 %	49/75%
Total number of clues	110	45	65

Table 13 The control group: number and percentage of coherence clues attained in the section representing semi-embodied concepts

Group	Number/% out of total clues	Number/% out in subsection A	Number/% out of in subsection B
Teachers	83/75 %	40/89 %	43/66%
Postgraduate	78/71 %	43/96 %	35/54%
Undergraduate	42/38 %	30/67 %	12/18%
Total number of clues	110	45	65

These findings could imply that the bodily experience of the subjects in the experimental group makes a difference in helping them to access the representations in the mental world, but more issues need explaining: primarily, what are the links between the contextual situation and integrative embodiment, and coherence? How does the image schema in the interpreter's mind work to help make sense of semi-embodied concepts? In comparison with any other section, the subjects achieved more of these coherence clues for both groups with and without the embodied experience. The issues arise from this: why is it comparatively easier to make sense and establish coherence in the section of semi-embodied concepts? The answer to this

question seems to point to the fact that the semi-embodied information may be general and broad from image schema perspective, but this needs further discussion with reference to the detailed corpora in the following chapter. In addition, how is the inferential ability facilitated or constrained by the interactive embodiment? In other words, does the interpreting subjects' interactive embodiment help them to activate their working memory?

The comparison of the results between the undergraduate interpreters and other groups in the experimental group is significant, in that the undergraduates in the experimental group not only did much better in following coherence clues than their peer group (47%, as mentioned above) but also nearly caught up with the experimental postgraduates (2% less), and attained the same coherence clues rating as the teachers (up to 85%). Can this point to the hypothesis (Section 5.1) that, the embodied experience can compensate for the deficiency in language competence? All the issues mentioned above are left to further explanations behind the data in the following chapter.

6.2.2 The section representing embodied concepts

This section includes coherence clues in matching steps in relation to the structure (S8) and fixing steps of the shiatsu equipment (S10-S15). This section overlaps with the interpreter trainees' previous bodily experienced stage of the activation and construal, by their experience of setting up and trying out the device (Section 5.1), analyzed from the propositional model. Tables 14 and 15 below show the number and percentage of coherence clues which the two contrastive groups attained for the embodied section, suggesting that the exposure to bodily experience process makes its significance felt in interpreting performance through the embodied activation and construal procedure, especially when the two contrastive groups were compared with each other. The outcomes show that the experimental group succeeded in tracking more coherence clues than the control group, on the grounds that the experimental group matched the coherence clues more than the control group in terms of the paired

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teachers' group (14% difference), and the paired postgraduate group (34%), and especially the paired undergraduate group, for which the difference was 43%:

Table 14 The experimental group: number and percentage of coherence clues attained in the section representing embodied concepts

Group	Number/% out of total	Number/% in subsection A	Number/% in subsection B
Teachers	89/52 %	77/67 %	12/22%
Postgraduates	119/70 %	96/83 %	23/42 %
Undergraduates	116/68 %	98/85 %	18/12%
Total number of clues	170	115	55

Table 15 The control group: number and percentage of coherence clues attained in the section representing embodied concepts

Group	Number /% out of total clues	Number/ % in subsection A	Number/ % in subsection B
Teachers	64/38 %	56/49 %	8/15%
Postgraduate	61/36 %	47/41 %	14/25%
Undergraduate	42/25 %	28/24 %	14/9 %
Total number of clues	170	115	55

In addition, the postgraduate group still takes a slight lead in attainment (2%) over the undergraduate group and even over the teacher's group (18%) in the experimental group. The outcomes of the experimental group basically coincide with those of the previous embodied activation and construal stage, in terms of coherence clues rating achieved by the different individual groups. Can it suggest: more embodiment, more understanding, and more coherence? At this point, more issues arising from this data will need to be investigated by referring to the corpora in the forthcoming chapter. Primarily, can the interpreter's embodied experience compensate for the deficiency in language competence? How can the interpreter rely on the embodied mental structure as the mappings to bridge reference and inference for coherence? In other words, do these findings suggest that the subjects with embodied experience have formed such embodied structures as frame and script, by having the action sequences projected and mapped in their minds due to the fact that this group had gone through the embodied activation and construal? In short, does the interpreting subjects' interactive embodiment help them to achieve coherence in interpreting each section?

It is also interesting to observe the two contrastive groups separately. Table 14 shows the coherence clues ratings achieved by the control group, who have not undertaken any bodily experience procedures. Under the non-embodied condition, the teachers' group ranks in the top place overall in achieving coherence, that is, 3% above the postgraduates group and 22% above the undergraduate group. But when we have a close look at subsection B, the non-embodied level, the teacher's group achieved 10% more coherence clues than the postgraduates and 1% more than the undergraduate group. In short, in the case of the non-embodiment level, regarding the overall interpreting performance, the experienced teachers could use their academic background to facilitate their interpreting, but when it comes to the less prominent or salient concepts, academic experience does not necessarily confer much advantage. This is further evidenced in the data in Table 13, which shows that, having undergone their bodily experience, the postgraduates and undergraduates improved their interpreting performance more than the teacher's group; the postgraduates achieved 70% of coherence clues, the undergraduates 68% while the teacher's group only 52%. Therefore, it is worth discussing this phenomenon in the following chapter: in the condition of non-embodiment, experience and academic background knowledge may play a role in achieving coherence, while, in the embodiment context, bodily experience makes a fundamental difference. And also, with the same degree of difficulty in terms of the speech material, and on the basis of embodiment, novices might do as well as the experienced, even if not better. Could it be assumed that interpreting courses or programmes for Chinese undergraduates can be offered, provided that embodied cognition is taken into their teaching modules?

In addition, further investigation of this phenomenon is required by combining the corpora with the theoretical framework of this study, which posits that the embodiment-based frames and scripts underlie the interpreter's performance to help to achieve coherence, and that when interpreters have the propositional mental structure and image schema they could have easy access to the local coherence clues, and the interpreter is able to bridge reference and inference for local coherence, since a chain

of mental links are projected into their working memory, by metaphorical processing, in a form of the schema, such as the container, the part-whole, the link, the centre-periphery and the source-path-goal (Lakoff 1987: 272-275), (reviewed in Section 4.2.2, and discussed in Section 7.2.2). The next issue to be discussed by combining the corpora is: how the interpreting subjects, on the basis of their existing bodily experience, processed the previous relevant construal elements into a part of working memory, and how they facilitate the current construal along with the functional web activated by the current words in integrating the embodied experience and interpreting through working memory (Section 3.5)? Following this line, it is necessary to note: how are verbs related with the whole situation, and could make some aspects more prominent and salient cognitively (Fillmore 1982, 1985), rather than logically or grammatically (Langacker 2000: 331, 359)? The issue arising from this finding will lead to a discussion: how will the interpreter's bodily experience affect her skills, such as anticipation, compensation, coordination and judgment?

6.2.3 The section representing non-embodied concepts

This section includes sentences 16 to 19; segments 34 to 43 (see Section 5.1). It represents non-embodied concepts and includes the type of knowledge which is far from the core of the direct embodiment (for instance, *warnings* on application of the shiatsu massager), which is more or less abstract (Subsection A), including the subject matter-based knowledge such as technical terms and numbers (Subsection B), defined by Wang (2006, Section 4.5.4) as background knowledge, which is unconventional and unpredictable in communication.

Tables 16 and 17 show the number and percentage of coherence clues attained by the two contrastive groups for this section based on non-embodied concepts. The experimental group again attained more coherence clues than the control group, with the teachers' group attaining nearly twice as many coherence clues as their peers group (50 % vs. 28%), the postgraduate group attained 19% more than their peer group (56% vs. 37%), and most strikingly, the undergraduate group's success in

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following coherence clues was 52% times higher than that of its peer group (64% vs. 12%):

Table 16 The experimental group: number and percentage of coherence clues attained in the section representing non-embodied concepts

Group	Number/% out of total clues	Number/ % in subsection A	Number/% in subsection B
Teachers	74/57 %	61/53 %	13/43%
Postgraduates	73/56 %	62/54 %	11/37 %
Undergraduates	83/64 %	73/63 %	10/33 %
Total number of clues 130		100	30

Table 17 The control group: number and percentage of coherence clues attained in the section representing non-embodied concepts

Group	Number/% out of total clues	Number/% in subsection A	Number/% in subsection B
Teachers	37/28%	30/26 %	7/23%
Postgraduate	48/37%	41/36 %	7/23%
Undergraduate	16/12 %	15/13 %	1/3%
Total number of clues 130		100	30

The issue which needs to be discussed in the forthcoming chapter is: has the embodied activation and construal helped the subjects with bodily experience to form a basic mental structure? Further, does this basic mental structure facilitate inference to achieve coherence (even though the interpreting outcome is not satisfactory in terms of the matching rate of coherence clues overall)? However, in comparison with the two previous sections of the semi-embodied concepts and embodied *concepts*, the interpreting performance of this section is the weakest link with respect to both experimental and control groups, in terms of the actual numbers of clues tracked. It is clearly the biggest obstacle in interpreting. The question arising from this finding will be further addressed by combining this theoretical framework and the corpora. The lack of specialized knowledge of what is being interpreted is the impeding factor which prevents the speaker from inferencing or bridging the reference for coherence; and the inactive, changeable and unpredictable information in the discourse is problematic for the interpreting subjects. Tables 16 and 17 show, even though the

technical terms had been distributed to the subjects before interpreting task, the outcomes of the two contrastive groups do not appear satisfactory. The technical terms and numbers in subsection B are the weakest links in the weak chain of the non-embodied section: the teachers in the experimental group only followed 27% of these and their peer group only 20%; the other two groups were worse.

At this point, my curiosity leads to a closer look at how subjects interpreted the technical terms and numbers in subsection B, as Table 18 shows below. The technical terms include *PVC guide, AC main outlet, short circuit,* and the numbers include *230 volts, 30 pounds*, and *69 pounds*. I focus on the teachers in the experimental group for examination. Table 18 below shows the accuracy in numerical and technical data rendered by the teachers' group. In terms of numbers, the findings show that the larger the number is, the more difficult it is for interpreting, and numbers are more difficult to render if more than two numbers are put together in a speech discourse:

Table 18 Accuracy in numerical and technical terms achieved by the teachers in experimental group

Serial No.	Numerical	T^1	T^2	T^3	T^4	T^5
41	30 pounds	ok	missed	ok	ok	ok
42	69 pounds	ok	missed	wrong (96)	wrong (68)	wrong (60)
27	230 volt	wrong (200)	wrong(220)	ok	ok	missed
	Tech-terms					
27	AC main outlet	missed (AC)	missed (AC)	missed (AC)	missed (AC)	missed (AC)
38	Short circuit	missed	missed	ok	missed	missed
19	PVC guide	ok	missed	ok	missed	missed

With respect to technical terms, only the general concepts could be presented (e.g. main outlet), but the specific terms (e.g. AC) are usually missed. The issue, arising from this for further discussion in combination with the specific corpora, is: could the interpreter's bodily experience help her to form frame knowledge and facilitate the inferencing process for the experimental group? In addition, regarding interpretation of numerical and technical terms, the issue arising from this finding for further discussion is: If 'the technical words are closely connected with learning the subjects and may present conceptual difficulties' (Jordan 1997: 152), should the interpreter be equipped with enough knowledge of the subject matter or popular science to be specialized in their interpreting career as Dillinger asserts (Section 3.4)? Further, are

numbers, names and terms, as Setton (1999: 253) claims, typical items which are difficult to associate into the mental model, and vulnerable to error or omission in interpreting? Following this question, more crucial issues to be discussed in the following chapter are: how can interpreter trainees be helped to build up the required knowledge or to comprehend the abstract concepts by metaphoric and metonymic processing? In other words, how can interpreters fulfill tasks involving more complex and specialized subject matters?

In order to find out how metonymic processing is reflected in interpreting the abstract or non-embodied information, I purposely analyzed the synchronicity of two subjects, an undergraduate and teacher with bodily experience, as Table 19 shows below. The corpus for synchronization is based on an undergraduate and a teacher. The accuracy of audible synchronization is guaranteed on the grounds that both the source speech of the Speaker and the interpretations of the subjects were stored separately in the master memory of the control panel, and their recordings automatically proceed without any margin of error for timing. The audio data in Table 19 is taken from the speech, starting from 3 minutes, 21 seconds to 4 minutes 12 seconds. A word-for-word Chinese gloss accompanies the English input test, including a few Chinese particles (e.g. *de*/地 an adverbial particle), and other language specific features without transparent equivalents in English (e.g. *yao/*要an auxiliary conditional marker; *yixia/*一下 an adverbial auxiliary phrase; *ba/*把 a preposition particle).

These results showed more detailed findings. The subjects start a bit slowly to follow up the thread of Speaker's ideas, with the undergraduate's EVS (ear voice span) from 7 to 8 seconds, and teacher's EVS from five to six seconds. When moving into the right track of the ideas thread of the Speaker, they both can keep nearly in a synchronic step with the speaker, up to 1 to 4 seconds EVS. In particular, the teacher appeared more professional than the undergraduate in anticipating and generalizing information:

Table 19 Synchronization: interpretations of the non- embodied section rendered by UG⁺¹ and T⁺¹ with gloss

ST S16: Always remember 03.21 to store it properly@03. 23 Place the appliance in its box or in a safe, dry, and cool place 03.29 + @

UG⁺¹ 接下来 我给大家 说一下注意事项 03.29 把它放到一个适当的位置 03.31 让它干燥 以及不要太潮湿的环境 03.35
Following, I to everyone say (yixia) warnings. with it put to a proper place let it dry and not too damp environment

T⁺¹ 记住 一定 要 把它 放在 安全，凉爽 的地方 03.25
Remember must (yao) with it put in (a) safe, cool (de) place

S17: Water or any liquids 03.33 that come into contact with the appliance03.35 are dangerous@03.36

UG⁺¹ 记住 不要让它以水， 以及液体接触 03.39 因为这是很危险的 03.40
Remember not (yao) let it with water, as well as liquid contact because this is very dangerous

T⁺¹ 不能够让水和任何液体进去 03.31
Not can let water and any liquid come in

S18: Avoid contact with sharp edges or pointed objects 03.41 which might cut or puncture the fabric surface. @03.43

UG⁺¹ 在此大家 注意 不要让他接触锐利的东西 03.45 它会损伤座椅 03.46
In here everyone pay attention not (yao) let it contact sharp (de) things it will damage (the) chair.

T⁺¹ 再一个 不要放到锐利东西的旁边 03.38
Another thing not (yao) put to sharp things (de) side

S19: To avoid breakage, 03.46 ₊ DO NOT wrap the power cord around the appliance ₊ 03.50 S20: DO NOT hang the unit by the cord+ @ 03.52 This will cause short circuit 03.55

UG⁺¹ 以及不要把这个线 环绕 在椅子上 03.52 更 不要把 它吊 起来 03.53 这样都会减少它的寿命 03.57
And not (yao) with this wire wrapped around this chair what is more not (yao) with it hang up this all will reduces its life

T⁺¹ 不要拉扯电线， 这样会把店子弄坏 03.50
Not (yao) pull or tear (the) wire this can (ba) (the) cushion damage

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S21: @ Ladies and gentlemen03.57, you could have it now at- 30 pounds 04.00. In John Lewis, Edinburgh 04.02, it costs- 69 pounds04.04@ If you are interested, feel free to try the Shiatsu massager again04.10 before you buy it.04.11 + Thanks

UG⁺¹ 生们女士们 03.58 你现在就可以得到它 @30 英镑的价格就可以把它带回家了 04.01 或者你花 60 英镑-如果你在国外 在 英国买它，大家可以试坐 一下在 买它之前 04.11
Gentlemen, ladies You now (jiu) can get it 30 pounds price (jiu) can with it take home, or you spend 60 pounds – if you (are) abroad, in UK buy it everyone can try it @ yixia before buying it

T⁺¹ 先生们女士们 你们现在就可以购买，只需 30 英镑 04.00 而在英国哪 需要 69 英镑 如果你想的话，可以再试一下 04.12
Gentlemen, ladies you now (jiu) can purchase only need 30 pounds but in UK (na :auxiliary) need 69 pounds if you want, can again have a try

This could show how the experimental subjects used metonymic mental processing for non-embodied abstract information. This will be further discussed in Section 7.2.3. However, the size of the corpus is not large enough; the metaphorical processing of abstract concepts has not been tracked in the data. In other words, how the interpreting subjects use metaphorical processing as an extension to understand abstract concepts has not been dealt with in the present corpus. This problem will further be discussed in Chapters 7 and 8 as a crucial part of future work.

6.3 The overall results: the role of the interpreter's bodily experience and the mental effort reflecting the textual structure

On the basis of the existing outcomes, we will summarize the role of the interpreter's bodily experience, in particular, to address the second research question: How does the interpreter's mental effort expended in achieving coherence reflect the textual structure of the source text (ST)? The answers to the two questions are found through the following results of the total outcomes of the two contrastive groups. Tables 20 and 21 below show the total results of the two contrastive groups in terms of the number and percentage of coherence clues which each total group of teachers, postgraduates and undergraduates followed for each section. The findings in the two tables below show that, as in all the previous sections, the subjects in the experimental group succeeded in following more coherence clues than those than the control group. Both contrastive groups achieved the highest level of coherence in the semi-embodied section, 85% for the experimental group and 62% for the control group, and came down to a lower level in the embodied section, 64% for the experimental group, 33% for the control group; finally the lowest level was in the non-embodied section, 56% for the experimental group and 25% for the control group:

Table 20 Number of total coherence clues and percentage attained by the overall experimental group

Section	activation & construal	embodied	semi-embodied	non-embodied
Number&% of total clues	154 /54%	324/64%	282/85%	220/56%
Number/% in Sub. A	132/68%	271/79%	131/97%	196/65%
Number /% in Sub. B	22/24%	53/32%	151/77%	34/37%
Total number	285	510	330	390

Table 21 Number of total coherence clues and percentage by the overall control group

Section	embodied	semi-embodied	non-embodied
Number& % of total clues	167/ 33 %	203/62%	101/25%
Number /% in Sub. A	131/38%	113/84%	86/28%
Number/ % in Sub. B	36/22%	90/46%	15/16%
Total number 285	510	330	390

In order to have a clearer picture of results relating to the role of the interpreter's bodily experience, Tables 20 and 21 above are represented as the following bar chart below, Figure 21, where the first bar on the left represents the embodied activation and construal stage, only carried out by the experimental group; with respect to the other three pairs, the bar on the left indicates the percentage of coherence clues which the experimental group attained while the bar on the right represents those which the control group followed:
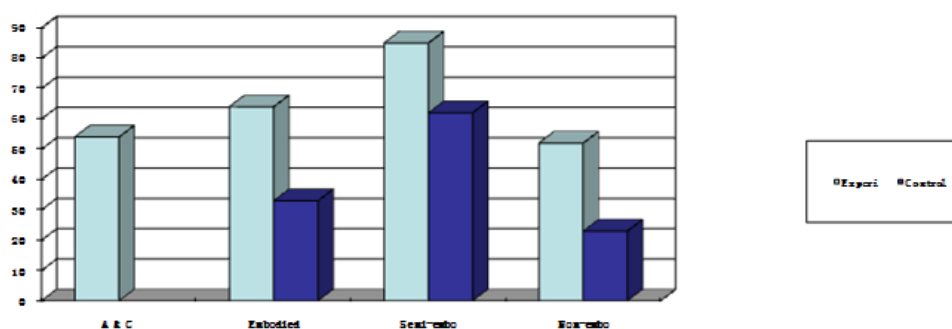
Figure 21 The data showing the role of interpreter's bodily experience

The findings suggest that, first and foremost, the interpreting subjects' exposure to bodily experience has driven them through their interpreting like a compulsive force vector, making the subjects in the experimental group achieve higher coherence rating than those in the control group. Thus, the hypothesis on the role of the interpreter's exposure to bodily experience (Section 5.1) has been verified.

Next, despite the different outcomes above, the two contrastive groups show a regular pattern of the interpreter's mental effort in achieving coherence, in terms of the textual structure. The coherence ratings stand in an inverse ratio to the mental effort: more coherence rating, less mental effort, vice versa. The findings in Figure 22 below show that, the two groups share the mental effort pattern, from the ICM perspective, indicating the relations of the coherence rating clues and the increasing mental effort spent by the experimental group (left) and the control group (right). The

best interpreted coherent section is the semi-embodied information, followed by the section representing embodied concepts, finally by the section representing non-embodied concepts, in terms of the coherence rating scale. The findings suggest that, in terms of the mental effort, the interpreting subjects spent the least mental effort on the semi-embodied section, a slight increasing mental effort on the embodied section, most mental effort on the non-embodied section. This finding contradicts the hypothesis in the Section 5.1, which assumes that the most coherent interpreted section should be the embodied section which was supposed to be the first place in the scale, and require least mental effort:

The increasing mental effort

Metaphor & Metonymy 56%	Non-embodied 25%
Propositional 64%	Embodied 33%
Image schema 85%	Semi-embodied 62%
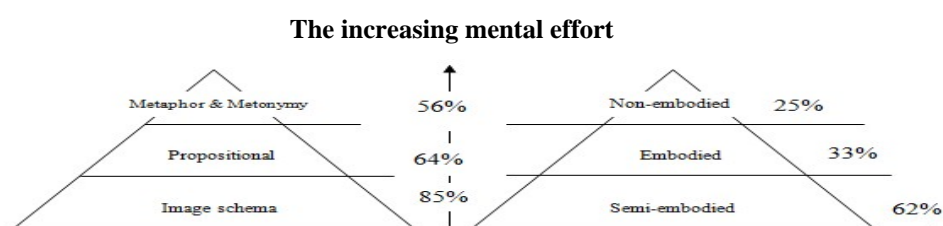
Figure 22a   ICM structure   Figure 22b   Textual structure

Figure 22 Data of the textual structure: an ICM perspective

From the ICM perspective, the interpreting subjects' mental effort reflects the texture structure of the source text (ST), which can be outlined in terms of the speech stages as follows:

a) Introducing the objective of the speech event: the interpreter's mental effort mental effort starts up its process at an easy and lower level.

b) The stage of semi-embodied concepts, analyzed from image schema perspective, including explanation of the meaning and purpose of the product being promoted: the interpreter's mental effort starts working at a stable and a low rate.

c) The stage of embodied concepts, viewed from the propositional model perspective, including briefing on the appliance's structure, explaining fixing procedures: the interpreter's mental effort starts working at an increasing level

d) The stage of non-embodied concepts, analyzed from the metaphorical and metonymic model perspective, including warnings about storage, favorable price /numerals, technical terms: the interpreter's mental effort progresses into the most demanding level.

e) Concluding remarks: the interpreter's mental process starts decreasing its effort.

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The data show a form of increasing mental effort invested in processing the semi-embodied, embodied and non-embodied knowledge in attention energy, with the embodiment playing the central role in understanding. These findings contribute to the theories of *contextual configuration* (Tebble 1994) (reviewed in Section 3.1.1) and information structure (Seleskovitch and Ledere 1986) (reviewed in Section 3.2), and the effort models (Gile 2005) (reviewed in 3.3.2). The issues arising from this finding will be discussed in combination with the corpus in the following Chapters 7 and 8, from the ICM perspective.

At this point, a question rises: how does the textual structure reflect cognitive properties in processing information from the ICM perspective, in terms of idealization, hierarchy, gradience, fuzziness and gestalt, reviewed in Sections 4.2.6 and 5.2? In other words, what do the cognitive properties suggest to the interpreter in processing information? Further, what underlies the properties? These questions will be discussed in Section 7.3. Now, this research will see how the undergraduates in the control group succeeded in their second attempt at interpreting the same text.

6.4 The second interpreting outcome achieved by the undergraduates without embodied experience

The five undergraduate subjects in the control group who were not subjected to bodily experience were asked to repeat the interpreting for a second time, but one subject (P^{-5} Table 4b) did not present his outcome due to a recording failure. We will see how the other four performed in the relevant sections, and compare their results with their four peers in the experimental group in their original interpretations. It is necessary to repeat the objectives of this repetitive group which are set out in Section 5.4.4, as follows: do all interpreters need to have physical experience of everything that could be talked about in the conference? Which parts should be physically experienced? Does the interpreter draw on some sort of indirect experience? In this section, we will be able to access only the initial outcomes of the issues, and undertake an in-depth discussion in the following chapter.

Tables 22 to 27 show the number and percentage of coherence clues attained for each relevant section based on the embodied, semi-embodied and non-embodied knowledge, by the two contrastive groups: the undergraduates in the control group, in

their first and second interpretations, and their peers of the experimental group, in their original interpretations. In the following tables in this section, first interpretation means the original interpreting performance of the undergraduates in the control group in terms of coherence clues, and second interpretation means the repeated interpretation of the same text of the same control group; the experimental group means the undergraduates of the experimental group in terms of their original interpreting performance.

6.4.1 The section representing embodied concepts

As mentioned above, Tables 22and 23 show the results of the undergraduates in the control group for their first and second performance of the interpretation, compared with the performance of their peers in the experimental group with respect to the number and percentage of coherence clues achieved for the embodied-section:

Table 22 Number and percentage of coherence clues attained by the four undergraduates of the control group in their first and second interpretations in the section representing embodied concepts

Number & % of total clues		Number //% of clues in Sub. A		Number/% of clues in Sub. B	
1st	2nd	1st	2nd	1st	2nd
34/25%	83/61%	22/24%	62/67%	12/27%	21/47%
Total number 136		92		44	

Table 23 Number and percentage of coherence clues originally attained by the four undergraduates of the experimental group in the section representing embodied concepts

Number & % of total clues	Number /% of clues in Sub. A	Number/% of clues in Sub. B
92/68%	76/83%	16/36%
Total number 136	92	44

From Tables 22 and 23, it can be seen that the control group have improved their interpreting coherence performance by more than twice as much from the first attempt (from 25% up to 61%). This suggests that a better preparation could contribute to coherence in SI. However, compared with their peer experimental group, the control group remains 7% and 26% behind in following coherence clues overall in subsection A, which may be due to the lack of the interactive embodiment process. In short, full preparedness is critical for interpreting, and the exposure to bodily experience remains the control centre to help the interpreter to achieve coherence, therefore, direct

understanding is based on embodiment, and needs to be physically engaged for making sense, and embodiment helps to extend indirect understanding. An interpreter needs bodily experience for direct understanding to facilitate her sense making process, in that she uses her bodily experience as a foundation to access the indirect understanding (an initial answer to the questions raised at the introduction of this section: do all interpreters need to have physical experience of everything that could be talked about in the conference? Which parts should be physically experienced?). In addition, an interesting finding is that with respect to subsection B, the accurate coherence clues attained by the undergraduates in the control group the second time are 11% higher than those originally achieved by the experimental group. This shows that the obscure and minor aspects of cognition are easily ignored by the experimental group, and full preparation, or rather imagery capacity contributes to comprehension and coherence in the indirect understanding. These findings will be further discussed in Sections7.1 and 7.4.

6.4.2 The section representing semi-embodied concepts

Tables 24 and 25 below show the results achieved by the undergraduates in both control (in first and second interpretations) and experimental groups, indicating the number of coherence clues attained for the section representing semi-embodied concepts:

Table 24 Number and percentage of coherence clues attained by the four undergraduates of the control group in their first and second interpretations in the section representing semi-embodied concepts

Number & % of total clues		Number /% of clues in Sub. A		Number/% of clues in Sub. B	
1st	2nd	1st	2nd	1st	2nd
35/40%	75/85%	30/83%	36/100%	5/10%	39/75%
Total number 88		36		52	

Table 25 Number and percentage of coherence clues originally attained by the four undergraduates of the experimental group in the section representing semi-embodied concepts

Number &% of total clues	Number /% of clues in Sub. A	Number/% of clues in Sub. B
76/86%	35/97%	41/79%
Total number 88	36	52

Just as in the embodied section, the overall interpreting coherence performance of the

undergraduates in the control group has been enhanced to over twice their original level from 40% to 85%, but still 1% less than that of their peers in the experimental group; specifically, 83% to 100% (3% higher than their peer group) in terms of subsection A, and from 10% to 75% (4% less than their peer group) with respect to subsection B. This finding further shows that the information which is closer to bodily experience is easier to retrieve than that which is further and remote from bodily experience, thanks to the imagery capacity. As the theoretical framework postulates, the information at the interface between the propositional mental structure and metaphoric and metonymic processing is general and broad, therefore easier to follow especially when imagination and inference is fully applied, and there is bodily experience to draw on. In other words, an interpreter who is fully prepared can achieve more coherence than her peer who is not fully prepared, on the grounds that she can use her imagination and inference for some sort of indirect experience, in order to make sense and build coherence, and bodily experience still plays a role of control centre for the most sufficient coherence (an initial answer to the questions raised at the introduction of this section: Does the interpreter draw on some sort of indirect experience?). This will be discussed in detail in Section 7.4.

6.4.3 The section representing non-embodied concepts

Tables 26 and 27 below show the results of both undergraduate interpreters in both control and experimental groups in the number and percentage of coherence clues achieved in the section representing non-embodied concepts. The undergraduates in the control group have also enhanced their overall performance from 15% to 48%, but this is still 16% less than their peers in the experimental group. Regarding subsection A the coherence clues attained by the control undergraduates are still 19% less than those tracked by the experimental undergraduates:

Table 26 Number and percentage of coherence clues attained by the four undergraduates of the control group in their first and second interpretations in the section representing non-embodied concepts

Number & % of total clues		Number /% of clues in Sub. A		Number/% of clues in Sub. B	
1st	2nd	1st	2nd	1st	2nd
16/15%	50/48%	15/19%	45/56%	1/4%	5/21%
Total number 104		80		24	

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Table 27 Number and percentage of coherence clues originally attained by the four undergraduates of the experimental group in the section representing non-embodied concepts

Number & % of total clues	Number /% of clues in Sub. A	Number /% of clues in Sub. B
67/64%	60/75%	7/29%
Total number 104	80	24

In addition, this result further shows that the non-embodied section, or rather, the concepts and language which are remote from bodily experience or perception, including technical terms and numbers, are the most challenging parts for interpreting, from 4% the first time and 21% the second time. How to further address this issue and offer solutions is to be discussed in Section 7.4.

It is time to go back to the questions at the introduction to this section: do all interpreters need to have physical experience of everything that could be talked about in the conference? Which parts should be physically experienced? The findings initially show that not everything needs to be experienced, but the bodily experienced concepts which play the role of control centre in achieving coherence, such as related actual components and operational process, should be embodied or experienced physically, helping to activate and construe the propositional mental structure. And then: Does the interpreter draw on some sort of indirect experience? Yes, her imagination might work to help her to make sense by using indirect experience; this really makes a difference regarding the semi-embodied discourse. However, the directly embodied experience will determine the effect of indirect experience. Ultimately, how are these issues handled in an interpreting training programme? These questions will be discussed further in the following Section 7.4 on the application of this study – an ICM-based interpreting training programme.

6.5 Concluding remarks

If this theoretical framework is correct, and the assumptions of the experimental conditions are justifiable as described above, then in the context of my experiment the following results would be expected. Firstly, from the results of the embodied activation and construal stage before interpreting, I have found that the subjects in the experimental group succeeded in achieving coherence clues more in the prominent and salient aspects of the shiatsu device than in the obscure and minor aspects, also

that the undergraduates did slightly better than the teachers, and the postgraduates ranked in the first place in tracking the coherence clues.

Secondly, I have presented comparisons of the performance of the different groups in following coherence clues with and without embodied experience in their interpreting, by comparing performance in the specific text segments and providing quantitative indicators. First and foremost, on the basis of the findings in the sections representing embodied *concepts*, semi-embodied and non-embodied concepts, the interpreting subjects with exposure to their bodily experience achieved a higher coherence rating than those in the control group. The first hypothesis on the role of the interpreter's bodily experience has been verified (Section 5.1). In addition, in terms of the experimental group, the postgraduates and undergraduates achieved higher coherence ratings than the teachers, but regarding the control group, the teachers achieved higher coherence clue ratings than the postgraduate and undergraduate subjects. One striking piece of data is that the non-embodied concepts are the weak links in interpreting, in particular, the numbers and technical terms.

Thirdly, I found that, in terms of the coherence ratings scale, the best interpreted coherent section is the semi-embodied information, followed by the section representing embodied *concepts*, finally by the section representing non-embodied concepts; accordingly, in terms of the scale measuring the interpreting subjects' mental effort, the interpreting subjects spent the least mental effort on the semi-embodied section, a slightly increasing mental effort on the embodied section, and the most mental effort on the non-embodied section, suggesting the interpreting subjects' mental effort expended in achieving coherence reflected the textual structure in terms of its content difficulty. The second hypothesis on the interpreter's mental effort (Section 5.1) has been contradicted and re-modified, which will be discussed in the following chapter. Finally, in order to explore such relevant questions as how the preparation works without embodied experience, the undergraduates in the control group were asked to interpret the same material for a second time. The result shows that the full preparation works effectively by means of the interpreting subjects' imaginative capacity, but not as well as bodily experience in helping to achieve coherence.

This chapter has described the key characteristics of the body of data relating to the research questions. However, the initial findings seem to be far from adequate to

provide either interpretations or the solutions to all the issues arising from the results, as discussed above , due to the small size of the corpus, only percentage results were used to indicate trends rather than show what results reached statistical significance, this will be discussed in Chapter 8. Therefore, the results of this chapter have only built up a framework for further exploration, so let us move on to Chapter 7, Discussion, bearing in mind all the issues arising from the results.

Chapter 7 Discussion

The previous chapter has described the data and findings which have initially addressed the research questions: a) Does the interpreter's relevant bodily experience help her to achieve coherence? b) How does the interpreter's mental effort expended in achieving coherence reflect the textual structure of the source text (ST)? The preliminary findings show that the interpreting subjects who were immersed in interactive embodiment prior to interpreting have achieved more of the coherence clues than those who were not, in their simultaneous interpreting (SI). The interpreters' exposure to interactive embodiment influences their performance in achieving coherence in the different sections representing semi-embodied, embodied and non-embodied concepts. The results in the previous chapter also suggest a more specific outcome with respect to the textual structure of the three sections of the source text (ST), from the ICM perspective, in terms of the coherence ratings scale: the best interpreted coherent section is the one which is based on semi-embodied concepts, followed by the section representing embodied *concepts*, finally by the section representing non-embodied concepts. In terms of mental effort, the findings indicate that the interpreting subjects spent least mental effort in processing the semi-embodied knowledge; a slightly increasing mental effort in processing the embodied knowledge; most mental effort in processing the non-embodied knowledge. The discussion develops around the two research questions, on the basis of the results presented in the previous chapter. This chapter will make an attempt at offering interpretations, comments and solutions to the issues arising from the results, in combination with the corpora.

This chapter develops with Sections 7.1 and 7.2 addressing Question (a), and Section 7.3 exploring Question (b). Section 7.1 will discuss the central role of the interpreters' immersion in interactive embodiment in helping them to establish mental coherence before interpreting. Section 7.2 will discuss interpreters' understanding of semi-embodied concepts (7.2.1), embodied *concepts* (7.2.2) and non-embodied and/or abstract concepts (7.2.3), in establishing coherence in SI, from the ICM perspective. Question (b) will be addressed in Section 7.3, which discusses the interpreter's mental effort in processing the textual structure, also from the ICM perspective. On the basis of these discussions above, in combination with the findings on the second

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interpretations rendered by the four undergraduate interpreters of the control group, Section 7.4 is designed to show the application of this research: an ICM-based interpreting training programme. Section 7.5 will establish the holistic model of coherence in SI, in terms of the origin of coherence, global and local coherence, contributing to an understanding of how coherence in SI is achieved. This discussion will be conducted on the basis of the discourse sequence, in which order of the source text (ST) develops, as described in Section 5.2 Materials, also in alignment with each section in Chapter 6.

7.1 Interpreters' immersion in interactive embodiment: a control centre for mental coherence before interpreting

In Section 6.1 the interpreting subjects of the experimental group immersed themselves in installing the shiatsu device, this bodily experience in combination with activation and construal activities helped them to build coherence throughout their interpretations, and invest more appropriate mental effort in processing the textual structure. The essential issue arising from the previous corresponding Section 6.1 is: what is the link between the interactive embodiment and coherence in SI? Initially, according to the Interpretive Theory of translation (IT), as reviewed in Section 3.2, SI has three stages in achieving coherence: (1) perception and its mental complement, (2) conceptualization and categorization, (3) interpreting output. The postulations of these three stages was supported by Lakoff and Johnson (1999: 17-43) who point out that conceptualization and categorization are shaped by the peculiar nature of our bodies, and processed in the brain.

The Embodied Cognition Paradigm in interpreting connects the interpreter with the language representations via her bodily experience, helping to broaden the view on interpreting. According to Setton (1999: xii), without links to some basic principles of cognition, interpreting studies will 'ultimately leave us with another complex descriptive nomenclature'. In other words, cognitive science provides the theoretical framework for interpreting studies. The most basic principle of cognitive science is embodiment (Lakoff and Johnson 1999: 17):

Our sense of what is real begins with and depends crucially upon our bodies,

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especially our sensorimotor apparatus, which enables us to perceive, move and
manipulate, and the detailed structures of our brains, which have been shaped by
both evolution and experience.

According to Lakoff and Johnson (1980: 77-82), this is because a bodily experience
or set of bodily experiences helps to make our *concepts* coherent by virtue of having a
mental structure. In other words, structuring the experience in terms of
'multidimensional gestalts' (1980: 81) and the correlations between them is the key to
understanding coherence in the experience and the discourse as well. Embodiment is
the core of the ICM, and the origin of coherence in interpreting, on the grounds that
the interpreter's relevant bodily experience helps her to link the related concepts. For
this reason, the interpreter should be engaged not only in interpreting skills training
but also in physical commitment to her interpreting task, especially in the case of such
applied subjects as the technical and business interpretations, as the Embodied
Cognition Paradigm requires.

At this point, let me refer back to the assumption of the Interpretive Theory of
translation (IT) (Section 3.2) on the three stages of interpreting: conceptualization,
categorization and expression. The three elements are inseparable. In completing their
embodied experience of installing the shiatsu device, and the subsequent cognitive
processing, the interpreting subjects formed categories and *concepts* through their
bodily experience. What that means is that the categories and *concepts* which the
interpreter forms are part of her experience, separating and structuring aspects of her
experience into discernible kinds. Thus, interactive embodiment helps the interpreter
to build up the basic coherence, or origin of coherence.

The subsequent issue raised by the results in Chapter 6 is: why are prominent
concepts more easily activated than subordinate or obscure ones in the interactive
embodiment in building coherence, in terms of the interpreting subjects of the
experimental group? This phenomenon is shown in the observation that, after their
bodily experience, the interpreting subjects recalled the main and significant
categories of the shiatsu device, such as *moving up and down, rotating* (69 % of
coherence clues for the teachers group, 72% for the postgraduates group, and 62 % for
the undergraduates group), but ignoring the minor or specific aspects, such as *on the
PVC guide* (13% of the coherence clues for the teachers, 27% for the postgraduates,
and 33% for the undergraduates). This issue is specifically addressed by Lakoff and

Johnson, referring to the interactive embodiment process (1999: 17-43), on the grounds that in the case of visual images, each incoming image is limited by the brain's processing capacity of what is being seen and visualized, only tending to focus on the highest or the most salient level of the perceived information. With 100 million light-sensing cells, the human eye has only about 1 million fibres accessible to the brain. Therefore, each incoming image must be reduced in complexity by a factor of 100; that is to say, information in each fibre constitutes a neural categorization of the information from around 100 cells. This sort of neural categorization exists throughout the brain, up through the highest level of categories. Following this theory, it can be assumed that the interpreting subjects of the experimental group undertook a neural hierarchic categorization of what they were physically engaged in. They tended to focus on processing the prominent and salient perceptual information which they could be aware of, such as *moving up and down*, and *rotating* next, but the least attention was given to the murky aspects, such as *PVC guides*, which exists in the bottom level of categorization. The references to neural events taking place could be further backed up by the relevant neuro-linguistic based research in future work since it was not the focus of this study at this stage.

Following the same line above, with respect to preparation for technical subject interpreting, the Interpretive Theory of translation (IT, 1986) (reviewed in Section 3.2) claims that, the interpreting trainees should acquire the technical knowledge, by virtue of comparison and observation of everyday seemingly familiar technology, from simple to complex knowledge, for instance, from the car driving to its driving system, from the television to its transmission. According to IT, exploring the depth of what is being observed is an interpreter's second nature (IT 1986) (reviewed in Section 3.2). The findings of this experiment support IT in that the interpreter should develop an acquisitive mind, given that the overall outcomes of activation and construal stage are 51% coherence clues attained by the teachers; 58% by the postgraduates and 53% by the undergraduates. The embodied cognition theory further gives an account of how this comparison and observation takes place. According to Lakoff and Johnson (1999: 17-43), the information is passed from one dense group of neurons to another through a sparse network of connections. When processing the information, the brain will start activating the pattern with a set of neurons, but cannot do this thoroughly, due to the sparse set of connections; in other words, the pattern of activation spread over the first

set of neurons is so great that it cannot be represented through a one to one mode in this sparse set of connections. Therefore, the connections automatically group certain input patterns, mapping them across to match the input and output ensembles. In this way, the brain will process the input information economically and naturally, by virtue of matching these input and output ensembles. Whenever a difference occurs between the outputs and inputs in terms of a neural ensemble, a further neural categorization will take place, resulting in more mental effort.

On this basis, the interpreter cannot mentally process the desired amount of information transferred from her perceptual system, due to the limitation of the sparse connections, but rather starts observing only the prominent aspects of what is being seen when she has the initial bodily experience, and has the input pattern projected into her mind as mappings. By means of her imaginative capacity, the interpreter will process the information smoothly when matching her mental mappings with the continuing input; otherwise she would have to spend more mental effort in processing the incoming information, due to the mismatch between her mental projections and the input ensembles in progress. Meanwhile, the interpreter needs to build up patterns of neural ensembles by constant categorization, in exploring the depth of an issue in question. Therefore, the interpreter should not only observe the physical context and object, exploring the highest level of categories, for the sake of her forthcoming interpreting task, but also consciously categorizes and conceptualizes the obscure and minor information in the bottom level of categorization by linking the relevant concepts.

Let us go back to the notion that the interpreter's interactive embodiment is the central control for her to achieve mental coherence before interpreting, on the grounds that through embodiment, the interpreter has the actual world projected into her mental world, which is the primary principle of the Embodied Cognition Paradigm in interpreting. This section is further discussed in combination with Langacker's acts of engaged and disengaged cognition (2008: 535), represented by Figures 23(a) and (b) below. Figure 22(a) below shows an act of engaged cognition, where the interpreter interacts physically and directly with something in the world (W). The interpreter effects this interaction (double arrow) through her body, primarily via her sensory and motor organs. The box labeled A indicates the role of the brain in this engagement: A is the processing activity, including the interpreter's sensory input and motor

commands, which constitutes her interactive experience. Figure 23(b) represents the interpreter's analogous mental processing which takes place without engagement during interpreting. This is disengaged cognition. In interpreting, certain facets of A, labeled A´ come to occur automatically for the interpreter, in the absence of any current interaction with the world:
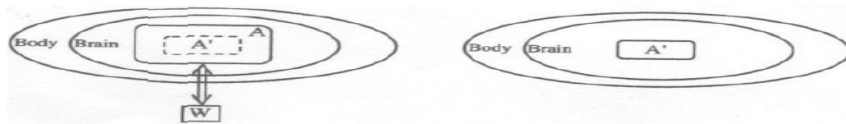
Figure23 (a) Engaged/embodied cognition   **Figure 23 (b) Disengaged/embodied cognition**
(Langacker 2008:535.Fig.14.15)

A´ is seen as a simulation of A, on the grounds that simulation is accepted as having a deep-seated role in conceptualization and cognitive semantics (Johnson 1987; Barsalou 1999; Langacker 2008: 536). By virtue of sensory and motor imagery, the interpreter can activate appropriate images – simulating the experiences they represent, to build up coherence. In addition, the interpreter relies on simulation to invoke an 'imaginary vantage point' (Langacker 2008: 536) or viewing circumstances by virtue of spoken expressions. In grasping ideas of the Speaker, or making sense, the interpreter simulates the experience and logic of the Speaker. In other words, 'Simulation is also essential for recognizing other conceptualizers and the nature of their mental experience' (Langacker 2008: 536). In understanding a speech, the interpreter has to imagine being in the Speaker's place in terms of the latter's motives, following his thread of ideas so as to construe the mental world of the Speaker via the blending space to build coherence (Figure 9, Section 4.4). Figure 24 below indicates how the interpreter and the Speaker blend in the mental spaces. The Speaker represents the source space and the interpreter the target space:
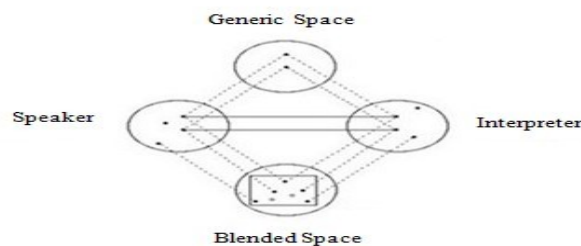
Figure 24 The interpreter and the Speaker in mental blending spaces (based on Fauconnier and Turner 2002: 7. Fig.3)

Both the Speaker and the interpreter have established a cognitive world via their interactive embodiment with the real world. They communicate for the exchange of information. The solid lines in the diagram represent counterpart connections, such as the conference purpose or theme, identities, roles, intentions and attitudes of participants. The generic space comprises the ICM and background knowledge, which is shared by the Speaker and the interpreter, and also determines the Speaker's speech contents. For the purpose of a given conference, structure from the two input mental spaces is projected onto a third blending space to determine the domain and topics of the conference. The two input spaces could be completely separated and simultaneously developed since they represent the Speaker and the interpreter as different communicators but share the same pattern of mental spaces. Speakers and interpreters are connected via their shared purpose/skopos, context and situations on this occasion, and further they are constrained by an ICM. In addition, the interpreter, in advance, will pose such questions of the conference as: what is the purpose/skopos of the conference and its time and place? What are the conference types, e.g. technological or economic? Who are the participants and what are their roles? What results do they expect to achieve? What are the problems they need to overcome to achieve the purpose? What conflicts lie in the different groups of participants? The simultaneous interpreter can creatively predict what is potentially to be expressed, and associate all relevant immediate events with the current situation to facilitate her interpreting performance. The ICM suggests that the simultaneous interpreter should be fully engaged in preparing for the coming conference. Besides what is mentioned above, the interpreter will further digest all the information available for the forthcoming conference, facilitating her output in the blending process. In terms of this study, the interpreter accesses her best understanding of the embodied knowledge by being immersed in the experience of installation of the shiatsu. This specific bodily experience is turned into her Experience in general as she incorporates this specific context of embodied experience into a broad and integrated context, which consists of the purpose of the shiatsu device, the process of its manufacture, its marketing, and all other relevant elements(Section 1.4).

This Embodied Cognition theory has developed and addressed the most critical weak point of all the theories reviewed in Chapter 2, represented by de Beaugrande and Dressler's theory on coherence, and Johnson-Laird's Mental Models Theory, on

the grounds that they have ignored the primary link between embodiment and the actual world. According to Lakoff (1999: 75-76) 'Accordingly, it seemed natural to assume that the mind could be studied in terms of its cognitive functions, ignoring any ways in which those functions arise from the body and brain'. Lakoff (1999: 76) has called the assumption of no body in the conception of mind as philosophy without flesh vs. Philosophy in the flesh. This is also where the objectivism-based SI paradigms misfire as reviewed in Sections 3.3 and 3.4.

According to Pöchhacker (1992; 2004) (reviewed in Chapter 3), Embodied Cognition is a 'new and promising path' for the direction of interpreting studies (2004: 203), but needs further exploration theoretically and experimentally. Interpreting studies is a young discipline; it has yet to reach its maturity, and it is developing in closer contact with other subjects, such as cognitive linguistics. Therefore, this study has provided a case for application of the Embodied Cognition Paradigm in achieving coherence in SI.

To sum up, interactive embodiment is the real origin of coherence. As Johnson (1987: xiii) asserts that 'Any adequate account of meaning and rationality must give a central place to embodied and imaginative structures of understanding by which we grasp our world'. Interactive embodiment serves as a control centre to access mental coherence in interpreting, and the central thread of the present discussion.

7.2 Integration: interpreting stage

In terms of IEF (Immersed Experiencer Frame) (reviewed in Section 4.5), the subjects of the experimental group have now carried out the embodied activation and construal stage, and then moved into the integration stage – the interpreting stage. We further discuss how the interpreting subjects in both the experimental and control groups have built coherence, via the sections representing semi-embodied, embodied and non-embodied concepts respectively in terms of the textual structure of the source text (ST).

In the following discussions, I basically adopt a simple random sampling method, which means that the probability or chance for each group or individual to be sampled is equal (Ma 2008: 33). I will select at random two contrastive groups at a time to compare in detail their performance over the selected section of the text.

7.2.1 Contextual situation dependency vs. semi-embodied concepts: an image schema perspective

This section ranges from sentence 1 to 7, designed to study the semi-embodied concepts, analyzed from the image schema. Sentences 1 to 4 are classified into introduction to the contextual situation (Section 5.2.1). The results in this semi-embodied section show that the experimental groups did better than the control group (85% vs. 75% for the teacher's groups; 87 % vs. 71 % for the postgraduate groups and 85% vs. 38% for the undergraduate groups). The first issue arising in Section 6.2.1 is: what are the links between the contextual situation and interactive embodiment and coherence? Tables 28a and 28b below show the interpretations of Sentence 1, rendered by experimental group (Table 27a), and the control group (Table 27b):

Table 28a Interpretations of sentence 1 to 2 by the undergraduates of the experimental group

Coherence clues: bold typed; [] omitted information; @ pause; - filled pause

ST S1: @ Good morning, ladies and gentlemen **S2:** @Welcome to our **product promotion fair** of **Hömedics. -** I am **Craig,** sales manager
UG⁺¹ 先生们女士们早上好 – (Good morning, gentlemen and ladies) 欢迎大家来到我们的**产品展销会** (Welcome to our **product promotion fair**) 我是**克瑞** –这里的销售经理 (I am **Keri**, sales manager)
UG⁺² 女士先生们早上好 –(Good morning, ladies and gentlemen) 欢迎来到这次广交会 –(Welcome to this **Guangzhou Trade Fair**) 我 –是销售经理**克莱斯** (I am sales manager, **Kris**)
UG⁺³ 女士们先生们早晨好 –(Good morning, ladies and gentlemen) 欢迎来到我们这个**产品促销会** –(Welcome to our **product Trade Fair**) 我是销售部经理克瑞 (I am sales manager **Keri**)
UG⁺⁴ 女士们先生们早上好 –(Good morning, ladies and gentlemen) 欢迎来到我们**产品的推销会** (Welcome to our **product promotion Fair**) 我是克莱恩销售部经理 – (I am **Keri-** manager of sales department)
UG⁺⁵ 女士们先生们早上好 –(Good morning, ladies and gentlemen)欢迎来到**产品促销会** –(Welcome to our **product Trade Fair**) 我是销售经理(I am sales manager)

A first close look at the superscripts shows that the interpreting subjects in both the experimental and control group seemed weak at proper names pertaining to the Speaker (Craig and Hömedics), presumably using more energy in processing, as pointed out by Gile in his Effort models (1995) (reviewed in Section 2.3), but the subjects of the experimental group rendered the two names more appropriately than the control subjects. Specifically, four out of the five interpreting subjects of the experimental group succeeded in rendering the Speaker's name, Craig; all five omitted the proper name, Hömedics, but they managed to replace it with general pronoun "我们" (we). On the other hand, as Table 28b shows, the five subjects in the

control group initially seemed constrained in following up the Speaker; the simple greetings (UG[-1]) and self-introduction (UG[-3]) were missed out; and the proper names were mostly omitted. In particular, hesitant pauses emerge in each interpreting recording, suggesting the interpreters' uncertainty and lack of confidence:

Table 28 b interpretations of sentence 1 to 2 by the undergraduates of the control groups

UG[-1] [] [] @ 我是**科瑞**销售经理- (I am **Keri**, sales manager)

UG[-2] 早上好女士们先生们-(Good morning, ladies and gentlemen)欢迎来到这个销售中心-(Welcome to this **sales center**)我是**科瑞德**销售经理 (I am **Kerid** sales manager)

UG[-3] 早上好先生们女士们-(Good morning, ladies and gentlemen) [] [] @

UG[-4] 早上好女士们先生们-(Good morning, ladies and gentlemen) 我是**科瑞德**销售经理 (I am Craig, sales manager) [] @

UG[-5] 早上好先生们女士们- (Good morning, ladies and gentlemen) 欢迎来到**家庭用品市贸会** *(Welcome to* **home commodity trade fair**) [] @

As the data shows, names can be associated into the mental model, so it is true of numbers and technical terms, as opposed to the assumption of Setton (1999: 253), as mentioned in Section 6.2.3. The truth is that interpreting names, numbers and terms need mental effort as much as Gile's mental models assume (1995) (Section 3.3.2). This will be further discussed in Section 7.2.3. Tables 29a and 29b below show interpretations of sentences 3 to 4 rendered by the undergraduates of the experimental and control group respectively. The undergraduates with bodily experience (Table 29a) have managed to make sense of the context and situation, tracking the links from the broad to specific information, following the coherence clues in the sequencing order: introducing a product→ look → shiatsu massager:

Table 29a Interpretations of sentence 3 to 4 by the undergraduates in the experimental group

ST S3:@I would like to **recommend** a @ good **product** to you. S4:+ Now **look at this** (pointing to the gadget) This is a **Shiatsu Massage Cushion**

UG[+1] 我很愿意给大家**介绍**一下我们的新**产品** (Now I would like to **introduce** our new **product**) 现在大家请**看这里** (Now please everyone **look at here**) 这是一个减压**按摩椅** (This is **a Shiatsu Massage Cushion**)

UG[+2] 现在哪-向大家**推销**一种新的**产品**(Now I would like to **market** our new **product**) 现在哪-大家**看到**的是一种**指压式按摩椅** (Now what you see is a **Shiatsu Massage Cushion**)

UG[+3] 今天-我想给大家**推荐**我们的一种**产品**(Now I would like to **recommend** our **product** to you) 这就是我们的**手指式按摩器** (This is a **Shiatsu Massage Cushion**)

UG[+4] 我想向大家**推荐**一个很好的**产品** (I would like to **recommend** our **product** to you) 大家看这里 (Look at here) 这是手指试按摩垫 (This is a Shiatsu Massage Cushion)

UG[+5] 我要向大家**推荐**一款好**产品**(I would like to **recommend** our **product** to you) 大家来**看看这个** (everyone **Look at this**) 这是一个手**指式按摩垫** (This is **a Shiatsu Massage Cushion**)

They appear assured and fluent in the interpreting processes without long and hesitating pauses, showing that their mental effort is used appropriately towards these semi-embodied concepts which are general and broad. On the other hand, the five undergraduates without bodily experience have tracked the basic coherence clues, but they appear unenergetic, hesitant and uncertain in interpreting, and use more effort than they should at this stage, in order to catch the coherence clues, even though the control group had been informed of the context of situation as had the experimental group:

Table 29b Interpretations of sentence 3 to 4 by the undergraduates in the control group

UG-1 我 要 向 你 们 **介 绍** 一 档 **产 品** (I would like to **promote** this **product** to you) 请 观 **看** 一 下 (please have **a look**) 这 是 一 款 手 指 式 按 摩 机 (This is a **finger like Massager**)

UG-2 [ ] **看** 一 下 **这 个** (Now **look at it**) 这 是 一 个 **手 指 式 按 摩 器** (This is a **finger like Massager**)

UG-3 我 给 你 们 **介 绍** 一 种 新 的 **产 品** (I would like to **introduce** a new **product**) **看 这 个 产 品** (Now **look at this product**) 这 是 一 个 **手 指 式 按 摩** 器 (This is a **finger like Massager**)

UG-4 这 对 你 来 说 **是** 一 个 和 那 很 好 的 **产 品** (**This is** a good **product** to you) **看 看 这 个** (look at this) 这 是 一 个 **按 摩 器** (This is a **Massager**)

UG-5 今 天 ， 我 给 你 们 **介 绍** 一 种 新 **产 品** (Today I would like to **introduce** a new **product** to you) **看** (**look**) 这 是 一 款 **手 指 式 按 摩 式 的 垫 子** (This is a **finger like massager**)

The significance of the contextual situation varies with or without any interactive embodiment for the interpreting subjects, thus providing a criterion for the differentiation of both groups with and without bodily experience. On the basis of the data above, I attempt to explain what is observed from the view of both Systemic Functional Linguistics (SFL) (Section 2.1) and embodied cognition on contextual situation based coherence. This section can be summed up as follows: the Speaker, Craig, the sales manager from Hömedics starts with the account of the social context or environment (Guangzhou Trade fair) where meanings are being generated:

Field of discourse: the skopos/purpose – promoting the shiatsu massager, introducing how to use it and warnings against misuses.

Tenor of discourse: the product promoter and the potential customers.

Mode of discourse: speech delivered by mono-lingual: English; the process of creating the discourse is via spoken medium. Channel: - phonic; - signed.

From the Embodied Cognition perspective, I again use Langacker's reference point relationships (1991: 170; 2008: 504) (reviewed in Section 4.7.1; Figure 11), so as to show how the interpreter constructs her path of mental access. Figure 25 below illustrates the way the experimental interpreter as the conceptualizer (represented by C) establishes the path of mental access to make sense and build coherence. Having been engaged in the embodied activation and construal stage, the interpreting subject will start up her mental progression by following the domain (D) – promotion of product, further narrowing down on shiatsu massager – the reference point (R), and tracking the chain of relations of target (T):
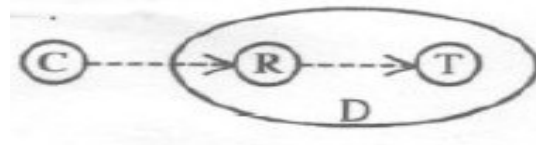
Figure 25 Path of mental access of the interpreter (Langacker 2008: 504. Fig.14.1)

Mental Models theory (MMT) (reviewed in Section 2.3) emphasizes two non-verbal aspects of discourse coherence; one is the contextual situation, the other inference. The interpreting subjects in the experimental group have formed the image schema of the shiatsu massage promotion in the Guangzhou Trade Fair. This image schema consists of simple and basic cognitive structures, derived from their embodied interaction with the physical context. On the other hand, the control group, without this embodied activation and construal stage, seemed constrained and less motivated in building coherence links. In short, interpreting is heavily situation-dependent, and the exposure to bodily experience helps the interpreter to facilitate inferential ability in achieving coherence, on the grounds that embodiment supplies the additional signaling required for the interpreter to build coherence. The idea is that, by experiencing installation of the parts and shiatsu device, the interpreting subjects in the experimental group had acquired some embodied structure and image schema of the context, in other words, they had established relationships which they could apply to other instances of this locative relation. This supports the assumption of the

Interpretive Theory of translation (Section 3.2), in attaching importance to the context and situation. The situation falls into both visible and invisible categories, including what we see, i.e. gestures and facial expressions, and all the factors relevant to the speech and all elements perceived and imagined in the conference.

The embodied context and situation might help to infer the elements and signs, which are indicated by the Speaker, for instance, the purpose or motive of the meeting: promotion of the shiatsu massager. The interpreting subjects of the experimental group could use their creative potential to anticipate possible ideas, direction and terms of the speech. This anticipation will help the interpreter to build up her cognitive context and coherent links. On the other hand, without bodily experience, the subjects in the control group appeared to have been less motivated or uncertain in the on-going interpreting task because they had not been singled out to have the interesting experience of the experimental group. According to the Mental Space Blending theory (Section 4.4) it can be assumed that the interpreting subjects with bodily experience had blended what they experienced in the contextual situation, including the purpose/skopos, domain, reference and targets. Experience has a very rich and broad sense, on the grounds that it includes not only basic perceptual, motor-program aspects but also emotional, social and linguistic dimensions (Johnson 1987: xvi). It is this interactive aspect of embodiment that helps the interpreter to make an effective sense of the contextual situations, thus building up coherence for what is to be interpreted.

Let us further discuss the corresponding questions arising from Section 6.2.1: What are the relations between semi-embodied concepts and image schemas? Why does it seem comparatively easy to make sense and establish coherence in the section representing semi-embodied concepts, compared with any other sections representing embodied and non-embodied concepts?

Tables 30a and 30b below show the interpretations from sentences 5 to 7, rendered by the five postgraduates in the experimental group (30a) and the five teachers in the control group (30b). Sentences 5 and 6 are included in Subsection B, explaining the Japanese word, shiatsu and its purpose; while Sentence 7 is categorized into Subsection A, including the testing of the listeners' feelings about the bodily massage. This classification is based on the assumption that Subsection A is closer to embodiment than Subsection B (Section 5.2):

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Table 30a Interpretations from sentence 5 to 7 by the postgraduates in the experimental group

Postgraduates in the experimental group

ST S5: @As you know, *shi* in Japanese means **finger** - and *atsu* means **pressure**, put **them** together and you've got Shiatsu; - meaning '**finger pressure**'

PG⁺¹正如你知道，这个-这个在日语名字是手指的意思。*Shiatsu*是压力 (As you know, *this*-in Japanese means finger, shiatsu **pressure**) 把它们放在一起，就是手指的压力和按摩 (Put *them* together, (it) means *fingerlike massage*)

PG⁺²众所周知呢，*shi*在日语里意为手指；*iatsu*意为按摩 (As you know, *shi* - in Japanese means **finger**, *iatsu* means **pressure**)

把它们和在一起，就是手指式按摩意思 (Put *them* together, (it) means *fingerlike massage*)

PG⁺³大家都知道，**shi**用日语来解释是手指，*iatsu*在日语里是按摩 (As you know, *shi, in* Japanese means **finger**, *iatsu* means pressure) 把它们放在一起，就是*Shiatsu*，意思哪就是手指式按摩 (Put *them* together, (it) means *finger massage*)

PG⁺⁴正如你知道的，**shi**在指手指；**atsu**是指手指的压力 (As you know -*shi* in Japanese means **finger**, **atsu** means **pressure**) 把它们放在一起，就是指手指的压力 (Put *them* together, (it) means *finger massage*)

PG⁺⁵大家知道，*shi*在日语里意为手的意思- *iatsu*是'按摩 (As you know, *shi, in* Japanese means **finger**, **atsu** means **pressure**) 那么，**shi+atsu**组合在一起，就是说用手指式按摩 (Put **shi** *and atsu* together, (it) means *finger massage*)

S6: + In this day and age of **bad backs**- due to **much office work**, **labor** and **sitting too long for your studies, Shiatsu Massager** is the perfect **relaxation gadget** for every occasion

PG⁺¹+当今社会，大家工作压力非常繁重，-+ (cough) 繁重的工作和学习 (Now in today's society everyone is under **work pressure**, too much **work** and **study**) 常常需要大家身心放松 (Often one needs **relaxation** and **massage**)

PG⁺²在这个时代中间呢，大家都在办公室坐着，工作的太久，有时候会觉得腰酸背痛 (Now in today's time everyone is **working in office**, working **too long**, feeling **backache**) 那么，可以用这个按摩垫可以帮助你舒展一下筋骨 (So you could use this massage cushion to **stretch your back**)

PG⁺³现在哪，由于过多的办公室工作都会造成大家背疼 (Now much **office work** gives rise to **backache**) 所以我们这个手指式按摩垫就是专门针对这种办公室背疼，或者对这个有所帮助 (So our **shiatsu massager** is designed for backache, hoped to **be of some help** for this)

PG⁺⁴现如今，由于在办公室呆的时间太长，背部压力很大，所以造成很多背部问题 (Nowadays much **office work** gives rise to **backache**) 而这款产品能够很好地缓解这种背部压力 (So our **shiatsu massager** is designed to **alleviate this back pressure**)

PG⁺⁵在如今过多的案牍工作当中，+ - (Now, due to much office work) 手指式按摩椅是你解除工作劳累的一个很好的器械 (This shiatsu

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Massager is a good device to alleviate your fatigue from work)

ST S7:+ Just now all of you have sat on it and have had a positive personal **experience**. **How** do you **feel** about it? @

Comfortable? +@ Yes, - I think you will **agree**. +

P G[+1] 刚才，你们都已经坐在我们垫子上进行了**体验**，- (Just now, you were seated on our cushion and have had **experience**) How- 你们感觉如何哪？ (**How** do you **feel**?) 我想大家感到**非常的舒适**吧？ (I think you will **feel comfortable**)

P G[+2] 刚刚哪 - 大家 - 已经**尝试**过了这个按摩垫，已经享受它了 (Just now, you were **seated on our cushion** and have had **enjoyed** it) 感觉怎么样？ (**How** do you **feel**?) **舒服**吧？ (**Comfortable**?) 我想大家会觉得**非常舒服**的 (I think you will **feel comfortable**)

P G[+3] 你们大家都已经坐在这个按摩垫上了，你们可以**亲身经历**这个垫子 (Just now, you were seated on our cushion, and have had **personal experience** of it) 有**什么感觉哪**？ (**How** do you **feel**?) **舒服**吗？ (**Comfortable**?) 是的，我觉得你们应该**会有这样的感觉** (I think you will **have such kind feeling**)

P G[+4] 就像你们现在坐在上面，**感受过了**一样，你们都有自己的个人**感受** (Just like your being seated on it you have had your own **experience** of it) **感觉怎么样**哪？ (**How** do you **feel**?) **感觉**到**很舒服**吧？ (**Comfortable?**) 我想的话觉一定会感觉很舒服的 (I think you will **feel comfortable**)

P G[+5] 我想， 刚才您已经**体验**过它了 (I think, just now you have **had experience** of it) 你**是不是**有这样的**体验**？ (Did you have had such feeling?) 非常舒适， 是吗？ (Comfortable, isn't it?) **我想肯定是的** (I think it is certain)

The data in Table 30a show that the postgraduates in the experimental group appear more motivated in following the Speaker's ideas while the teachers in the control group seem less motivated in generating messages, and lost more coherence clues, although they have tried to manage their interpretations in an economical way. In order to have a clear picture of this finding, I take the super-segments of the postgraduate (PG^{+2}) in the experimental group, and the teacher (T^{-1}) in the control group as follows:

PG^{+2} 众 所 周 知 呢 ， *shi* 在 日 语 里 意 为 **手 指** ； *iatsu* 意 为 **按 摩** (As you know, *shi* - in Japanese means **finger**, *iatsu* means **pressure**) 把 它 们 和 在 一 起 ， 就 是 **手 指 式 按 摩** 意 思 (Put *them* together, (it) means *fingerlike massage*)

PG^{+2} 在 这 个 时 代 中 间 呢 ， 大 家 都 在 **办 公 室 坐 着** ， **工 作 的 太 久** ， 有 时 候 会 觉 得 **腰 酸 背 痛** (Now in today's time everyone is **working in office**, working **too long**, feeling **backache**) 那 么 ， 可 以 用 这 个 按 摩 垫 可 以 帮 助 你 舒 展 一 下 筋 骨 (So you could use this massage cushion to **stretch your back**)

PG^{+2} 刚 刚 哪 - 大 家 - 已 经 **尝 试** 过 了 这 个 按 摩 垫 ， 已 经 享 受 它 了 (Just now, you were **seated on our cushion** and have had **enjoyed** it) **感 觉 怎 么 样** ？ (**How do you feel?**) **舒 服** 吧 ？ (**Comfortable?**) 我 想 大 家 会 觉 得 **非 常 舒 服** 的 (I think you will **feel comfortable**)

The postgraduate in the experimental group vigorously followed the coherence clues (bold typed in the corpus) as follows:

shi → 手 指 ； *iatsu* → 按 摩 → 把 它 们 和 在 一 起 → 手 指 式 按 摩 ；
在 办 公 室 坐 着 → 工 作 的 太 久 → 腰 酸 背 痛
尝 试 → 感 觉 怎 么 样 → 舒 服 吧 ？ → 非 常 舒 服 的

However, the teacher in the control group (please refer to Table 30b below) has lost the coherent links in sentence 7, omitting the information, and also appears unsure and hesitant in interpreting as follows:

T^{-2} 在 日 语 中 *shi* 是 *手 指* - *atsu* 指 的 是 **压 力** 的 意 思 (*shi* in Japanese means *finger*; *iatsu* means **massage**) 两 者 放 在 一 起 ， 意 思 是 手 指 按 摩 . 可 以 有 效 的 减 轻 你 的 压 力 (Put **them** together, (it) means **finger pressur**e cushion)

T^{-2} [] []
T^{-2} 刚 才 ， 你 们 都 **感 受** 了 (Just now, you have **had experience**) [] **舒 服** 吗 (**Comfortable?**) 我 **觉 得 应 该 是** (I think (you) **should have**)

The corpus in Table 30a and Table 30b represent the interpreting performance of the two contrastive groups, in terms of the section representing semi-embodied concepts. The difference between the experimental and control group lies in the compulsive force schema (Johnson 1987: 2) (reviewed in Section 4.2; Figure 8), in that the interpreters' relevant bodily experience helps them to drive through their interpreting track as the compulsive force vector to make them process information efficiently.

Table 30b Interpretations from sentence 5 to 7 by teachers in the control group

ST S5: @As you know, *shi* in Japanese means **finger** - and *atsu* means **pressure**, put **them** together and you've got Shiatsu; - meaning '**finger pressure**'

T⁻¹ 大家都知道，*shi* 在日语中意思值得是 **手指** - *atsu* 指的是 <u>按压</u> (As you know, *shi* in Japanese means *finger; iatsu* means **massage**) 所以，把 **他们** 合在一起，就是 **手指式按摩椅** (Put **them** together, (it) means **finger pressur**e cushion)

T⁻² 在日语中 *shi* 是 *手指*- *atsu* 指的是 **压力** 的意思 (*shi* in Japanese means *finger; iatsu* means **massage**) **两者** 放在一起，意思是手指按摩.可以有效的减轻你的压力 (Put **them** together, (it) means **finger pressur**e cushion)

T⁻³ 大家知道，*shi* 在日语中指的是 **手指** (As you know, *shi* in Japanese means *finger*) **两者** 结合在一起就是 **手指按摩椅** (Put **them** together, (it) means **finger pressure** cushion)

T⁻⁴ 你知道，*shi* 在日语中指的是 **指头**：- *atsu* 指的是 **压力** (sh*i* in Japanese means **finger;** **iatsu** means *massage*) **放在一起**，就是 **手指按摩椅** (Put **them** together, (it) means **finger pressure** cushion)

T⁻⁵ 你们应该知道，*shi* 在日语里面是 *手指*；- *atsu* 指的是 **安压** (As you know *shi* in Japanese means *finger; iatsu* means *massage*) **两者** 放在一起，意思是 **手指式按摩**。(Put them together, (it) means **finger pressure** cushion)

S6: + In this day and age of **bad backs**- due to **much office work**, **labor** and **sitting too long for your studies, Shiatsu Massager** is the perfect **relaxation gadget** for every occasion

T⁻¹ 现在呢，很多的人 **很长时间坐在办公室里** (Now, many people **work in the office for long time**) 所以这样一个 **手指试按摩椅** 对坐办公室的人来说 **是一个很好的**- (so this **shiatsu massager** is a **good** (device) for a person sitting in office)

T⁻² [] []

T⁻³ 今天由于 **太多的工作，压力太大** (Now due to **much work**, (people) have too much pressure) 因此，**按摩** 是一种 **很好的放松方式** (so this shiatsu massager is a good (device) for relaxation)

T⁻⁴ 在现在时代呢，我们的 **脊背** 呢由于 **办公室的压力** 很多- 很受压力 (In today's age, due to **office pressure** we have **backache**) 现在我们有这样一个 **好东西** (Now we have such **a good thing**)

T⁻⁵ 现在我们都有许多 **办公室的任务** (Now, we have much **office work**) []

ST S7:+ Just now all of you have sat on it and have had a positive personal **experience**. **How** do you **feel** about it? @ **Comfortable**? +@ Yes, - I think you will **agree**. +

T⁻¹ 你**坐上去** (Just now, you **sat on it**) 有**什么感觉**？ (**How** do you **feel**?) 很**舒服**吧？ (**Comfortable**?) 呃，我相信**是**的 (I think you will **agree**)

T⁻² 刚才，你们都**感受**了 (Just now, you have **had experience**) [] **舒服**吗 (**Comfortable**?)﹞我**觉得应该是** (I think (you) **should have**)

T⁻³ [] **舒服**吗？ (**Comfortable**?) Yea，我想你们都**感到很舒适** (I think you will **feel comfortable**)

T⁻⁴ 你现在**坐上来** (Just now, you are **sitting on it**) **感觉如何呢**？ (**How** do you **feel**?) **感觉是不是非常棒**。((Are you) feeling great?) 是的 (Yes)

T⁻⁵ 刚才，你们都可以**坐在上头** (Just now, you may **sit on it**) 你们**感觉如何**？ (**How** do you **feel**?) **舒服**吗？ (**Comfortable**?)是的 (**Yes**)

In terms of the textual structure, the Speaker, at the beginning of speech, will talk about general things, providing outlines and topics. At this ice-breaking stage, the information is neither specific, nor profound, and the ideas are predictable; likewise, the interpreter can work her way in sparing mental effort. The finding accounts for the results in Section 6.2.1: it seems easier to make sense and to establish coherence in this section representing semi-embodied knowledge; however the experimental groups did better than the control group. This section reflects the relation between interactive embodiment, and the textual structure or the information pattern, from the image schema perspective. After experiencing the installation of the shiatsu device, the interpreting subjects formed the basic, pre-conceptual structures, or schematized patterns of this activity, especially pertaining to vision, space, motion, and force; meanwhile they formed the image schema, which fundamentally provide a skeletal organization relevant to the conceptions and information, as Langacker (2008: 32) claims as follows:

> Cognitive linguists incline more to imagistic accounts. The best-known proposal posits a set of image schemas, described as schematized patterns of activity abstracted from everyday bodily experience, especially pertaining to vision, space, motion, and force. Image schemas are seen as basic, pre-conceptual structures that give rise to more elaborate and more abstract conceptions (or at least provide their skeletal organization) through combination and metaphorical projections.

The interpreting subjects of the experimental group underwent the embodied activation and construal stage, and formed the initial image schema, on the basis of which they projected this image schema into their working memory to facilitate their interpreting. According to Lakoff (1987: 454) it is possible for an image schema to fit into a perception or an image, in that our perceptions and our mental images are structured by image schemas, and the schemas associated with lexical items are capable of fitting the schemas that structure our perceptions and images. As explained in Figure 14, Section 5. 1, the image schema, which lies at the interface between the propositional structure and metaphorical/metonymic processing, provides the skeletal organization of the cognition process, giving rise to the general and broad framework of information. According to Ungerer and Schmid (2001), even though developed, the schema is apparently less concrete than the rich prototype categories of objects and

organisms; 'as the term suggests, an image schema, as a basic and abstract semantic principle, should be understood as a mental picture which is more elementary than both concrete categories and abstract principles' (Ungerer and Schmid 2001: 160). This is the answer to the question: what are the relations between semi-embodied concepts and image schema? Further, why does it seem easy to make sense and establish coherence in the semi-embodied section?

Finally, how is the inferential ability facilitated and constrained by the existing interactive embodiment? Tables 30a and 30b above also show that both experimental and control groups rendered the basic information, but the former provided a more coherent and continuous pattern of propositions, in other words, the subjects of the experimental group showed a better inferential capacity than the control group. The assumption for this is that their bodily experience gave rise to direct understanding, which is reflected in the set of propositions. According to Johnson, 'A proposition exists as a continuous, analog pattern of experience or understanding, with sufficient internal structure to permit inference' (1987: 4); and image schemata and their metaphorical extensions are embodied in this special sense; they constitute much of meaning structure and inferential patterns. Johnson asserts (1987: 4):

> This structure constrains the way the schema organizes meaning and influences the drawing of inferences in domains of understanding concerned with forces of a certain kind. The main point is that the internal structure of the image schema exists in a continuous, analog fashion within our understanding, which permits it to enter into transformations and other cognitive operations.

This implies, as reviewed in Section 4.2.5 that the cognition process is like a compulsive force driven by a power (Johnson 1987), and the source of the power is generated through immersion in interactive embodiment, which in turn determines the image schema, and both the embodied *concepts* and image schemata further enable inferencing in interpreting. This finding will fill in the gap in the Mental Model theory (MMT) on inferencing (Section 2.3), which ignores the origin of coherence. This finding gives the answer to the question: How is the inferential ability facilitated and constrained by the existing interactive embodiment?

At this point, we cannot help wondering if the causes for the omissions might be various, and if embodiment may be only one part of the solutions, could a full

preparedness reduce the loss of information, helping the interpreter without bodily experience to follow the Speaker's flow of ideas? In other words, what needs to be experienced directly? And what can be extended from the embodiment? This will be discussed in Section 7.4.

7.2.2 Direct embodied understanding and coherence building: a propositional model perspective

This section is based on direct bodily experience, as defined in Section 5.2.3, ranging from sentence 8 to 15, segments 15 to 33. The section representing embodied concepts is further divided into two subsections: Subsection A and Subsection B. Subsection A includes the fixing steps (S9-15) serving as the control centre for understanding this discourse; Subsection B (S8) includes information about the structure of the shiatsu device, as one part of the subjects' bodily experience but not so prominent in terms of cognition. This section is used to study how the interpreter's bodily experience leads to direct understanding and coherence, analyzed from the propositional model perspective (Chapter 5, Figure 15). At this embodied stage, the experimental group matched the coherence clues more successful than the control group: the paired teacher's group showed 25% difference, and the paired postgraduate group, 34%, and most strikingly for the paired undergraduate group, the difference was 43%. The first issue arising from the corresponding section in the previous section 6.2.2 is: can the bodily experience compensate for the deficiency in language competence as this theoretical framework assumes? To further answer this question we can look at groups representing different levels of language competence. We notice that the postgraduates of the experimental group took a slight lead in attainment over the undergraduates of the experimental group (2%) and even over the teachers in the experimental group (18%).These outcomes of the experimental group coincide with those of the embodied activation and construal stage, in terms of coherence clues ratings which the postgraduates (58%), undergraduates (53%) and teachers (51%) had achieved. Can it suggest: more fully engaged embodiment means more understanding, and more coherence? From the corpora below, we can see interpretations from sentence 8 on the structure of shiatsu rendered by the undergraduates in the experimental group and the teachers of the control group as Table 31 shows:

Table 31 interpretations of sentence 8 on the structure of shiatsu device by the undergraduates in experimental group and the teachers in the control groups

ST S8: @The **structure** of Shiatsu Massager is **simple**. @ **Two kneading heads**, - **rotating**, + **travel up** and **down**- **along the PVC guides,** @ **relieving pain** and **fatigue** on your back. +@

Experimental undergraduate group

UG+1 这个使用方法很 **简单** (This application method is **simple**) **两个按摩球** (**Two kneading heads**) [] 以及这样的 **一个导轨** (and along with this **guide**) 从上倒下，*从颈部到腰部* (from **up** and **down**, from neck to waist) []

UG+2 这个手压式的按摩椅，它的 **结构** 其实非常 **简单** (The **structure** of this shiatsu is **simple**) 有 **两个按摩头** (There are **two kneading heads**) 然后，-+在椅子的背部 **移动** 来按摩 (then **move** at the back of the char to massage [] []

UG+3 手指式按摩垫的 **结构** 非常 **简单** (The **structure** of this shiatsu is **simple**) 有 **两个按摩头** (There are **two kneading heads**) [] 它们 **上下移动** (They **move up** and **down**) [] []

UG+4 那么，它的 **结构** 非常 **简单** (its **structure** is **simple**) **两个按摩** (There are **two kneading heads**) [] [] []

UG+5 手指式的按摩 **垫结构** 是非常 **简单** 的 (The **structure** of shiatsu massager is **simple**) [] [] [] []

Control Teacher's group

T-1 它的 **结构** 非常 **简单** (Its **structure** is **simple**) 有 **两个按摩点** (There are **two massage devices**)   [] [] [] []

T-2 [] [] [] [] [] []

T-3 这款手指按摩椅的 **结构** 非常的 **简单** (Its **structure** is **simple**) [] [] [] [] []

T-4 这个按摩器的 **结构** 非常 **简单** (This **structure** of massager is very **simple**) 有两个尼龙的-*电子 (*There are two nylon electros) [] []放

在 **PVC** 的靠背上 (Put on PVC back) []

T-5 [] [] [] [] [] []

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The five undergraduates in the experimental group seem more confident in following the coherence clues than the five teachers in the control group, providing a more coherent chain of ideas, while the latter appear to lose the coherent links in various degrees. We will use the superscripts of Subsection B (S8), the structure of the shiatsu device, to have a close look at the data of two experimental undergraduates (UG^{-1} and UG^{+2}) vs. two control teachers (T^{-1}and T^{-2}) below, as represented in Table 30, so as to discuss these points:

UG^{+1}这个使用方法很**简单** (This application method is **simple**) **两个按摩球** (**Two kneading heads**) [] 以及这样的**一个导轨** (and along with this **guide**) **从上倒下，从颈部到腰部** (from **up** and **down**, from neck to waist) []
UG^{+2}这个手压式的按摩椅，它的**结构**其实非常**简单** (The **structure** of this shiatsu is **simple**) 有**两个按摩头** (There are **two kneading heads**) 然后，-+在椅子的背部**移动**来按摩 (then **move** at the back of the char to massage [] [])

These two undergraduates in the experimental group (UG^{+1} and UG^{+2}) appeared to be driven by a compulsive force, following the basic coherence clues, starting from *simple structure →two kneading heads → move up and down* (bold in the examples). They can basically follow the Speaker synchronically, and coordinate the information, able to go beyond the constraint of language input, while the first teacher in the control group only renders the general information: its structure is simple, but cannot go on with how the two kneading heads work. In particular, the second teacher in the control group got stuck, seeming to blank out as following data shows:

T^{-1}它的**结构**非常**简单** (Its **structure** is **simple**) 有两个按摩点 (There are **two massage spots**) [] [] [] []

T^{-2} [] [] [] [] [] []

The whole data in Table 31 above, sampled from the five undergraduates of the experimental group and the five teachers of the control group, share similar findings to those above. With respect to the interpretations, the coherence clues achieved in this Subsection B are basically proportionate to the degree to which the subjects followed the coherence clues in the corresponding embodied and construal stage. As the finding concludes, if they can draw on embodied cognition, the interpreting undergraduates/novices can interpret as well as the interpreting teachers/ professionals. This finding on the role of interactive embodiment in coherence building has significance for SI training. The experimental group and control group process the output in the same way, as Dillinger (1989, 1994) (Section 3.4) found out: the

professional interpreters have the same process as the novice ones in comprehension. However, this finding also complements Dillinger's conclusion from the ICM perspective: the difference lies in the interactive embodiment-based cognitive process; and also challenges Dillinger's conclusion on the interpreter's qualifications: the interpreter is made, rather than born. This finding implies that it is far from enough only to make SI trainees undergo highly intensive training of SI strategies; instead, they should be provided with interactive embodied processes, which would lead them into a fulfilling cognitive context, in this case, interpreting undergraduates can have a simultaneous training course and/or programme. However, how could a course predict all the different possible types of embodied experiences they need for all the possible interpreting contexts? In other words, how could a course prepare them for all the types of embodied experience? This will be discussed in Section 7.4.

In addition, the coherence clues rating of this Subsection B in Tables 16 and 17 points to the assumption of the Interpretive Theory of translation (Section 3.2) that the interpreter's immersion in interactive embodiment compensates for the deficiency of language; more embodiment, more understanding, and more coherence, even considering that this Subsection B is not prominently or saliently experienced. This echoes the spreading activation of de Beaugrande and Dressler (1981), (reviewed in Section 2.2.1), in that when an item of knowledge is activated, other items closely relevant to it in mental storage become active to a different degree in terms of prominence. According to Wang (2006) (Section 4.4.4), the memory in the remote area is least likely to be activated in cognition. The answer to the issue (why did the interpreting subjects activate the prominent concepts more easily than the subordinate or obscure ones in the interactive embedment?) has also been discussed in Section 7.1.

The issues above can be further discussed by means of the theories of multidimensional and experiential gestalts (Lakoff and Johnson 1980) (Chapter 4). The coherent structure of experience gives rise to experiential gestalts with the dimensions of experience. An experience or set of experiences are construed coherent by virtue of having a structure. This structure characterizes multidimensional and experiential gestalts, which are ways of organizing experiences into structured wholes. According to Lakoff and Johnson (1980: 81) experiential gestalts take the form of multidimensional structured wholes. Accordingly, their dimensions are defined with respect to directly emergent concepts. That is, the various dimensions, such as

participants, parts, stages, are categories that emerge naturally from our experience. The experiential gestalts with the dimensions of experience gives rise to causation, a directly emergent concept, and the other dimensions in terms of which we further categorize our experience. This concept of causation will be used in the following discussion from a more micro perspective.

According to Lakoff and Johnson (1980: 81) 'understanding such multidimensional gestalts and the correlations between them is the key to understanding coherence in our experience'. From the discussion above we can postulate that the experimental interpreting subjects, especially, the undergraduates of the experimental group, had formed the multidimensional gestalts, correlating the dimensions between the elements. They have used these basic dimensions of their experience to achieve coherence, categorizing the elements in terms of gestalts with at least these dimensions in terms of participants, parts, stages, linear sequence, and purpose. 'The various dimensions are categories that emerge naturally from our experience. This contributes to global coherence' (Lakoff and Johnson 1980: 77). In this study's case, participants are the sales promoter, and the potential customers; parts are those of shiatsu device, which the experimental interpreting subjects have experienced physically by virtue of their perceptions, and their interaction with them. Stages mean the fixing steps from the beginning to the end. Linear sequence means that the interpreting subjects were engaged physically in installing the shiatsu in the right order. Purpose means the sales promoter's desire to sell out the product, so as to meet the needs of the users. In short, the bodily experience helped the interpreting subjects to access the coherent structure of experience, that is, experiential gestalts with the dimensions of experience, which has facilitated their capacity to achieve original and global coherence. The next issue arises: how can interpreters rely on the propositional structure and image schema as the mappings to bridge reference and inference for coherence? Could this mean that the interactive embodiment helps the interpreting subjects to activate their working memory by the link schema? These questions go down from the origin of coherence and global coherence to local coherence. I will use the superscripts of sentence 9 to 15, the fixing step of the shiatsu device, for micro analysis as shown in the postgraduate group with their bodily experience (Table 32a) vs. the postgraduate group without their bodily experience (Table 32b):

Table 32a The embodied section rendered by the postgraduates in the experimental group

N	English input	PG+1	PG+2	PG+3	PG+4	PG+5
21	S9:I would like to talk about **how to use** this Shiatsu Massager	下面，我很高兴给大家介绍一下**如何使用**这个产品 Next, I am pleased to talk bout how to use this product	我向大家介绍一下**怎样使用**它Next, I will talk about **how to use** this product	现在哪，我来告诉大家，-介绍一下**如何使用**这个按摩垫Now I will talk about how to use this massager	我现在想向你们展示一下**如何使用**这一款按摩椅Now I will talk about **how to use** this massager	我想说一下**怎么样使用**这个手指式按摩垫 I will talk about **how to use** this massager
22	Briefly there are **six steps** you should remember:+ @	简单的说有**六步** Briefly speaking, there are **six steps**	非常简单，有**六个步骤** Briefly speaking, there are **six steps**	简单的来说，**有六个步骤** Briefly speaking, there are **six steps**	简单的来说有**六个步骤** Briefly speaking, there are **six steps**	总共**有六步** Briefly speaking, there are **six steps**
23	S10: One. **Attach** the massage seat - to almost **any chair** @	第一步，-+(cough)把这个按摩垫**放倒椅子的椅背上**First step, **put it upon any chair**	第一，把按摩垫**放在随意的一个椅子上面** First, **put it upon any chair**	第一步 - 把按摩垫**固定**在任何椅子上都可以First step, **fasten** it **upon any chair** +	第一步，把这一款手指式按摩垫可以**放到**任何一个椅子上First step, **put it upon any chair**	第一，把这个按摩垫**放在任何靠背椅上** First, **put it upon any chair**
24	using the **integrated strap** at the back of the seat	然后+确保用**松紧带**把它**固定好**And then make sure to **hold** it well **integrated strap**	用后面的**松紧带绑上**，And **hold** it well with **integrated strap**	为了确保有没有安好，就**看一下**这个**松紧带**To make sure of its installation, have a **look at** this **integrated strap**	然后那用**松紧带系紧**And then **tighten** it with this **integrated strap**	然后，**扣紧松带**And then **tighten the integrated straps**
25	+ Ensure it is held firmly in place by **adjusting the strap** as necessary@ +	@[]	@[]	@[]	@[]	@[]
26	S11Two,**Connect the power supply lead** from the adapter with the corresponding lead-in the side of the seat+ @	第二步，进行**电源连接**，-把**导线**连接起来 Second step, **connect power supply**, lead	第二步，**接上电源**，将**导线**接上。 Second step, **connect power supply, lead**	第二步，就是**通电** Second step, connect power	第二步，把**电源线接到电源**上面 Second step, **connect cord** to **power supply**	第二，在您将**线路连接好**之后，Second, **connect cords**
27	S12Three. **Plug the adaptor** into a **230V AC mains outlet** and switch on+	第三步，+把**适配器**放到**240**伏的电压情况下Third, **put the** adaptor into a **240 main outlet**	第三步，然后哪，把**适配器结上**，**234 AC电源** Third, **connect the adaptor** into **a**	第三步，+把这个**适配器插到230**伏的电源上，并通上电Third, **plug the adaptor** into a 230v main	第三步，把这个**适配器接到240**伏的电源上面，然后打开Third, plug the adaptor into a 230v main	然后哪，把**适配器联到2 40**伏的插座上 Third, plug the adaptor into a 240v main outlet and switch on

28	By the way,- remember to **finish steps 1 to 3** -before switching the appliance on at the mains+ @	+	在坐上之前，**确保前三步已经做好了** Before being seated **make sure of the first three steps**	+顺便哪，我提醒一下大家**前三步都要适当的做好** By the way I remind everyone to **do first three steps properly**	[]	顺便说一下，在连接电源之前，**把上述三步完成** By the way, **finish the first three steps** mentioned above before connecting power
29	S13 Four. Once seated, - **use the remote control-** to operate the appliance.+	第四步，使用，按摩器，- **使用遥控器**，来遥控手指按摩垫来进行按摩Fourth step, **use the remote control**, and then press 'power'	第四步，**使用遥控器**选择上面的按钮，根据自己的需要选择按钮 Fourth, **use the remote control's button** and select according to your need	下面，我们进行第四步，**使用**你手中的**遥控器**选择你不同的需要，然后根据你的需要选择按摩垫活动的范围 Next, we will carry on the fourth step, **use the remote control** in hand and select according to your need	第四步，用这个**遥控面板**，把电源健打开，然后可以上下调控 Fourth **use this remote control panel** and put the power on and operate the up and downs	第四步，你可以**用遥控器**来控制它.通过开关键来控制手指式按摩垫的开关 Fourth **use this remote control** for operation
31	S14: five. For an **intense massage,- remove the flap** from the back of the cushion	第五步，+- (cough)如果想要等到较轻柔的按摩，可以把减压垫放到后面去 Fifth, if (you)want **gentle massage, put the flap over to back**	第五步，如果想要**力度大一点**的话，就把这个减压垫放到椅子的背面 Fifth, if (you)want **stronger** massage, **put the flap over to back**	第五步，我们可以把**减压帘**从按摩垫上**移走**，或者是**移上** Fifth, we could **remove** the flap or **keep** it (on the back)	第五步，如果觉得**背部压力太大**，可以把这个帘子放到椅子背后来**减轻这个压力**Fifth, if (you)feel **pressure too intense** we could **put the flap to the back** to reduce the pressure []	第五，如果你要**增加按摩强度**的话，可以**去掉减压帘** Fifth, if you want to **increase massage** intense degree, (you) could **remove the flap**
32	- For a **gentler massage, keep the flap** on and you can soften the massage further- by **placing a towel** between your back and seat. +	如果想要**较强的按摩**要把减压垫放到上面 If (you)want a tense flap , put it on []	如果**要压力小一些**，就把这个**减压垫放上** If (you)want a gentle flap , put it on []	这是根据个人的需要，这是减压帘的作用 This is based on your own need. this is the function of the flap[]		

The five postgraduates in the experimental group followed the coherence clues from the beginning to end; they started up with 如何使用 (how to use), and 六个步骤 (six steps), further entered into more specific information, but closely followed the tiny links. For instance, from segments 26 to 27, sentences 11 to 12, they have used the coherence clues 连接电源 (*connect power supply*) as triggers to access the sub-links: 适配器 (adaptor), 插入插座 (plug it into socket), even though the word 'socket' (插座) did not appear in the source text. In addition, they properly processed the semantic meaning by using cohesion shifts. For instance, in segment 24, sentence 10, three out of the five ($PG^{+1, +4, +5}$) have added the cohesive device, conjunction '然后' (and then), to make the sequential action clearer. Another example is that none of the five have used the switch code method to interpret, *one* to *six* steps, but rather, they have interpreted them into, 第一步(first step)，第二步 (second step)，or 下一步 (next step)，or 然后 (and then).

The five postgraduates in the experimental group can track the coherence clues synchronically, abreast with the speed of the speaker (normally 1 to 2 seconds minimum, in following the thematic elements). What is more, when the Speaker steps up his speed, the interpreters in the experimental group can go beyond the constrain of language form, and coordinate the information output, for instance, in sentence 14, segments 31 and 32, the five postgraduates in the experimental group can recognize the information by judgement (see Chapter 1). By comparing the source text (ST) and the target text (TT), we can see that the five subjects are not confined to the information density (Dillinger 1994) (Section 3.4), instead, have used syntactic structures and their bodily experience based mental structure to judge the inputs while producing speech, for instance, when hearing For an intense massage, they have instantly anticipated remove the flap, and accordingly, at For a gentler massage, they have immediately supplemented and completed the referents of keep the flap on. This data shows that the subjects, who undertook this embodied activation and construal stage, can automatically project their actions and events into their minds through the mental space blending process, on the grounds that the mental spaces are linked to each other through a series of mappings and projections, and constitute a conceptual integration network (CIN), and language is regarded as a series of complicated cognitive processing triggers. The interpreting subjects followed their mental mappings to form a CIN by virtue of the temporal iconicity mappings (Section

4.6.2 Mapping iconicity) in the form of a frame and script. Langacker (2008: 79) gives an account of temporal iconicity as follows:

> There is a natural tendency for conceived time and processing time to be co-aligned, such that the order in which events are conceived as occurring dovetails with the order in which they are conceptualized and described

This observation suggests that the iconicity of the embodied process is projected into the experimental interpreters' mind through their immersion in embodiment, in that the subjects have natural chains of actions and events stored in their minds, accessing the sequential discourse, which agrees with the theory of iconicity. Information organized according to natural language sequence is easier to remember (Clark and Clark 1977, Wang 2006: 555-556), as reviewed in Section 4.6.2; and the subjects tend to store events according to the natural sequence to establish coherence (Smith and Mclin 1970; Engelkamp 1974; Wang 2006: 555-556). In the meantime, the subjects with bodily experience can mostly anticipate, coordinate, compensate and judge the Speaker's flow of ideas (see Chapter 1).

This finding also compensates for the deficiencies in the theories of frame and script and iconicity, in how the interpreter builds coherence in cognition, shown in Figures 16 and 17, through the subjects' bodily experience of installing the parts of the shiatsu device: a chain of mental links are projected into their working memory, by metaphorical processing, in the form of a schema, such as the container, the part-whole, the link, the centre-periphery and the source-path-goal (Lakoff 1987: 272-275; reviewed in Section 4.2.3), which shows how the embodiment-based frame, script and iconicity work in helping the interpreters to achieve coherence.

On the other hand, as Table 32b below shows, the subjects without bodily experience appear vulnerable to losing the thread of ideas, losing the coherence links, with pauses and hesitations. A close look at the data in Table 32b shows that three postgraduates in the control group (PG$^{-3,-4,-5}$) cannot respond to the input of the information on the first step of installation (segment 23); more coherence clues are omitted in segments 23, 24 and 28. Particularly regarding segments 31 and 32, the five postgraduates in the control group cannot access interpreting strategies, such as anticipation and judgement, as their peers do. They have omitted the information (PG^{-1}, PG^{-2} and PG$^{-5)}$) or paused and hesitated, unable to render the complete information (PG^{-3} and PG^{-4}).

32 b: The embodied section rendered by the postgraduates in the control group

No	English input	PG-1	PG-2	PG-3	PG-4	PG-5
21	S9: I would like to talk about **how to use** this **Shiatsu** Massager	我现在想说说**如何使用**这个手指式按摩 I would like to talk about **how to use this shiatsu massager**	我要告诉你**如何使用这个按摩器** I would like to talk about **how to use (it)**	[ ]	我想谈**如何使用这个手指式按摩垫** I would like to talk about **how to use this finger passage** cushion	我想给你们介绍一下如何使用这个手指式**按摩垫** I would like to talk about **how to use this shiatsu** massager
22	Briefly there are **six steps** you should remember:+ @	这里你需要记住**六个要点** Here you need to remember **six points**	简单的来说，有**六步**应该记清楚 Briefly speaking there are **six steps**	有**六个步骤**使用这个按摩椅 Briefly speaking there are **six steps**	大概来说有**六个步骤**，我们应该记住 Briefly speaking there are **six steps** (which) we should remember	有三项你们应该知道 Here you need to remember **three points**
23	S10: One. **Attach** the massage seat - **to** almost **any chair** @	第一步，把它**放**到每一个**凳子上** First step, **put** this massager on **to a chair**	第一步，- 用**松紧带**把它**放到**任何一个**椅子的后背** First, **put** this on to **any chair** with **integrated straps**	第一[ ] First	[ ]	[ ]
24	using the **integrated strap** at the back of the seat	用**松紧带**把它绑在背后 Fasten it with **integrated straps**	[ ]	用**松紧带**调节好 use **integrated straps** for adjustment	[ ]	[ ]
25	+ Ensure it is held firmly in place by **adjusting** the **strap** as necessary@ +	[ ]	[ ]	[ ]	[ ]	[ ]
26	S11: Two. **Connect** the **power supply lead** -from the adapter - with the corresponding lead- in the side of the seat.+ @	第二步，**连接电源** Second step **connect the power supply**	第二步，将**导线接好**，与椅子左边的导线连接在一起 Second, **connect** the **lead** to the cord of chair on the left side	第二步，**连接电源**，导线 Second, **connect the power** and **lead**	第二，- **连接适配器** Second, **connect** the **adaptor**	第二步，**插上适配器**，插上**导线**。 **connect** the **adaptor** and **lead**
27	S12: Three.	[ ]	*第三步，-*	第三步呢，是把这个	第三，把**适配器插到230**	[]

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7	**Plug** the **adaptor** into a **230V AC mains outlet** .and switch on+ @		*打开开关*。+ Third, **switch on**	**适配器** 调到*200-.* Third, **adjust** the **adaptor** to *200*	**伏** 的 电 流 上 Third, **plug** the **adaptor** to **230v electric current**
28	By the way, - remember to **finish steps 1 to 3** -before switching the appliance on at the mains. + @	[]	顺便说，在打开开关前，**完成一，二，三步** By the way **finish 1-3 steps before switching on**	[]	[]	[]
29	S13: Four. Once seated, - **use** the **remote control**- to operate the appliance.+	一旦坐在上面，按一下功能健 Once seated **press** the **functional button**	第四步，**使用遥控器** Fourth step, use remote control	第四步，是坐下来把**按钮按下去**，按下按钮，按摩器开始按摩 Fourth step, once seated **press** the **button** to start up the massager	第四，坐下，**按动一下电源健**，然后选择按摩的形式 Forth, take a seat **press** the **power button** and then select the massage mode	第四，+ 使用遥控器,打开电源开关Fourth **use remote control** and put the switch on
31	S14: five. For an **intense massage**,- **remove** the **flap** from the back of the cushion	[]	[]	第五步呢，[] Fifth []	第五，+ 如果**轻柔的按摩** Fifth, if (you) need **soft massage**	[]
32	- For a **gentler massage**, **keep** the **flap** on and you can soften the massage further- by **placing** a **towel between your back and seat**@	[]	[]	要**轻轻的按摩**，在你的**后部**放一个毛巾 Sixth, for a **gentle massage put a towel behind your back**	把毛巾放到你的后背 **Put** a **towel behind your back**	[]
33	S15: Six. **Press** the "**Power** "**button** -(for a second time)- to stop the massage. ++ @	功能健再按一下使它关闭 **Press the functional button** once more to stop it	第六步，第二次**按下**电源**开关**，停止使用按摩器 Sixth, **press** the **power switch** for a second time	第六步呢，把这个**按钮再按一次**- Sixth, **press** the **power switch** for a second time	[]	第六步，**再按**一下这个**健就**会停止按摩six step **Press** the **button** once more to stop

In addition, the five postgraduates in the control group cannot synchronize the output speed with the input, and they cannot conceptualize what is being interpreting so as to make direct sense or build coherence.

These phenomena can be further discussed in terms of frame and script. The subjects in the experimental group activated the link of sense among the shiatsu installation steps, and put the components together according to their relations by closeness of linkage, and formed the mental structure representing the shiatsu installation process. In short, they have made sense and achieved coherence in interpreting due to the existing stereotypic frame and script in their minds. As mentioned above, in addition to the interactive embodiment, image schema, iconicity, and a stereotypic approach to coherence, causation relations can also account for the phenomena of building coherence in SI. During interpreting, they were able to follow the thread of the Speaker's ideas, making sense and building coherence, rather than engaging in code-switch transmission, as the Interpretive Theory of translation postulates (Section 3.2).

With respect to local coherence, the relationship between *concept*s can be expressed in linking causal phrases such as gives rise to, results in, is required by, or contributes to. This is called causation, which appears to account best for the relation between language and conceptual structure, as well as for the relationships among the varieties of causation (Lakoff 1977). The experimental postgraduates can track the causation relations among fixing steps by virtue of a series of actions: *attach the seat → connect the power supply→ plug the adapter → use the remote control → remove or retain the flap → press power button*. According to Lakoff (1987: 54) causation is direct manipulation, characterized broadly and typically by the following cluster of interactional properties, this is called prototypical causation. I combine this assumption with the corpus as follows:

(1) *There is an agent that does something*. (In this experimental case, the agent, the experimental subject installs the shiatsu massager.)
(2) *There is a patient that undergoes a change to a new state*. (The shiatsu's parts are put together into a massager.)
(3) *Properties 1 and 2 constitute a single event; they overlap in time and space; the agent comes in contact with the patient*. (The experimental subject is engaged

physically in contact with the shiatsu equipment.)

(4) *Part of what the agent does* (*either the motion or the exercise of will*) *precedes the change in the patient*. (The subjects intend to put the parts of the shiatsu device together for massage.)

(5) *The agent is the energy source; the patient is the energy goal; there is a transfer of energy from agent to patient*. (The experimental subject feeds energy into the shiatsu.)

(6) *A single definite agent and a single definite patient*. (The experimental subject and the shiatsu massager.)

(7) *The agent is human*. (The experimental subjects.)

(8) *The agent* a) *wills*, b) *is in control of, and* c) *bears primary responsibility for both his action and the change*. (The experimental subject manipulates his or her action.)

(9) *The agent uses his hands, body, or some instrument*. (The subject uses his or her perceptual organs.)

(10) *The agent is looking at the patient, the change in the patient is perceptible, and the agent perceives the change*. (The subject has fixed it and enjoyed the massage.)

According to Lakoff (1977, 1987: 54) the category of types of causation shows prototypical effects in the ways that they are represented in natural languages. These effects are relatively uniform across languages, also evident in this corpus, as revealed above.

In addition, the data in Tables 31a and 31b above show that the findings support Fillmore's observations of verbs (1982, 1985) (Section 2.2.2.1), i.e. verbs are related with the whole situation, and can make some aspects more prominent and salient. In other words, it is the actions of fixing procedures that turn out to be the trajectors, the prominence and salience in the whole installation process to establish coherence. This finding challenges Wang's claim (2006) that trajectors are mostly animated living things or people as subject(s) in sentences; but here in this experiment context, it is a series of actions, or verbs rather than nouns or animated living things or people that act as the attentional focus (trajector) in this technical context for the sake of coherence. Therefore it further supports Langacker's theory of current discourse space (CDS) (2000: 331, 359) (Section 4.6.3), in that the choice of subject and object is neither a logic nor a grammatical issue but rather it involves cognition construal, mental focus or prominent concept. This develops the theory of thematic progression

(Section 2.1 and Section 3.1.1), in that the ICM-based approach to discourse analysis is to follow the semantic focus from the cognitive perspective, thus revealing the mental central attention of the Speaker, rather than being only limited to the text context.

The interpretations rendered in the section representing embodied *concepts* also suggest that the subjects used an increasing attentional effort to follow the coherence clues as the information is becoming more specific. In particular, when the information gets dense, as observed in Dillinger's research into coherence in clauses (reviewed in Section 3.4), the subjects in the experimental group appeared to be struggling in following the coherence clues, the subjects of the control group seemed desperate as the corpora show above. This issue needs to be further studied, and will be addressed in Section 8.4, Future work.

In summary, as reviewed in Section 4.5, the ICM-based approach helps the interpreter to fill in missing links and to access the cognitive world, in achieving global and local coherence. In addition, the presence of the ICM was felt in the subjects' distribution of their mental effort in their interpreting process in retrieving the relevant information from their memory storage. These findings support the hypothesis posited in Section 5.1.

So far, we have discussed the semi-embodied discourse, from the image schema perspective, the embodied discourse from the propositional model perspective. According to the literature reviewed in Chapters 3 and 4, the propositional model and image schema together are the fundamental cognitive process to achieve the basic coherence in SI. We will move on to the non-embodied/abstract discourse, analyzed from the viewpoint of metonymic and metaphoric models in the following section.

7.2.3 Non-embodied concepts and indirect understanding: a metonymic and metaphoric perspective

As Section 5.2.4 explained, this section representing non-embodied concepts is based on sentences 16 to 19, segments 34 to 43. Knowledge in this section is not directly embodied, or remote from the core of bodily experience, unconventional and unpredictable in communication (Wang 2006, Section 4.4.4). The concepts in this section are defined to be inactive according to Chafe (1994) (reviewed in Section 4.7). The non-embodied section is also separated into two subsections: Subsection A (S16-

19) (warnings) and Subsection B (technical terms listed below). This section is used to study how abstract concepts/non-embodied concepts are analyzed from the perspective of metaphorical and metonymic models in the construction of coherence in SI (Figures 14a and 14b; Section 5.1).

Strictly speaking, the corpora in Table 33 below should reveal the role of metonymic processing, and the online background knowledge, and unconventional and unpredictable communication claimed by Wang (2006) (Section 4.4.4). However, in this research, metaphorical processing was not displayed as expected. This needs further exploration. The results in Chapter 6 show that the experimental group attained more coherence clues than the control group (with the teachers' groups 50 % vs. 28%; the postgraduate groups 56% vs. 37%; the undergraduates group 64 % vs. 12 %). However, even for the subjects in the experimental group, this section representing non-embodied knowledge is the weakest link in the three sections (85% of accurate coherence clues for the semi-embodied section, 64% for embodied, but only 56% for the non-embodied), especially in terms of the subject matter, technical terms and numbers (37%).

In addition, as reviewed in Section 5.3, the subjects in the experimental group were active in asking questions when hearing the experimenter's instructions of *warnings* against damage to the shiatsu device; it is assumed that asking questions can help the interpreter to activate mental links and build coherence.

The corpora in Table 33 below represent the interpretations of teachers in both the experimental and control group. As reviewed in Section 4.7 on the ICM-based methodology, the subjects in the experimental group built mental coherence by activating the functional and meshing net of concepts, on the grounds that they had undertaken the embodied activation and construal stage, and filled the slot (trajector) and pair (landmark) cognitive *concept* map as Figures 19 and 20 indicate. The embodied activation and construal has also helped to activate the conceptual knowledge system, enabling them to track the coherence clues in terms of the trajector and landmark in the current discourse space (CDS). The corpora show that the teachers in the experimental group can process the information in an economic way as de Beaugrande and Dressler have claimed (1981) (reviewed in Section2.2.1):

Table 33 Interpretations of the non- embodied section rendered by the teachers of both the experimental and control groups

ST S16: Always remember to **store** it **properly**@ **Place** the appliance in its **box** or in a **safe**, **dry,** and **cool** place. + @
Teachers in the experimental group
T⁺¹ 记住一定要把它 **放** 在 **安全**，**凉爽** 的地方 (Please remember to **put** it in a **safe** and **coo**l place)
T⁺² 把它 **放** 到 **干燥**，**防水** 的地方 (**Put** it in a **safe** and **cool** place)
T⁺³ 一定要适当的 **放置放** 到 **干燥**，**凉爽** 的地方 (Please remember to **place** it **properly**, **Put** (it) in a **dry** and **cool** place)
T⁺⁴ 请记住把它 **放** 在 **安全**，**干燥** 的盒子中 (Please remember to **put** (it) in a **safe** and **dry** box
T⁺⁵ 把它 **放** 到 **干燥**，不要太潮湿的地方 (**Put** it in a **dry** and **not humid place**)
Teachers in the control group
T⁻¹ []
T⁻² []
T⁻³ []
T⁻⁴ **放** 到 **干燥**，阴冷的地方 (**Put** (it) in a **dry** and **cool** place)
T⁻ 我们必须把它 **放** 到 **合适** 的地方 (We shall **put** it in a **proper place**)

S17: **Water** or **any liquids** that come into contact with the appliance are **dangerous**@
Teachers in the experimental group
T⁺¹ 不能够让水和任何液体进去 (**Don't let water or any liquid into it**)
T⁺² 不要见水 (**No water**)
T⁺³ 不要接触任何的液体，否则是很危险的 (**Don't let any liquid into it,** it is **dangerous** otherwise)
T⁺⁴ 有一些注意事项-要防水 (There are some warnings, **free from water**)
T⁺⁵ 不要见水 (**Free from water**)

Teachers in the control group
T⁻¹ []
T⁻² []
T⁻³ []
T⁻⁴ 千万不要让水流进去 (**Never let water in**)
T⁻⁵ 水根任何液体都是不可接触的 (**Water and any liquids could not come into this**)

S18: **Avoid contact with sharp edges** or pointed objects which might **cut or puncture the fabric surface**. @
Teachers in the experimental group
T⁺¹ 再一个，不要放到锐利东西的旁边 (In addition, **don't put** (it) **to a sharp object**)
T⁺² 远离尖锐的东西以免把它的表面损伤 (**keep it far away from sharp objects to damage its surface**)
T⁺³ 也不要用锋利的东西接触它 (**nor put** (it) **to a sharp object**)
T⁺⁴ 要和一些锋利东西隔离开来 (**separate it from sharp objects**)
T⁺⁵ 不要让尖锐的东西接触 (**Do not let sharp objects touch it**)
Teachers in the control group
T⁻¹ []
T⁻² []
T⁻³ []
T⁻⁴ 也不要任何锐物划伤这个表面 (**don't have it scraped with a sharp object**)

T⁻⁵我们要尽量**避免与锋利的东西来接触** (we should try to **avoid letting it in touch with any sharp objects scratch this surface**

S19: To avoid breakage, ₊ **DO NOT wrap the power cord around the appliance** ₊ S20: **DO NOT hang the unit by the cord**+
@
   This will **cause short circuit**

Teachers in the experimental group
T⁺¹不要拉扯电线，这样会把店子弄坏 (**Don't stretch the wire lines,** (this) will damage the cushion)
T⁺²不要卷起来 (**Don't wrap it up**)
T⁺³更不能用导线捆绑坐垫。否则呢会引起短路 (**Don't wrap the massager with wire lines,** this will lead to **short circuit**)
T⁺⁴不能用绳索捆绑， 也不能将其打卷 (**Don't wrap the massager with wire lines. don't bundle it**)
T⁺⁵不要卷折 (**Don't bundle it**)

Teachers in the control group
T⁻¹ [ ]
T⁻² [ ]
T⁻³ [ ]
T⁻⁴不要用导线把这个东西倒挂起来(**Don't hang this with cord**)
T⁻⁵为了**避免损伤**–我们**不能有线悬挂它** (in order not to **damage it,** we should **not hang it**)

S21: @ Ladies and gentlemen, you could have it now at- **30 pounds. In John Lewis, Edinburgh,** it costs- **69** pounds
@ **If you are interested**, feel free **to try the Shiatsu massager** again before you buy it. + Thanks

Teachers in the experimental group
T⁺¹先生们，女士们你们现在就可以购买，只需30英镑而在英国哪需要69英镑–如果你想的话*可以**再试**一下* (Ladies and gentlemen You could get (it) now only at **30** pounds, But in **UK** at **69** pounds, You could **try** again if you like)
T⁺²先生们，女士们，你们现在用优惠价格可以购买 (Ladies and gentlemen You could but it at a favorable price)
T⁺³在**英国**它的价值是*96*英镑 而在广交会上，我们只卖30英镑,现在大家可以**体验**一下(In **UK** it costs **96** pounds; but in Guangzhou trade fair we only sell at **30** pounds You could **try** again if you like)
T⁺⁴先生们女士们你们现在花30英镑就可以买到我们的产品–那么这个产品在伦敦售到了*68*英镑.谢谢大家的光临 (Ladies and gentlemen Now you spend **30** pounds for it; But in London it costs **68** pounds)
T⁺⁵你们现在花30英镑就可以买到它， 而在国外需要60磅； 对此感兴趣的话，现在就可以买它 (Now you spend **30** pounds for it; But in overseas countries it costs *60* pounds

Teachers in the control group
T⁻¹女士们，先生们你现在只用30英镑就可以享受这个价值为*60*英镑的手指式按摩椅 (Ladies and gentlemen You could get (it) now only at **30** pounds, which should have cost 60 pounds)
T⁻² [ ]
T⁻³女士们，先生们你们现在花30英镑就可以买到这个按摩椅， 如果对此感兴趣的话现在就可以体验 (You could get (it) now only at **30** pounds. You can **enjoy** it if you are **interested**)
T⁻⁴女士们，先生们你现在只用30英镑就可以卖到这个东西在你买之前可以大大方方的**感受一下这个按摩垫** (You only spend **30** pounds on this you could feel free to **try it** before you buy it)
T⁻⁵女士们，先生们你可以用30 – ₊ *60*英镑买它， 如果你觉得适合的话，大家就可以买它
   (Ladies and gentlemen you spend only **30**pounds, *60* pounds on this If you feel it proper you could buy it)

For instance, in terms of interpreting Sentences 16 to 19, while the five teachers in the experimental group can generate the information accurately in the target language of Chinese, the three of their peers (T^{-1}, T^{-2} and T^{-3}) have omitted the information. This is a typical example of the metonymic processing in meting out information, on the basis of the interpreter's bodily experience and conceptual knowledge (Section 4.2.4). This also supports Dillinger's conclusions (1989, 1994) (Section 3.4) – comprehension and coherence in interpreting is not a specialized ability, but the application of an existing skill under more unusual circumstances. Also making sense in interpreting is characterized by all of the same components being processed as listening. Interpreting experience has a weak quantitative effect on interpreting overall in terms of difference between the interpreting professional and the novice; the difference, if there is one, may be that the experienced interpreter may have learned to be more selective in the surface information which they process semantically.

Furthermore, in order to see the role of the interpreter's immersion in embodiment and the conceptual knowledge system, by virtue of metonymic processing, I purposely analyzed the synchronicity of two subjects' output (Section 6.2.3, Table19), rendered by an undergraduate (UG^{+1}) and a teacher (T^{+1}) in the experimental group. Generally the results repeated those discovered by Paneth (1957) and Oleron and Nanpon 1965) (reviewed in Chapter 1), who found that the ear-voice-span (EVS) or lag ranges from two to four seconds minimum, and two to ten seconds maximum. However, my results have shown more detailed findings; that is, the subject started a bit slowly, following up the thread of ideas, with the undergraduate's EVS from seven to eight seconds, and teacher's from five to six seconds. When following the right track of the thread of ideas, they could keep nearly in a synchronic step with the Speaker, up to one to four seconds EVS. In particular, the teacher appeared more professional than the undergraduate in anticipating and generalizing the information. It can be assumed that equipping the interpreter with interactive embodiment and the relevant conceptual knowledge can help them in retrieving information due to metonymic processing: one word can activate the whole functional net stored in memory. However, due to the small size of this corpus, this aspect of synchronization needs to be studied further. This will be addressed in Chapter 8 in terms of limitations and future work.

On this basis, let us return to the issues arising from the corresponding Section 6.2.3. Primarily, how is metonymic and metaphorical processing reflected in achieving coherence in the non-embodied knowledge? As reviewed in Sections 4.2.3

and 4.2.4, according to Ungerer and Schmid (2001: 147), metaphor and metonymy are different kinds of cognitive processes. Metaphor is primarily a process of mentally comparing one thing to another, and its principal function is to understand or make sense. Metonymy, on the other hand, basically has a referential function, allowing us to use one entity to stand for another. Therefore, metonymy not only serves as a referential device but also as a function of making sense or providing understanding.

First, I discuss the links between the metonymic model and the non-embodied discourse. One entity is being used to refer to another; this function of metonymy is one of the basic elements of interpreting as the Interpretive Theory of translation claimed (1986): 'when an expression that ordinarily profiles one entity is used instead to profile another entity associated with it in some domain' (Langacker 2008: 69). Likewise, when the interpreter processes the coherence clues in terms of the trajector and landmark in the source text by virtue of the current discourse space (CDS), she will cognitively turn to the experiential connections and conceptual knowledge system relations for inference, which will also contribute to the economy of her mental effort as reviewed in Section 2.2.1. The metonymic processing is reflected in the interpreting process, and its importance is more felt in interpreting abstract and less or non-embodied concepts. The corpus in this section further supports and complements the Interpretive Theory of translation (Section 3.2), in that making sense and attaining coherence must be built upon perfect understanding of the source text, and interactive embodiment can facilitate the interpreter's understanding of the background knowledge in question.

According to the corpus in Tables 33 above, the interpreting subjects are not good at interpreting technical terms and numbers, when rendering the segment 27: *Plug the adaptor into a 230V AC mains outlet,* the subject (UG[+1]) interpreted 230V into 两千八百四十 (two thousand eight hundred forty). As a matter of fact, the conceptual knowledge on the household power is 230 volt for Chinese domestic utility. This echoes the definition of knowledge for the interpreter by Pöchhacker (1992) (Section 3.5) – 'specialized knowledge and competence of a given professional', on the grounds that interpreting involves not only interactive embodiment but also conceptual knowledge system. This also supports the theory of continuity of de Beaugrande and Dressler (1981: 84), reviewed in Section 1.2.1, in that 'cognitive processes contribute a certain amount of COMMONSENSE knowledge derived from the participants' expectations and experience regarding the organization of events and

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situations'. From this corpus in terms of technical terms and numbers, it appears that the interpreting subjects might lack in such common sense knowledge. This is another instance of metonymic processing (see Section 4.2.4).

According to IT, a technical term does not stand alone; it becomes meaningful in a conceptual knowledge system (Section 3.2). This can be explained by the theory of economy and inheritance of de Beaugrande and Dressler (1981: 92) (Section 2.2), on the grounds that as each item of knowledge may be stored in a cognitive system a mental effort is needed for searching this item, this is economy; and due to the fact that the item of knowledge is stored in a neat hierarchy, in form of classes vs. instances, subclasses vs. super classes, or analogies, prediction is possible about the time needed to access a certain fact, this is inheritance. These assumptions can provide an account of the weak points in the corpus where the interpreters performed poorly. In short, whether a word will activate a functional and meshing network will depend on her integration of the conceptual knowledge system. This finding challenges the assumption of Setton (1999: 253): 'Numbers, names and dates are classic examples of items difficult to associate into the mental model and notoriously vulnerable to error or omission'. It is true that names and numbers are difficult and susceptible to error or omission, but they can fit into the Effort Model (Gile 1995) (Section 3.3.2), on the grounds that the background or specialized knowledge will balance the degree of error. For instance, in terms of multiple choices of measurement units, a. ton, b. gram, c. kilogram, it was possible for a three or five year old child to choose the item: Jack weighs 25 tons, but an adult would not, because background knowledge or common sense makes a difference. In addition, in Section 7.2.1, the corpus shows that the experimental group normally used a general pronoun, we, instead of the proper name, Hömedics, but the control group mostly omitted this message. Therefore, numbers and names are also associated into the Effort Model (Gile 1995). This finding also challenges Pöchhacker's claim (1992) (Section 3.5) that the interpreter as a low-knowledge individual in technical conferences can still manage to establish a sufficient degree of coherence as a basis for target text production, suggesting that Pöchhacker's observation is incomplete in this regard. Rather, without a comprehensive model of the text contents, or holistic structure of the conceptual knowledge system, the interpreter cannot rely on the non-embodied literal propositions to build up coherence as 'models are assumed to be easier to remember than propositions because they are more elaborated and structured'(Setton

1999: 17). In other words, the function of economy and metonymy determines coherence in interpreting to a substantial extent. Therefore, this finding supports Dillinger's assumptions (1989; 1994) (reviewed in Section 3.4): the interpreter must have the same knowledge as presupposed by the Speaker, and greater specialization of interpreters and the inclusion of specific domain knowledge are necessary for their training. Furthermore, the Speaker/writer has to design the text so that the interpreter, rather than the Speaker's equally knowledgeable counterparts, can understand it.

As a matter of fact, this finding further complements Pöchhacker's framework of knowledge system (1992), (Section 3.5), from a micro perspective, by virtue of analysis of concept and inference. Firstly, the cognitive conceptual knowledge system has concepts built upon embodiment, as Lakoff (1987: 154) points out as follows:

> Cognitive models are embodied, either directly or indirectly by way of systematic links to embodied concepts. A concept is embodied when its content or other proprieties are motivated by bodily or social experience. This does not necessarily mean that the concept is predictable from the experience, but rather that it makes sense that it has content (or other properties) that it has, given the nature of the corresponding experience. Embodiment thus provides a non-arbitrary link between cognition and experience.

A *concept* determines the inferential capacity, and inference, as the locus of perception and motor control, is the key element in interpreting. Lakoff and Johnson (1999: 20) define the *concept* as follows: 'An embodied concept is a neural structure that is an actually part of, or makes use of, the sensorimotor system of our brains. Much of conceptual inferences, therefore, sensorimotor inference'. According to Johnson (1987: xi-xii) 'What makes concepts concepts is their inferential capacity, their ability to be bound together in ways that yield inferences'.

Next, the cognitive conceptual knowledge system, as a type of mental processing, constitutes a series of psychological transformations, by which information about the relative locations and attributes of phenomena, either propositional or non-propositional can be acquired, coded, stored, recalled, and decoded on the basis of everyday experience or metaphorical spatial environment. Therefore the representations are reflected in cognitive processing, like a script, schema or frame of references. On the other hand, the linguistic formalism has defined a concept as a

perceived regularity in events or objects, or records of events or objects, normally designated by a label, ignoring the part of the human perceptual functions which also have impulsive force in exciting the working memory and facilitating coherence.

Thirdly, propositions contain two or more concepts connected by linking words or phrases to form a meaningful statement. A proposition is a 'continuous, analog pattern of experience or understanding, with sufficient internal structure to permit inferences' (Johnson 1987: 4) (Section 7.2.1).This structure influences the inferential capacity in making sense. The cognitive conceptual system is represented in a hierarchical manner with the most broad, most general concepts at the top of the map and the more specific and detailed concepts arranged hierarchically below. The hierarchical structure for a particular domain of knowledge also depends on the context in which that knowledge is being applied or considered. This agrees with the categorization of embodied cognition. In addition, the conceptual knowledge system involves the inclusion of cross-links. These are relationships or links between concepts in different segments or domains of the conceptual system. Cross-links help to see how a concept in one domain of knowledge is related to a concept in another domain.

The discussions above provide supplementary support for the conceptual structure, reviewed in the theoretical framework (Chapters 2 and 3), including conceptual network (Figure 1); knowledge space with an integrated unit (Figure 2); schematic illustration of the cognitive model (Figure 6 *on the beach*); exemplary network of the cognitive model (Figure 7), shiatsu structure and fixing steps of shiatsu, based on CRP, trajector and landmark (Figures 19 and 20). Before the interpreting task, the interpreter can construct a conceptual system with reference to some particular focus question which the Speaker seeks to answer. In this way, the interpreter can understand through the organization of knowledge pertaining to some situation or event, thus accessing the context for the task which she will interpret, by activating and construing the links in the knowledge network.

Now, I will discuss metaphor vs. the non-embodied or non-propositional abstract discourse. According to Johnson (1987: 104), metaphor is understood in a metaphorically extended sense, not only as 'propositional connection of two highly delineated, already determinate domains of experience, but also as a projective structure by means of which many experiential connections and relations are established in the first place'. As reviewed in Chapter 4, the fundamental propositional structure and image schema are extended into metaphorical and

metonymic processing for the abstract concept and language; the interpreter will also follow this cognitive process in making sense and building discourse in interpreting. However, this aspect of metaphoric processing was not significantly noted in the corpus due to the limited corpus size; this will be further discussed in Section 8.3 Limitations.

In summary, it is on the basis of embodied experience and conceptual knowledge system that the interpreter makes sense and builds coherence, through metonymic and metaphorical processing.

7.3 The interpreter's mental effort and the textual structure: an ICM perspective

There is one issue, which has been implicit in previous discussions, and now I explicitly discuss it in this section: how does the interpreter's mental effort expended in achieving coherence reflect the textual structure in the source text (ST)? The results show the process of the interpreter's mental effort in processing information structure, seemingly mismatching the ICM structure with this information distribution pattern as assumed in Section 5.1's hypothesis, in that comprehension of the semi-embodied section, rather than of the embodied section ranked highest in terms of coherence clues achieved (85% vs. 62% for the semi-embodied section; 64% vs. 33% for the embodied section; and 56% vs. 25% for the non-embodied section). However, the findings agree with the ICM assumptions in processing information, rather than contradict them, in that the ICM is idealized: the information structure or the textual structure does not fit in with the ICM, perfectly or all the time. As a matter of fact, this seeming mismatch agrees with the textual structure for technical discourse proposed by Trimble (1985) (reviewed in Section 5.2), but analyzed from a mental effort perspective, on the basis of the ICM. The introduction is the beginning of a speech, and belongs to a warm-up stage; the information is usually general and broad, indicating that the interpreter can save her energy. When the speech enters into the section representing embodied knowledge, the interpreter will spend more effort in following up the thread of the Speaker's ideas to achieve coherence, due to the fact that the information is getting dense and specific. The corpora in Tables 34a and 34b below are interpretations rendered by PG^{+1} of the experimental group and PG^{-1} of the control group:

Table 34a Representations of causation rendered by PG⁺¹

下面－我很高兴给大家介绍一下**如何使用**这个产品（Next, I am pleased to talk about how to use this product）简单的说有**六步**（Briefly speaking, there are **six steps**）第一步，－＋（cough）把这个按摩垫**放倒椅子的椅背上**（First step, **put it upon any chair**）然后＋确保用**松紧带**把它**固定**好（And then make sure to **hold** it well with **integrated strap**）@［］第二步进行**电源连接**，－把**导线**连接起来（Second step, **connect power supply**, lead）第三步，＋把**适配器**放到*240伏*的*电压*情况下（Third, **put** the adaptor into a *240 main outlet*）第四步－使用－按摩器－ 使用**遥控器**，来遥控手指按摩垫来进行按摩（Fourth step, **use** the **remote control**, and then press 'power'）第五步，＋－（cough）如果想要等到**较轻柔的按摩**－可以把**减压垫放到后面去**（Fifth, if (you)want **gentle massage**, **put the flap over to back**）如果想要**较强的按摩**要把减压垫**放到上面**（If (you)want a tense flap, put it on）［］第六步，＋－（cough）**按下电钮**－把**电源切断**（Six, press the power button to cut power off）

Table 34a shows that PG⁺¹ in the experimental group has formed a causal, sequential and specific links, and followed coherence clues (bold typed) just like the compulsive force driven pattern as Johnson (1987) claims. On the other hand, PG⁻¹ in the control group in Table 33b appears uncertain, omitting the primary information, or losing the crucial coherence clues, as the compulsive force has seemed to lose its vector. More mental coherence, less mental effort:

Table 34b Representations of causation rendered by PG⁻¹

我现在想说说**如何使用**这个手指式按摩（I would like to talk about **how to use this shiatsu massager**）这里你需要记住**六个要点**（Here you need to remember **six points**）第一步，把它**放**到每一个**凳子上**（First step, **put** this massager on **to a chair**）用**松紧带**把它绑在背后（Fasten it with **integrated straps**）［］第二步**连接电源**（Second step **connect the power supply**）［］［］一旦坐在上面，按一下功能健（Once seated **press the functional button**）［］ ［］**功能健**再按**一下**使它关闭（**Press the functional button** once more to stop it）

Following this line, with the speech moving to the non-embodied, and/or abstract concepts, the interpreter will apply her utmost attention for processing, activating proper expectations about the function of each new element to make sense. The abstract concepts are most effort consuming, and most vulnerable in making sense, especially without the context of embodiment. In order to have a further micro analysis, interpretations rendered by Teacher⁺¹ in the experimental group and Teacher⁻¹ in control group are provided in Table 35 below. Teacher⁺¹ in the experimental group has basically followed the coherence clues, presented the information economically; in other words, she has not been stuck in the code-switching or word for word

translation, but rather, focused on the ideas or the sense, going beyond the confinement of language surface, while Teacher[-1] in the control group has failed to track the coherence clues until the last sentence, when she seemed to start up her response, but it was too late:

Table 35 Micro analyses: interpretations rendered by Teacher [+1] in the experimental group and Teacher [-1] in the control group:

_____

ST S16: Always remember to **store** it **properly**@ **Place** the appliance in its **box** or in a **safe**, **dry**, and **cool** place+@

T[+1] 记住一定要把它**放**在**安全凉爽**的地方 (Please remember to **put** it in a **safe and cool** place)
T[-1] [ ]
S17: **Water** or **any liquids** that come into contact with the appliance are **dangerous**@
T[+1] 不能够让水和任何液体进去 (Don't let water or any liquid into it)
T[-1] [ ]

S18: **Avoid contact with sharp edges** or pointed objects which might **cut or puncture the fabric surface**. @

T[+1] 再一个 **不要放到锐利东西的旁边** (In addition-**don't put (it) to a sharp object**)
T[-1] [ ]
S19: To avoid breakage, + **DO NOT wrap the power cord** around the appliance + S20: **DO NOT hang the unit by the cord** +@ This will **cause short circuit**

T[+1] **不要拉扯电线**，这样会把店子弄坏 (**Don't stretch the wire lines,** (this) will damage the cushion)
T[-1] [ ]

S21:@ Ladies and gentlemen, you could have it now at- **30 pounds. In John Lewis, Edinburgh,** it costs- 69 pounds@ **If you are interested**, feel free **to try the Shiatsu massager** again before you buy it. + Thanks

T[+1] 先生们，女士们你们现在就可以购买，只需**30**英镑而在英国哪需要69英镑–如果你想的话*可以**再试**一下 (*Ladies and gentlemen you could get (it) now only at **30** pounds, But in **UK** at **69** pounds, you could **try** again if you like)
T[-1] 女士们先生们你现在只用**30**英镑就可以享受这个价值为*60*英镑的手指式按摩椅 (Ladies and gentlemen you could get (it) now only at **30** pounds, which should have cost 60 pounds)

The descriptions above aim to show how the interpreting subjects' mental effort expended in achieving coherence was reflected in processing the textual structure, and how they worked their way through the different sections in interpreting the overall structure. From the perspective of the textual structure, the interpreter's interactive embodiment is the control centre of coherence building in this SI context, either facilitating or constraining the interpreter's capacity to build coherence throughout interpreting to more or less degree. In addition, the more prominent and salient cognitive aspects give rise to direct understanding and coherence. With respect to the obscure and minor cognitive aspects, if the interpreter was not inquisitive, or not

careful enough to observe what is going on, say, from whole to part, outside to inside, she would lose out in information distribution links. The section representing embodied *concepts* in this research comes in the second rank in terms of coherence clues, and is analyzed from the propositional model perspective. According to the results, the best interpreted coherent section is semi-embodied information which corresponds to the image-schema. The section representing semi-embodied knowledge is more easily processed than the other two sections due to the fact that information in the image schema is general and broad, or in a skeleton form.

When moving further away from the embodied knowledge to the non-embodied knowledge, the subjects started to confront difficulties, indicated by long pauses and omissions of information. This shows that background knowledge, represented by the conceptual knowledge system, is crucial in SI. Basically the interpreter should have acquired enough conceptual knowledge of the subject matter to process the information in question. The abstract concepts are the weakest link, particularly in terms of interpreting technical terms and numbers as the results in Chapter 6 show.

On the basis of this ICM-based discourse structure prototype, the interpreter can classify a variety of information in terms of the textual structure, and determine her mental effort or attentional energy; in other words, the interpreter will use this ICM based discourse structure prototype to complement the formula by Gile (1995) in his Effort Models: SI = L (listening and analysis) + P (production) + M (memory) + C (coordination) (reviewed in Section 3.3.2).

The SI information structure has semi-embodied information in the top rank, embodied in the middle and non-embodied information in the bottom. It implies that the interpreter would know semi-embodied information is general and broad, where the interpreter must meet (1) $LA \geq LR$: listening and analysis adequacy can cope with this section. When the interpreting moves to embodied information, the interpreter must meet (1) $LA \geq LR$, and (2) $MA \geq MR$: not only listening but also more memory effort is involved. When the interpreting comes to the non-embodied section, the interpreter must meet the four: (1) $LA \geq LR$, (2) $MA \geq MR$, (3) $PA \geq PR$ and (4) $CA \geq CR$: the capacities available for each effort, including listening and analysis, memory, production and coordination, must be equal to or larger than its requirement for the task at hand (Gile 1997/2002: 165), suggesting that the non-embodied information, with abstract and specialized terminology, might be the greatest potential enemies, which the interpreter should spare no effort to overcome by virtue of

activating and construing the cognitive functional and meshing network.

The ICM improves on the rationalism-based theories on simultaneous interpreting, as reviewed in Section 3.3. On the basis of early cognitive science, both Cognitive Processing paradigm (CP) and the Effort Model assumed a strict dualism in which the mind was characterized in terms of its formal functions, independent of the body. This is the problem of 'Cartesian discipline' with interpreting studies, advocated by Gile (1994: 53), (Section 3.3). Lakoff and Johnson (1999: 75-76) went to the core of the issue of the early cognitive linguistics as follows:

> Mind, on both conceptions, happened to be embodied in the brain in the trivial sense in which software needs hardware to run on: the brain was the hardware on which the mind's software happened to running, but the brain - hardware was seen as being capable of running any appropriate software, and so was assumed to play no essential or even important role in characterizing the mind-software. Functionally, mind was disembodied. Moreover, thought was seen as literal; imaginative capacities did not enter the picture all. This was modern version of the Cartesian view that reason is transcendental, universal, disembodied, and literal.

The Embodied Cognition theory gives an account of the reason why the working memory assumption (Section 3.3), in ignoring the role of bodily experience, has lost its explanatory power. While pointing out the weak points in traditional cognitive linguistics, the ICM also inherits its reasonable elements, such as computing methods, which have been reflected in this study. In summary, with respect to the interpreter's mental effort, this study has provided a framework for Tebble's contextual configuration (1994; reviewed in 2.1) and IT's information structure (1996; reviewed in 3.2), and also a flow chart for Giles's effort models (1995; reviewed in 3.3.2).

Now let us discuss this question: what do the cognitive properties suggest to the interpreter in processing information, from the ICM perspective, reviewed in Section 4.3? Further, what underlies the properties? Idealization suggests that the interpreter can use a prototypical model – that is, the best, representative example - to categorize the textual structure of the source text, dividing concepts relating to the topic into embodied, semi-embodied and non-embodied knowledge, and distributing her mental effort. Fuzziness suggests that the interpreter needs to know that, within the idealized textual structure, the embodied *concepts*, and semi-embodied and non-embodied

concepts merge into each other; however, the textual structure develops from the whole to the partial, which suggest to the interpreter that, the information will be transmitted from general to the specific, in a hierarchal and graded structure, so the interpreter expends an increasing mental effort.

I start to explore this question above through Lakoff's assumption on categories (1987: 6): 'any adequate account of human thought must provide an accurate theory for all our categories, both concrete and abstract'. This ICM-based textual structure and the interpreter's mental effort expended in achieving coherence can be explained and classified by means of the functioning of categories, on the grounds that 'A central goal of cognitive science is to discover what reason is like and, correspondingly, what categories are like'. According to Lakoff and Johnson (1999: 19), categorization is defined as not a simply intellectual matter, occurring after the fact of experience; rather 'the formation and use of categories is the stuff of experience. It is part of what our bodies and brains are constantly engaged in'. Categories must have best examples, referred to as prototypes.

This ICM-based prototype of the discourse structure, comprising the embodied, semi-embodied and non-embodied knowledge, is determined by cognitive categorization, on the grounds that 'how we categorize is central to any understanding of how we think and how we function' (Lakoff 1987: 6), and that 'Linguistic categories are among the kinds of abstract categories that any adequate theory of the human conceptual system must be able to account for' (Lakoff 1987: 180). I apply the cognitive conceptual system to account for the abstract categories of the discourse structure in coherence in SI.

This ICM-based prototype of discourse structure is based on basic level categorization: generalization proceeds upward from the basic level and specialization proceeds downward (Lakoff 1987: 13). With respect to the discourse structure prototype, it starts upward from image schema based general information to embodied information in the middle, to the top of abstract/non-embodied concepts, and downward vice versa, i.e., the properties of hierarchy and gradience. However, the categorization process cannot clearly separate embodied knowledge from semi-embodied and non-embodied knowledge in a textual structure, but can be categorized based on the attributes, i.e. fuzziness; the categorization starts from the whole and holistic to the partial and decomposed; finally, this ICM-based prototype of discourse structure is an idealized model for the interpreter to follow.

At this point, the discussion is directing towards a question: how can these assumptions be applied to an interpreting teaching program? It involves a paradigm shift in interpreting study, on the basis of this Embodied Cognition Paradigm. This will be discussed in the following section, in combination with the findings from the undergraduates of the control group who repeated the interpreting.

7.4 The application of this research: an ICM-based interpreting training programme

The undergraduates in the control group repeated the interpreting for a second time, and improved their interpreting performance in terms of each section, that is, they made the most progress in the semi-embodied section (up to 45%), next in the embodied section (up to 39%), and least in the non-embodied section (up to 17%), but still did not perform as well as their experimental peers respectively (1%, 7% and 16% less respectively). The findings show that full preparedness makes a difference, which echoes the statement of Lakoff (1987), reviewed in Chapter 4: it is the imaginative capacity that enables the interpreting subjects of the control group to make sense of what they did not see and feel, but it is bodily experience that gives rise to the best understanding and coherence. The issues arising from the undergraduates repeating their interpreting performance, reported in Section 5.4.4, are as follows: do all interpreters need to have physical experience of everything that could be talked about in the conference? Which parts should be physically experienced? Does the interpreter draw on some sort of indirect experience? Ultimately, how can an ICM-based interpreting training be implemented by virtue of the programme? In addition, in Section 7.2.2, some relevant issues are also raised, including: how could a course predict all the different possible types of embodied experiences they need for all the possible interpreting contexts? In other words, how could a course prepare them for all the types of embodied experience? We will undertake an in-depth discussion and suggest solutions to these issues by means of this ICM-based interpreting training paradigm. In order to provide answers to the questions, I provided a three module structure in Figure 26 below, on the relations among the three fields: interpreting, technology and business (Gao 2005: 41-45). There are three modules. Module one (top) refers to interpreting studies as the dominant theme of this research. Module two, the overlapping sections of the three circles (arrow), refers to the bodily experience

module which determines a better understanding of the specialized knowledge. Module three is referred to as the specialized knowledge of technology and business (on each side):
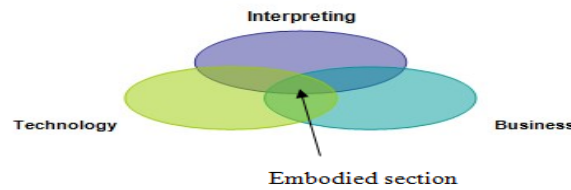
Figure 26 The cross-disciplinary interpreting training modules

Basically fitting into the ICM structure, the overlapping part is the embodied base, from which are extended to the semi-embodied knowledge nearby, and further to the abstract knowledge. On the basis of the ICM, the three module structure (Figure 26) can be further represented by an integrated three module system of cross-disciplinary interpreting education programme, where each module has its own content, and is shown in the following Figure 27:
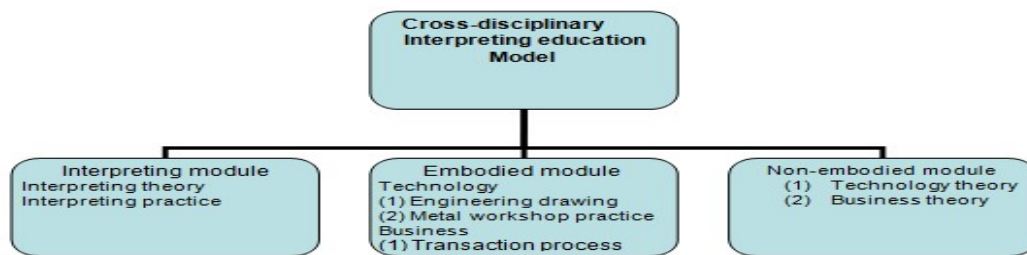
Figure 27 Cross-disciplinary interpreting education programme

The interpreting model (top) can be divided into interpreting theory and the interpreting practice/slots (left). The Embodied Module is mainly targeted towards bodily experience-based knowledge: technical and business are indispensable to each other in engineering and business projects (in the middle). For instance, if the interpreting trainees are engaged in machine building-based translation and interpreting, they will learn how to read engineering drawings, and physically engage in the metal workshops process, ranging from wood mould, casting, machining, heat treatment, testing and measuring, assembly to management control. In addition to the subject matter of technology, the interpreting trainees should learn business. The core for the business knowledge is the embodied business transaction, which involves how to negotiate a business deal, such as offer, counter-offer, and how to document the business texts, such types of physically experienced activities. This is the section representing embodied knowledge for interpreting trainees. In short, for technical and

business interpreting, the interpreting trainee should try every means to be physically involved in the context. It is best to have a hands-on experience to have access to the direct and best understanding of the embodied knowledge, which can be analyzed from the propositional model perspective. This is the first step to make sense of the technical information, by accessing the origin of coherence. These practical parts should be physically experienced.

From the technical engagement and the business transaction, the interpreter will extend to her understanding of the semi-embodied knowledge, which is the outcome of her bodily experience and reflections, analyzed from an image-schema perspective. The interpreter will further make sense of more abstract theoretical concepts, or the specialized knowledge of the given fields. In addition, technical and business terms are living organisms, which cannot stand alone by themselves, but rather exist in a conceptual knowledge system. This is related to indirect experience that the interpreter draws on, and needs more mental effort. The indirect understanding based on direct and bodily experience would work best, and can be viewed from the metaphorical and metonymic model for understanding.

The discussions above imply that interpreting specialization will be the orientation and trend for interpreter training development, echoing Dillinger's finding (1989; 1994) (Section 3.4). Specialization refers to the fact that the interpreter should have her own field of subject matter; in other words, she should specialize in one given study subject, such as technical and business based subjects. The departments of interpreting and translation can design their cross-disciplinary curriculum according to their resources in terms of disciplines available in their universities. For instance, for a business-based university, business interpreting courses can be designed; while for a technology-based university, technical interpreting course can be offered. In reality, both technical and business fields are normally indispensable to each other in engineering and business projects. Developing a command of such ranges of relevant knowledge is possible. According to the Interpretive Theory of translation (Section 3.2), there are a few principles for natural science, by which the interpreter can infer the whole from a single instance. It is worth noting that the relevant abstract concepts or non-embodied knowledge can be learned and prepared, but costs more mental effort. What is more, it is physical and mental engagement that gives rise to optimum understanding. Different study fields have their own contents, but consist of the basic cognitive elements – the embodied, semi-embodied, and non-embodied sections. This
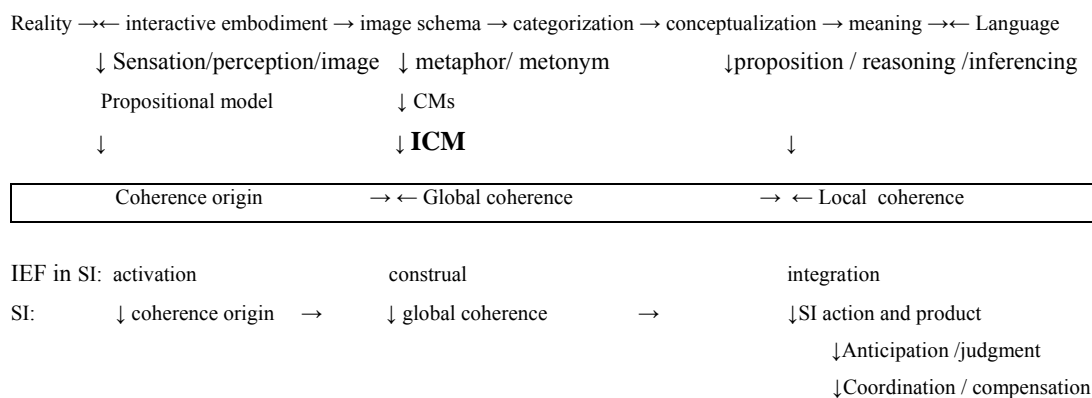
partially answers the question: how could a course prepare the interpreter for all types of embodied experience?

The ICM-based interpreting training programme has its rationale in the paradigm shifts in higher education resulting from Embodied Cognition. The courses and teaching approaches adopted by the higher education institutions and the academic disciplines, including translation and interpreting studies, need to be re-evaluated, to bring about a concept shift in education so as to catch up with current social and economic development. According to Gibbons (et al.1994), the most prominent theory of the *New Production of Knowledge* consists of Model 1 and Model 2. Model 1 refers to the traditional fundamental research paradigm undertaken within a particular discipline; this kind of research is the in-depth accumulation of knowledge, but the problem lies in the separation of disciplines and irrelevance to the present local and regional social and economic needs. Model 2 refers to a cross-disciplinary research paradigm on the basis of practical issues. In the information age, the research paradigm is Model 2 oriented, in that the boundary among disciplines is fuzzy, with top priority given to the interaction between theory and practice, one discipline joined to another. This kind of cross-disciplinary paradigm will lead to a large number of new study fields and potential developments. Model 2 gives more weight to the frontier exploration of the discipline, where many practical and social problems exist, therefore Model 2 is practical problem-driven research. However, the two models are complementary, on the grounds that Model 2 is regarded as an extension of Model 1, and also generates new research directions for Model 1. On the basis of the theory of the *New Production of Knowledge*, interpreting studies, as an academic discipline, involves not only interdisciplinary (Model 1) but also cross-disciplinary research (Model 2). Interdisciplinary study means in-depth research into interpreting by referring to the disciplines such as psychology and cognitive science, while cross-disciplinary focuses on the interpreting trainees' cross- disciplinary command of knowledge, which extends to other subject matters, such as interpreting for business and technology, involving bodily experience as the core in the interpreting training.

In summary, this section has made an attempt to find out the solutions to the issues arising from the previous sections, by designing an ICM-based interpreting training programme. This topic has been presented in a separate paper, entitled *A Cross-disciplinary Course Design for Interpreting* (Gao 2005: 41-45).

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7.5 An outline model for coherence in SI

Based on the discussions above, this section proposes an outline model of coherence in SI as Figure 28 shows below. This study assumes that the interpreter should carry out her interpreting task in the context of embodied experience on the grounds that coherence can be reduced if she does not have any bodily experience, especially in the applied fields of technology and business. Figure 28 below shows how the ICM is used to explore coherence in SI, and how this model combines the relevant elements discussed so far. This model can serve as panoramic view of the process of coherence in SI, showing a flow chart of the interpreter's mental effort in processing information in building coherence:

Reality →← interactive embodiment → image schema → categorization → conceptualization → meaning →← Language

      ↓ Sensation/perception/image   ↓ metaphor/ metonym   ↓proposition / reasoning /inferencing

      Propositional model   ↓ CMs

    ↓   **↓ ICM**   ↓

Coherence origin	→ ← Global coherence	→ ← Local coherence

IEF in SI: activation   construal   integration

SI: ↓ coherence origin   →   ↓ global coherence   →   ↓SI action and product

                                                                   ↓Anticipation /judgment

                                                                   ↓Coordination / compensation

Figure 28 An outline model for coherence in SI

Before the conference the simultaneous interpreter will prepare herself for the interpreting task in an integrated way. She will start finding out the purpose of the conference and understanding all information relevant to the topic. In the case of a technical conference the simultaneous interpreter starts making sense of the topic and building up coherence, from her interactive embodiment, by being physically involved in the technical aspects, for instance, the mechanical device system. She observes, if possible, puts her hands on what she will be engaged in for interpreting, cognitively speaking, by her sensation, perception, and imagery capacity. In this way she will attain an aspect of a directly experienced situation which is directly understood because it is pre-conceptually structured. In other words, she will initially form the embodied/propositional mental structure of the technical topic. During this interactive embodied processing she will activate the links and relations of the basic-

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level embodied *concepts* to achieve the fundamental coherence, that is, the origin of coherence. This process is represented on the first vertical line of Figure 28. Meanwhile during the preparation for the coming conference she will encounter some abstract concepts, for instance, the subject matter and technical terms, some of which are within her comprehension (semi-embodied concepts) but some might be understood by analogy or metaphor, and need more hard work to gain this specialized knowledge (non-embodied concepts). When she has construed all the information and made sense of the topic; she will have an ICM in her mind, which gives rise to global coherence. This process is indicated by the second vertical line of Figure 28.

When the conference starts, the interpreter will access the on-line speech via the cognitive world (ICM + background knowledge) by reasoning and inferencing to achieve coherence in SI. At this stage, the knowledge acquired via direct and indirect understanding will help the interpreter to achieve local coherence. This process is illustrated by the third vertical line of Figure 28. Local coherence in SI is established, represented by the interpreting strategies – anticipation, compensation, judgement and coordination (Chapter 1). In short, Figure 28 shows the way in which the model of coherence in SI is built in relation to the three parts which comprise origin of coherence, global coherence and local coherence.

In addition, the interpreter could use this model to organize her mental effort. As discussed above, the interpreter uses the embodied experience based knowledge as the control centre to extend her understanding of the information available, ranging from the embodied to the abstract. The interpreter expends less mental effort on the embodied *concepts* which give rise to direct understanding. The interpreter spends more mental effort on some abstract technical concepts which can be understood via familiarity with popular science, or made sense of by analogy or metaphor. For the interpreter, to construe a structure of abstract or non-embodied conceptual knowledge is the most challenging task. On the basis of what kind of information is easy or difficult to process, the interpreter will determine how to distribute her limited amount of mental effort to the different parts of the source text.

The interpreter should prepare adequate knowledge relating to the topic for the conference interpreting on the grounds that inadequate knowledge will put the interpreter in a vulnerable position. According to Pöchhacker (1992) (reviewed in Section 3.5) knowledge is the most crucial factor to enable the interpreter to make sense and establish coherence, in that the total capacity available to the interpreter

must be equal to, and usually exceed the total requirements (Gile 1995) (reviewed in Section 3.3.2). This is because each item of knowledge is stored in a cognitive system and the interpreter has to spend a heavy mental effort while searching for the item needed. In other words, when the interpreter is receiving a stimulus, she will turn to the short-term storage and processing resources to mediate the online interaction between the fresh input and the knowledge stored in long-term memory. If she fits the input in with her ICM and background knowledge she can establish coherence immediately, otherwise she will lose the chain of the links and struggle to rethread the flow of ideas because she has inadequate relevant knowledge available; in other words, her working memory will be breaking down.

On the basis of the previous literature review and the findings of the experiment, this thesis has provided a model of coherence in SI. Theoretically and experimentally, I have attempted to explore the role of the interpreter's relevant bodily experience to help the interpreter to achieve coherence, and also the way the interpreter distributes her mental effort in processing the textual structure, from the ICM perspective.

7.6 Concluding remarks

At this point, I have explored the research questions, on the basis of corpora. I have developed the theoretical arguments grounded in the literature review of this study. The discussions centre on one point: in order to make sense and build coherence the interpreter is basically dependent on her interactive embodiment. The interpreter's interactive embodiment, as the compulsive force vector, facilitates her inferential capacity in helping her to build up links among the concepts in the contextual situation. Direct bodily experience gives rise to the best understanding; the interpreter's embodied experience can compensate for her deficiency in language competence. However, it is also crucial for the interpreter to build up her conceptual knowledge system, not only relating to the embodied knowledge but also the non-embodied knowledge, by means of her imagery capacities. In addition, the interpreter can distribute her mental effort according to her knowledge structure in terms of embodied, semi-embodied and non-embodied concepts. On the basis of the discussions above, an ICM-based interpreting programme was introduced, showing how this research can be applied to interpreting teaching, and the model of coherence

in SI was formulated, demonstrating how the research and the programme work in the interpreting process.

This chapter is the heart and climax of this study which takes up approximately double the space of any other chapter. This chapter has developed not only descriptive but also analytic and critical discussions on the primary results and findings. I have highlighted where there are differences and similarities from the literature or between different or contrastive groups. So far, we have completed both the theoretical framework and experiment, and will conclude the whole study in the following chapter.

Chapter 8 Conclusions

With both the theoretical framework and experiment outcomes covered, this study now arrives at its destination – the conclusions. The primary focus of this study is summed up in Section 8.1 Synopsis; and Section 8.2 presents the contributions to interpreting studies, Section 8.3 to interpreting education and training, and Section 8.4 to the study of cognitive linguistics on coherence. Whilst claiming the contributions as above, this study acknowledges its limitations in terms of its authenticity (Section 8.5). Section 8.6 designs future work around the topic of coherence in SI with respect to divided attention (Section 8.6.1), pauses and synchrony (Section 8.6.2), time lag and segmentation (Section 8.6.3), intonation and stress (Section 8.6.4), cohesive ties in the embodied cognition context (Section 8.6.5), all of which are apparent in the data, but have not been studied in depth. To address these issues, this study will further combine Embodied Cognition with the Relevance Theory (Sperber and Wilson 1986/1995/2001) to shape a future cognitive and pragmatic framework (Section 8.6.6).

8.1 Synopsis

Coherence in interpreting is a topical issue in interpreting studies, and involves the ultimate concerns of this study. In order to address these concerns, I proposed two specific research questions on the basis of the ICM, as stated in Section 1.2, Introduction:

1) Does the interpreter's relevant bodily experience help her to achieve coherence in the source text (ST) and target text (TT)? (Chapters 5, 6 and 7).

In order to address this point, I designed a bodily experience based experiment, by enabling the interpreting subjects of the experimental group to be physically engaged in installing the testing tool – the shiatsu device – prior to interpreting. This set the platform for comparison between the experimental group who had bodily experience and the control group who did not have bodily experience (Chapter 5). The experiment outcomes show that the interpreting subjects of the experimental group performed better at interpreting than those of the control group, in terms of the coherence clues rating; and that the former's previous relevant bodily experience

fundamentally helped them to achieve mental coherence throughout the interpreting performance (Chapters 6 and 7). This finding points to the assumptions and theories in the framework, in that, through their embodiment-based activation and construal stage (Section 5.4), the interpreting subjects of the experimental group had a basic embodied mental structure and image-schema of the installation procedures of the shiatsu device, basically with the fixing procedures mapped into their minds via mental space blending. In other words, the interpreting subjects were able to activate the causal concepts, relations and links in a mental workspace, which helped them achieve coherence in following the source text (ST) and hence in producing target text (TT). The interpreters' relevant bodily experience helped them to build up the concepts throughout their interpreting. On the other hand, I also found that the full preparation, displayed by the interpreting undergraduates without bodily experience, worked effectively, especially in terms of the semi-embodied knowledge, due to their imaginative capacity, but significantly less than the exposure to bodily experience.

Following the role of the interpreter's relevant bodily experience, I also found that, the prominent embodied *concepts* will be activated more easily than those subordinate and obscure embodied ones, revealing a more specific and detailed cognitive processing property in making sense and establishing coherence, from the ICM perspective.

In addition, I found that the undergraduate subjects' exposure to bodily experience helped them in achieving coherence despite their lower language level and lack in interpreting experience (Chapters 6 and 7). The results show that, after immersion in bodily experience, the undergraduates in the experimental group not only did much better in following coherence clues than their peer group but also nearly caught up with the postgraduates and teachers in the experimental group. In short, the interpreters' relevant bodily experience facilitates their capacity in building coherence throughout to a greater or lesser degree. The first hypothesis on the role of the interpreter's bodily experience, formulated in Section 5.1, has been confirmed.

Next, I will address the second question:

2) How does the interpreter's mental effort expended in achieving coherence reflect the textual structure in the source text (ST)? (Chapters 5, 6 and 7).

The data in Chapters 6 and 7 show how the interpreter's mental effort expended in

achieving coherence reflects the textual structure of the ST, and how the interpreters worked their way through the different sections in the overall structure. It is their interactive bodily experience that influenced the mental effort which the interpreters distributed to the different sections representing semi-embodied, embodied and non-embodied knowledge respectively. According to the results, the best interpreted coherent section is the semi-embodied information, analyzed from the image-schema perspective. The section representing semi-embodied concepts is more easily processed than the other two sections representing embodied *concepts* and non-embodied concepts. Semi-embodied knowledge has a general and broad nature, in a skeleton form. The interpreting subjects spent the least mental effort in this section.

When moving further away from the semi-embodied to the embodied knowledge, analyzed from the propositional model, the interpreting subjects in the experimental group started using more of their mental effort in processing embodied information: on one hand, the more prominent embodied cognitive aspects gave rise to their direct understanding, facilitating their coherence building; on the other hand, the obscure and minor cognitive aspects negatively influenced them in achieving coherence. If they were not inquisitive, or careful enough to observe what was going on, in detail (e.g. from whole to part, outside to inside), they would have to spend more mental effort in processing the current information so as to maintain the coherent links. Another factor is that the information is dense which taxes the interpreter's mental effort, as Dillinger's assumption (Section 3.4).

When coming to the section representing non-embodied concepts, analyzed from the metaphoric and metonymic model, the subjects started to confront more difficulties, indicated by the lowest coherence ratings, long pauses and omissions of information, and the most mental effort. The abstract concepts were the weakest link, particularly in terms of interpreting technical terms and numbers. This shows that, in addition to the interpreter's bodily experience, a conceptual knowledge system of the subject matter is crucial in achieving coherence in SI. In other words, the interpreter should acquire enough specialized knowledge to process the information in question. In short, the section representing non-embodied concepts is the most problematic, especially in terms of the subject matter, and numbers, names and technical terms. It is the section which demands the heaviest mental effort.

From the data, I found that, the second hypothesis, formulated in Section 5.1, was re-modified: in terms of the process of the interpreter's mental effort, the semi-

embodied section came in the first rank in achieving coherence clues, with the least mental effort; the embodied section came in the second rank, with more mental effort; the non-embodied section in the bottom rank, with most mental effort. The findings above agree with the ICM assumptions in processing information, rather than contradict them, in that the ICM is basically idealized: the information structure or the textual structure does not fit in with the ICM, perfectly or all the time. As a matter of fact, this seeming mismatch shows the true and specific situation of the textual stricture, as explained in the corresponding sections.

In following section, I will sum up the findings relating to the objectives formulated in Section 1.2, Introduction. I will address the first objective:

1) *To make a critical examination of the previous theories in the field of linguistics and SI studies relating to coherence* (Chapters 2 and 3).

I reviewed the most prominent and representative literature on coherence in Chapter 2, and found that coherence has been discussed from a number of perspectives, ranging from Systemic Functional Linguistics (SFL) (Section 2.1), a Knowledge-based view (Section 2.2) to Mental Models theory (Section 2.3). Next, in Chapter 3, I discovered how the theories on coherence have helped interpreting researchers with their analysis of coherence in SI, including: Systemic Functional Linguistics (SFL)-based researches into coherence in SI (Section 3.1); and three SI paradigms: (1) the empiricism-based paradigm: Interpretive Theory of translation (IT) (Section 3.2), (2) the rationalism-based paradigm: the Cognitive Processing theory (CP) and the Effort Models (Section 3.3), (3) the paradigm combining empiricism and rationalism: the computational approach to understanding and coherence (Section 3.4), and finally *From Knowledge to Text: Coherence in Simultaneous Interpreting* (Pöchhacker 2002) (Section 3.5). However, I noted that none of these have addressed the issue of the origin of coherence, on the basis of the Embodied Cognition. Therefore, I aimed to address this inadequacy.

 2) *To provide a new perspective on coherence in SI in the field of research and training* (Chapter 4 to 5).

In opposition to the previous theories on coherence, reviewed in Chapters 2 and 3, this

study has used the interpreter's embodied direct understanding and non-embodied indirect understanding (Lakoff 1987: 292-294; reviewed in Chapter 4) to explore the interpreter's comprehension and coherence building process. The kinds of information experienced bodily and directly are more understood than those less experienced. Therefore, Embodied Cognition theory explains the findings which the traditional theories, reviewed in Chapter 2 and 3, have not yet attempted: concepts which one word will activate are on different levels in terms of salience; the concepts at frontier and remote levels are less likely to be activated than those at a prominent level; discourse coherence is in proportion to cognitive distance: the closer the cognitive distance in bridging the concepts in pairing utterances, the shorter the time to trace the references. According to Embodied Cognition theory, it is bodily experience that gives rise to the best understanding, enabling the communicator to build up coherence directly. This is the reason why interpreters with bodily experience can achieve more coherence than those without; bodily experienced knowledge is more easily activated than that not bodily experienced, and it is used to extend understanding to semi-embodied concepts (from an image-schematic perspective) and non-embodied abstract concepts (from the metaphorical and metonymic view). The ICM-based theory has provided a new perspective on coherence in SI in the field of research and training.

3) *To contribute to the general understanding of how coherence is achieved in SI* (Chapters 6 and 7).

The data and findings (Chapters 6 and 7) show that, when the interpreter forms the origin of coherence, by means of her relevant bodily experience, she can have access to global coherence, and further attain local coherence in interpreting to such an extent that one word will activate a series of her experiences or concept structures in the frame, script, and the specific uniform knowledge structure, in a particular context. These findings are observable in the capacity of the experimental group in their appropriate strategies including anticipation, compensating, judgement and coordination, contributing to the general question of how coherence is achieved in SI.

8.2 Contributions to interpreting studies

As a contribution to the research into interpreting studies, this study has provided a case for the paradigm shift toward the Embodied Cognition Paradigm (Pöhhacker 2004; reviewed in Section 3.5), via the application of the ICM. As reviewed in Chapter 3, the empiricism-based paradigm, the Interpretive Theory of translation (IT) basically relies on subjective evidence (Section 3.2)；and the rationalism-based paradigm, the Cognitive Processing theory only aims to give an objective account of meaning by formalist means, i.e. viewing meaning as a series of computer data (Section 3.3.1)；and the paradigm combining empiricism and rationalism – the computational approach to SI – still uses the first generation cognition theory to investigate understanding and coherence (Section 3.4). I classified the three paradigms as Objectivism, because they have ignored primary evidence in human reason: Thought is embodied. The Embodied Cognition Paradigm of interpreting studies rules out the fundamentally irrational element of Objectivism, and maintains an Experientialist view on interpreting studies, emphasizing the role of interactive embodiment in conceiving the actual and mental world. This research has adopted the experientialism-based ICM as an approach to SI and designed the experimental procedures, on the basis of the framework of the Immersed Experiencer Frame (IEF), and used the ICM-based tools to track coherence clues, taking advantage of Dillinger's computational approach to manipulate the data. This study has also contributed to an understanding of how to combine the ICM theory with a computational approach (Lakoff 1987) (Section 3.3), in interpreting studies.

In addition to the theoretical framework, the methodology and experiment, this study contributes to research into the interpreter's mental effort. The findings show that the interpreter's mental effort expended in achieving coherence was reflected in processing the textual structure, illustrating the way the interpreting subjects worked their way through the different sections representing the embodied, semi-embodied and non-embodied knowledge, in the overall structure of the ST. This ICM-based framework has set up a prototypical model for the theories of the contextual configuration (Tebble 1994) (Section 3.1.1), the information structure in the Interpretive Theory of translation (Seleskovitch and Lederer 1986) (Section 3.2), and a flow chart and a system for the Mental Models (Gile 1995) (Section 3.3.2).

8.3. Contributions to interpreting education and training

As a contribution to the education and training of interpreters, this study has designed an ICM-based interpreting training programme, based on the concepts of embodied, semi-embodied and non-embodied knowledge structure, required of interpreting trainees, showing that the interpreting trainees can acquire the basic level embodied knowledge, or the best understanding knowledge from direct physical involvement, and extend their embodied knowledge to the semi-embodied and non-embodied knowledge (Section 7.4). This study has pointed to both the need for 'specialized knowledge and competence of a given professional or other group' (Pöchhacker 1992; Section 3.5) and the inevitable trend to specialization in interpreting education and careers, pointed out by Dillinger (1994) (Section 3.4). In order to help interpreting trainees access the specialized knowledge, this study attaches importance to cross-disciplinary education in interpreting education and training.

In order to show how this ICM-based interpreting training programme works, an interpreting model of coherence in SI has been posited (Section 7.5). The model shows the way the interpreter applies her relevant bodily experience to make sense of the current utterance and build coherence. This model suggests that, regarding interpreting teaching, it is not adequate for teachers only to focus on interpreting skills and practice; they can guide their students to engage in interactive embodiment as well, particularly in relation to applied fields, such as engineering and business interpreting, to build up the relevant ICM for the subject matter and thus improve their interpreting performance.

According to the findings of this study (Chapters 6 and 7), language deficiency can actually be complemented by cognitive competence; therefore, it is appropriate for third and fourth year undergraduates of language majors to have interpreting training courses and/or interpreting programme. Interpreters are made rather than born, provided that they are trained according to the embodied cognitive process. This study sheds light on the teaching of interpreting and compiling pedagogical material. Interpreting textbooks can be compiled by integrating interpreting skills with embodied cognition to suit the specialization orientation; the interpreting material can be designed in the form of cross-disciplinary interpreting education modules, with the embodied module as the core, and further extended to the non-embodied module (Section 7.4).

8.4 Contributions to cognitive linguistics on coherence

This study contributes to the development of cognitive linguistics with regard to understanding and coherence, by putting forward the terms embodied *concepts*, semi-embodied and non-embodied concepts, to show how understanding is processed, and also offers a holistic view on coherence, based on embodied cognitive linguistics. On the basis of the concepts of global and local coherence of the Mental Models theory (Section 2.3), this study has put forward the notion of the origin of coherence, on the basis of embodied cognitive linguistics, pointing out that the cognitive process starts with interactive embodiment with the actual world and it is this interface between interactive embodiment and reality that gives rise to coherence (Chapter 5 to 7). In other words, coherence begins with interactive embodiment which leads to the origin of coherence; the embodied origin of coherence threads through the global and local coherence, basically determining the links between concepts and meaning through cognitive processing.

8.5 Limitations

This study has made contributions to interpreting studies with respect to research and education as well as cognitive linguistics. However, it has several limitations. The primary limitation is its deficiency in authenticity. As Mackintosh comments (1983) concerning her own research into message loss in SI, this kind of intensively focused experimental research features the lack of authenticity of the experimental data, and the initial conclusion 'would have to be checked against a corpus constituted under real life conditions' (Mackintosh 1983; Pöchhacker 2004: 71). Following the principal limitation of authenticity, the first major methodological problem, in terms of the subjects, is the inclusion of non-professional simultaneous interpreters. According to Gile (1994), professional interpreters might be significantly different from students or amateur interpreters in performing an interpreting task, and the latter may not be representative of the interpreting activities to be researched. This is because 'A professional's approach and appropriate working methods in I/T are the result of training, experience and selection' (Gile 1994: 44). In this study, the subjects, interpreting teachers, the postgraduates and undergraduates are amateurs in a strict sense, so this further reduces the validity of comparability (Gile 1994: 45) between

the experienced teachers, less experienced postgraduates and undergraduates in Section 5.3. With respect to the experimental material and conditions, the simulated speech and manipulated procedures have some discrepancies from the actual situations in SI.

The next limitation is the small corpus size in terms of the material, which only lasts approximately 5 minutes, and has only one text. Although this small sized corpus is justified in Section 5.2, to some extent, it has reduced one of the most prominent advantages of corpus-assisted studies – processing of texts of a large number of words; therefore, the conclusions drawn upon such small corpora are slightly shaky and, at best, can be considered as working hypotheses to be confirmed in future studies. Also, due to the small corpus size, another limitation is that, although the experiment apparently showed how the mental propositional structure and image-schema, and partially metaphorical processing (i.e. the fixing procedure and structure of the shiatsu device in terms of frame and script, cognitive processing by virtue of schema, such as the container, the part-whole, the link; Sections 4.2.2; 5.4.2) are reflected in processing the information to achieve coherence in this SI experiment, it is not obvious how metaphorical processing works in meting out abstract concepts to achieve coherence, specifically, what sorts of schema exist to reveal the way abstract concepts are processed. This further suggests its limitation to the research into the more *intellectual* aspects of profession where prior embodiment is not a prominent feature.

With regards to the experiment, I did not undertake the sample T test for all the groups to ensure the effect of language proficiency, nor measure the individual differences in visual imagination; all the reference to neural events taking place is still speculative; the relevant neurolinguistic research is needed to back up the discussion.

Finally, although I have examined the impact of the interpreter's interactive embodiment on her coherence building capacity, concluding that the interpreter's relevant interactive embodiment plays a primary role in building coherence, there are other additional factors, such as language incompetence, gaps in extra-linguistic knowledge or coordination problems (Gile 1995), information density (Dillinger 1989, 1994) also leading to errors and failures in coherence in SI, but I have not distinguished between these failures and errors in my corpus. Since the interpreter deals with a task, coordination is essential, and since interpretation is a form of action, it involves the skills, such as judgement, compensation and anticipation. Although the

pilot testing of this study has studied these aspects in the translation process, a large size corpus-based study is required to further investigate the issue of coordination.

At this stage, I might as well turn back to Pöchhacker (1992) (Section 2.4): 'What is sufficient coherence – do we know? I am afraid the answer must be negative.' This point is discussed in the following section as future work.

8.6 Future work

This study has started from a concern with the way the simultaneous interpreter makes sense and builds coherence synchronically. However, synchronically achieving coherence, via overlapping talk and the interpreter's multiple involvements in her interactivity of listening and speaking, involves more relevant issues which need to be studied further, including divided attention (Section 8.6.1), and pauses and synchrony (Section 8.6.2), time lag and segmentation (Section 8.6.3), all of which are apparent in the data, but have not been studied in depth.

8.6.1 Divided attention and coherence in SI

One of the future undertakings is the research into attention-sharing in Chinese to English SI. In other words, how does the simultaneous interpreter manage the process of alternate switching of attention between listening and target-language output while making sense? Or, how can the simultaneous interpreter attend to both the speech of others and her own so as to achieve coherence? If the simultaneous interpreter becomes more coordinated and automatic in attention-sharing process through exercise and experience as claimed by Gran (1989: 97), how is this evidenced empirically in Chinese to English simultaneous interpreting? Furthermore, does the simultaneous interpreter learn either to ignore the sound of her own voice so as to avoid interference (Kurz, 1996) or to monitor her own voice, for instance, for self-correction (Gerver, 1971)? The attention-sharing principle in the interpreting process is fundamental to recent studies on working memory and making sense in SI. However, as Pöchhacker (2004: 116) concludes, the details of the interpreter's selective allocation of her attention resources remain unclear.

8.6.2 Pauses and coherence in SI

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Another future exploration of this study is to investigate the issue of pauses in Chinese simultaneous interpreting. There are pauses emerging in the data of this study. However, what types of pause are existent in SI? What are the causes for the pauses? What time length and frequency is shared for each type of pause? In addition, how does the simultaneous interpreter take advantage of pauses in the source speech to make sense while avoiding the simultaneity of listening and speaking? In other words, how would the simultaneous interpreter try to crowd as much of their output as possible into the speaker's pauses (Barik, 1973) while also building up coherence? Further, are source-speech pauses either an epiphenomenon of the task or a strategy to aid interpreting performance (Barik, 1973; 263) in making sense during the interpreting? This study will be based on the pause-time analyses of authentic conference speeches, taking advantage of a computer-assisted speech corpus (e.g. Lee 1999, Yagi 1999, Tissi 2000), and employing a pause criterion of 250 milliseconds (Gever 1975, 1976) so as to address the issue of the essential simultaneity of speaking and listening while establishing coherence in Chinese to English simultaneous interpreting.

8.6.3 Time lag and coherence in SI

The next issue for future work is further to investigate time lag or ear-voice span (EVS) in Chinese to English SI in terms of time taken to make sense, in that the findings of the stopwatch measurements have varied with various researchers. As reviewed in the Introduction of this study, Paneth (1957/2002: 32) measured lag times in fieldwork data and found average values between 2 and 4 seconds with the conclusion that 'the interpreter says not what he hears, but what he has heard'. Andres (2002) used time-coded video-recordings to study EVS, and found that average lag time for professional subjects working from French into German is between 3 and 6 seconds and may mount up to 10 seconds. In order to test their findings I analyzed two subjects' audio segments in Sections 6.2.3 and 7.2.3, however, this small sized audible data cannot provide a whole picture of EVS. In addition, according to Goldman-Eisler (1972/2002) EVS units are not of a lexical but of a syntactic nature, and EVS units basically consist of a complete predicative expression (noun phrase + verb phrase). Along this line, I argue that EVS units are made up of theme and rheme chain-like structures (Section

2.1), in which themes play a crucial part in achieving coherence and the EVS is directly connected with sense-making capacity. Therefore, in order to identify the thematic structure as the embodied cognitive interrelation of EVS, this future study will observe how, in making sense, the interpreter chunks the segmentations in output production while following the sequence of the input segments, on the basis of a large sized corpus.

8.6.4 Intonation and coherence in SI

In addition to the issues pertaining to simultaneity in interpreting, the findings in this study will also progress to research into the use of intonation and stress in SI. This study has focused on the coherence clues in comprehension in SI, but has not yet investigated how these clues are reflected in intonation and stress, in other words, how a prosodic pattern is formed by the coherence clues in SI. These aspects of spoken language are so important that they cannot be ignored in analysis of SI. In my future work, from the perspective of the rhythmic feature of coherence clues in SI, I will investigate how the coherence clues are used by the interpreter strategically so as to stay as close as possible to the speaker in terms of the goal which is driven at, the speed which is maintained and key points which are stressed. This will be undertaken by computer-assisted speech data analysis; phonetic analysis software will be used to mark the coherence clues in the spoken/voice text in terms of the rise and fall of the pitch and intensity to observe the rhythmic feature of coherence clues in SI.

8.6.5 Cohesion shifts in the embodied cognition context

From this study's corpus, one issue becomes prominent; that is, the interpreting subjects use cohesive devices in this embodied cognition based context; therefore, what kind of role do the cohesive devices actually play from the embodied cognitive perspective in coherence in S? Are there similarities and differences with the findings of Shlesinger (1995; reviewed in Section 2.1.1)? Further, does the simultaneous interpreter adopt the cohesive devices consciously or unconsciously to establish coherence in the embodied cognition context? I will study cohesion shifts in the embodied cognition context.

8.6.6 A cognitive and pragmatics view, based on neurolinguistics

Although partly involving the pragmatics-based relevance theory (Sperber and Wilson 1986/1995/2001), the model of relevance degrees will be fully used along with the ICM to explore this topic. Cognition is relevance-orientated, and relevance can be employed to explain cognitive behaviour; it serves as a role of guidance in communication, during which 'the greater the processing effort, the lower the relevance' and vice versa (Sperber and Wilson 1986: 124). This model can be represented in the formula: Relevance=$\frac{\text{context effect}}{\text{processing effort}}$. Likewise, the interpreter will tend to use the minimum mental effort to access the maximum context effect, and therefore will spend her energy on the most relevant information so as to produce coherent information, enabling the listener to follow the thread of ideas at the minimum mental cost. I will discover the answers to the issue of coherence in SI from a cognitive and pragmatics view, based on neurolinguistics. This future work will attempt to see how the interpreter's brain works, in the embodied and non-embodied contexts, applying functional Magnetic Resonance Imaging (fMRI), to make the discussion more plausible rather than speculative.

8.7 Concluding remarks

This conclusion has provided a summary of the theme of this study – the role of the Idealized Cognitive Model in simultaneous interpreting, presented the contributions to simultaneous interpreting in terms of research and training, acknowledged its limitations, and finally outlined its future work. While the findings of the present study have answered aspects of the research questions on coherence in simultaneous interpreting, they have also raised a series of new questions to be addressed as above. These questions point to new academic expeditions which will be undertaken as described. This study concludes its present exploration on the topic: Coherence in Simultaneous Interpreting from Idealized Cognitive Model Perspective, with Eliot's lines from his *Four Quartets* (1945):

> What we call the beginning is often the end
> And to make an end is to make a beginning.
> The end is where we start from …

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Appendixes

The CD-Rom attached with this copy of the thesis contains (1) source text, (2) coherence clues attained by each subject, and TEM scores achieved by the interpreting undergraduates, (3) transcribed protocols of each subject in the experimental and control groups.