Hacettepe University Graduate School of Social Sciences
Department of Translation and Interpreting

VISUAL FOCAL LOCI IN SIMULTANEOUS INTERPRETING

Alper KUMCU

Master's Thesis

Ankara, 2011

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KABUL VE ONAY

Alper KUMCU tarafından hazırlanan “Visual Focal Loci in Simultaneous Interpreting” başlıklı bu çalışma, 27 Haziran 2011 tarihinde yapılan savunma sınavı sonucunda başarılı bulunarak jürimiz tarafından Yüksek Lisans Tezi olarak kabul edilmiştir.

Prof. Dr. Ayfer ALTAY (Başkan)

Prof. Dr. N. Berrin AKSOY (Üye)

Doç. Dr. Aymil DOĞAN (Danışman)

Yrd. Doç. Dr. Elif ERSÖZLÜ (Üye)

Yrd. Doç. Dr. Emine YARAR (Üye)

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Alper KUMCU

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ÖZET

KUMCU, Alper. *Andaş Çeviride Görsel Odak Alanları*, Yüksek Lisans Tezi, Ankara, 2011

Kültürler ve diller arası bir iletişim çözümü olan sözlü çeviri içinde bulunduğumuz çağın ayırt edici özelliklerinden biri olan bilgi toplumlarının hem nedeni hem de sonucudur. Son yıllarda teknolojinin gelişimi ile birlikte yeni sözlü çeviri türleri ortaya çıkmış, işlenen bilgi hacmi, çeşitliliği ve hızında büyük artışlar olmuştur. Teknoloji ile birlikte ortaya çıkan bir sözlü çeviri türü olan andaş çeviri dahi yeni alt türlerle gelişmektedir. Konferans çevirmenliğine yönelik ulusal ve uluslararası meslek birlikleri, standartlar, görsel-işitsel konferans teknolojilerindeki gelişme ile birlikte ortaya çıkan yeni çalışma koşulları, kabinlerde sadece duyduğunu değil aynı anda gördüklerini de çevirmek zorunda kalan yeni bir konferans çevirmeni profilini ortaya çıkarmıştır. Günümüzde çoğu konferansta konuşmacılar görsel malzemelerden çokça faydalanmakta ve/veya konuşma metinlerini önceden hazırlamakta; çevirmenler de bu malzemeleri kabinlerdeki ekranlardan ve/veya bilgisayarlarından takip edebilmektedir. Konferans çevirmeni açısından ilave bir bilgi kaynağı olan yazılı metnin bilişsel düzlemde verimli bir şekilde işlenmesi ve yönetilmesi çeviri performansı açısından elzemdir.

Bu amaçla ODTÜ İnsan-Bilgisayar Etkileşimi Araştırma ve Uygulama Laboratuvarı'nda yapılan bu çalışmada, andaş çeviride görsel girdinin konumu ve bilişsel yönetimi iki farklı çalışma paradigması ve gözlem grubu tasarlanarak incelenmiştir. Birinci gruba (n=6) konuşma metni çeviriden yaklaşık 5 dakika önce verilmiş, bu süre boyunca ön hazırlığını yapan deneklerden yaklaşık 11 dakikalık konuşmayı metin olmadan andaş olarak çevirmeleri istenmiş; ikinci grup (n=6) ise aynı konuşmayı herhangi bir ön hazırlık yapmadan ancak çeviri boyunca konuşma metnini takip ederek ve yine andaş olarak çevirmiştir. Bu koşullar altında çeviri yapan deneklerin okuma örüntüleri, bilişsel yükleri, çeviri performansları, bellekte tutma düzeyleri ve öz değerlendirmeleri nicel ve nitel

analiz yöntemleri kullanılarak göz izleme cihazı, sözlü çeviri testi, anket ve bellekte tutma testi aracılığıyla incelenmiş ve karşılaştırılmıştır.

Çalışmanın, yaygın ancak sözlü çeviri çalışmaları bağlamında adı tam anlamıyla konulmamış bir sözlü çeviri türü olan metinli andaş çevirinin doğasının anlaşılması, buna göre performans arttırıcı yöntemlerin geliştirilmesi ve sözlü çevirmen yetiştiren programların bu doğrultuda zenginleştirilmesi noktalarında sözlü çeviri araştırmalarına katkı sağlayacağı umulmaktadır.

Anahtar Sözcükler

Metinli andaş çeviri, görsel girdi, metin işleme, okuma örüntüleri, göz hareketleri, göz izleme, bilişsel yük, bellekte tutma düzeyi, konferans çevirmenliği teknolojileri.

ABSTRACT

KUMCU, Alper. *Visual Focal Loci in Simultaneous Interpreting*, Master's Thesis Ankara, 2011

The emanation of information societies can be regarded as one of the distinctive features of the era we live in and interpreting, a communication solution between cultures and languages can be assumed as both one of the reasons and the results of the information societies. New interpreting modalities have emerged with the development of the technology and there has been considerable increase in the volume, variety and pace of the processed information. Even simultaneous interpreting (SI), which has evolved thanks to the technology, has been developing with new sub-modalities. New working conditions, which have emerged due to the progress in the audio-visual conference technologies, are now acknowledged by the national and international professional associations and the standards. These conditions have brought forward a new profile for the conference interpreter, who has not only to interpret what s/he hears but also what s/he sees. Today, at various conference settings, speakers substantially benefit from visual materials and/or prepare written texts regarding their speeches in advance and interpreters are able to follow the visual materials in question via booth monitors and/or portable computers. In this regard, cognitive processing and management of the written text effectively as an additional source of information have become indispensable for the interpreting performance.

With this in mind, the status and the cognitive management of the visual input in simultaneous interpreting were analysed by designing two different working paradigms and observation groups in this study that was conducted in METU Human-Computer Interaction Research and Application Laboratory. The written text of a speech was delivered to the first group (n=6) approximately 5 minutes in advance and the subjects in this group, who studied the text in the meantime, were asked to interpret the speech of a duration of approximately 11 minutes

simultaneously and without the text. On the other hand, second group (n=6) was asked to interpret the same speech simultaneously while following the text visually yet without preparation. Accordingly, reading patterns, cognitive loads, SI performances, retention levels and self-evaluations of the subjects were analysed and compared with quantitative and qualitative methods using eye tracker, SI test, questionnaire and retention test.

It is expected that the study would contribute to the literature of interpreting studies in terms of understanding the nature of simultaneous interpreting with text, a common yet not decently acknowledged interpreting modality within the scope of interpreting studies, developing performance enhancing strategies and enriching the curricula of interpreter training programmes accordingly.

Key Words
Simultaneous interpreting with text, visual input, text processing, reading patterns, eye movements, eye tracking, cognitive load, retention level, conference interpreting technologies.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTOGRAPHS

LIST OF CHARTS

LIST OF APPENDIXES

CHAPTER 1

INTRODUCTION

"The universe is change; our life is what our thoughts make it."

Marcus Aurelius, Philosopher

World incessantly changes and so does the humanity. The only thing that does not change is the change itself as stated by Heraclitus. Yet, there is one more fact that does not change either: the necessity to understand 'the other'. The innate need of interaction has been embedded in the codes of humankind since the ancient times. According to the Book of Genesis, "when the whole earth was of one language and of one speech", humanity felt the necessity to reach God and therefore, was believed to build 'Tower of Babel'[1] in the plain land of Shinar. When "God went down and confounded their language" and approximately six thousand languages emerged in the meantime, divine communication need evolved into a humane one. Thereby, the practice of immediate oral translation; *i.e.*, interpreting, has become a *sine qua non* component of human communication and thus, of life. As Engle and Engle (1985) put forward "the lives of every creature on the earth may one day depend on the instant and accurate translation of one word" (as cited in Gentzler, 2001, p. 7). Interpreting researchers of Paris School have always considered interpreting and translation as two different forms of the same process (Riccardi, 2002, p. 81) and it has long become conventional to express that the already established intercultural communication mechanisms in the world is dependent on instant and accurate interpreting. This statement is self-

[1] It is also noteworthy that although etymologically the word Babel is constituted of "Ba" (father) and 'Bel' (god), the word is also used for 'chaos' in some parts of the Old Testament (Yücel, 2007, p. 192).

evident as there have always been interpreters at the milestones of history. According to the Greek mythology, Hermes was considered as the first interpreter since he interpreted messages from the gods for the mankind. Apart from him, Herodotus, an early Greek writer, was the first to mention interpreters and needless to say, the activity of interpreting is as old as the word for it (Taylor-Bouladon, 2001, pp. 7-8).

Throughout the timeline of interpreting, it has marvelled the layman due to its technical and complicated nature. However, interpreting is a social phenomenon as well as a linguistic and a cognitive one. Considering the complexity, elaborating on interpreting within the scope of the society now and then, instead of its cognitive structure, would seem as trivial at *prima facie*. Notwithstanding, any scientific and empirical study on interpreting requires the researcher to discuss, or at least, comprehend the context in which the interpreter operates. This is particularly vital in the case of a casual and strong interconnection between the epoch, along with the technological developments, and the functionality of the interpreter. Thus, it would be befitting to broach the subject from the perspective of the new society, technology and the interpreter herself/himself. The abovementioned 'context' ascribes to be the world in which we inhabit today. If one is asked to define it in three words, **globalisation, communication** and **technology** may be among them. It is not erratic that all these three concepts are intertwined with each other and even a minor change in one of these would initiate a kind of butterfly effect that will lead to alteration in other spectra.

There appears to be another umbrella term above globalisation, communication and technology, tagging the era: **information**. Information, which is defined as the communicable knowledge of anything, is the concept that laid the foundation of and reshaped our cosmos today in a general sense. Information is flowing around and through the world faster and denser than ever before by dint of Information and Communication Technologies (ICTs) and information workers who utilize the technologies in question. As a matter of fact, industrial

societies have evolved into information societies and conventional economies have evolved into knowledge economies. As Webster (2002) specified, “ours is now an e-society” and therefore, “we must come to terms with a ‘weightless economy’ driven by information” (p. 2). The economy used to be run full-circle by the workers of the industrial society, conducting specialized and repetitive tasks for manufacturing goods on the assembly line in the previous era characterized by the notion of Fordism. However, in the post-Fordism era of today the ‘good’ on the production line is the ‘processed information’, which is generated by the digital citizens of the network era. This can be regarded as both the cause and effect of globalism. Bassnett (2002) commented on globalism by stating that “today, in the twenty-first century, political, geographical and cultural boundaries are perceived as more fluid and less constraining than any time in recent history and the movement of peoples across these boundaries is increasing” (p. 10). Information is both the main input and output of today’s world and this fact constitutes the key feature of information society. The suggestion is that we have achieved an information society when the preponderance of occupations is found in information work. Since the raw material of non-manual labour is information, substantial increase in such informational work can be said to announce the arrival of an information society (Webster, 2002, p. 14). The increase in the number of information natives, the generation who was born into a world with information technologies, is also another indicator of the dawn of information societies.

Information workers in the service industry receive raw information as the input and then transform it into the processed information as output. In this respect, translators and interpreters may well be regarded as information workers within the service industry. They receive source text or source speech as raw information, process and transform it, and then emit it as intelligible processed information for the target reader or audience. Thus, it would not be wrong to argue that translators and interpreters are inextricable elements of the information society. At the expense of moving a little further, it can also be put forward that transition from industrial society into the information society can

only be possible with translators and especially interpreters, since intercultural communication is an obligation of the network societies. Hence, interpreting, in particular, needs a special attention here. When compared to translation, information flow is faster, denser and much more frequent in all working modalities of interpreting. Even so, SI has a delicate status in the scale of all interpreting modalities with regard to time constraints and other cognitive difficulties.

With this background, it would make sense to put forward that the profession of interpreting as a whole has come into prominence as never happened before in history. Although Venuti (1992) stated “translation continues to be an invisible practice…” (p. 1), the identity of the interpreter has become visible again in parallel to sociocultural and socio-political developments in the last decades. During the time of multicultural, multi-ethnic and hence, multilingual civilizations such as Ottoman Empire, the role of translators and interpreters, so-called *dragomans*, has always been a critical one, nearly similar to those of diplomats. However, ‘the new world order’ described above, has reshaped the sphere of interpreting and redefined the profile and identity of interpreter accordingly. One of these new elements, professionalism, observed in every branch of science, effected interpreting as well. Today, interpreters have to perform their ‘art’ at the edges of human cognition due to excessive data on specific topics and within certain borders of ethics and job definitions. On the other hand, technology has created new experiences, new demands and therefore, new modalities of interpreting as SI, video or tele-interpreting etc. Furthermore, international organizations and industry standards with regard to conference interpreting set new principles, which also gave rise to new working conditions, as in the case of SI with text. In parallel with these novelties, pedagogical requirements have emerged with the rising volume of demand for ‘decent interpreting’ in the global market. As a natural consequence, numerous training programmes were launched to train professional interpreters or already-established translation schools included interpreting into their curricula. What is more, curricula of these academic establishments were to be reviewed and renewed with the

abovementioned innovations in practice and studies of interpreting. This background constitutes the social perspective towards new trends in SI.

From a theoretical and cognitive point of view, interpreting, as a practically performed profession, has long prompted theoreticians and scholars to elaborate on it critically. After a brief flurry of interpreting research (IR) by psychologists in the sixties and early seventies, the scene was taken over by practising interpreters, so-called the generation of ‘practisearchers’. Although they rejected the intervention of non-interpreters into the field at the beginning; SI, in particular, has constantly attracted the attention of various disciplines, mostly cognitive ones, since the beginning of IR (Gile, 2000, pp. 89-90). Scientific inquisitiveness towards SI primarily stems from the cognitively over-complicated nature of the operation. Indeed, SI necessitates mystifying cognitive tasks; namely perceiving, comprehending, processing input and then producing both intelligible and informative output, all to be performed almost simultaneously in remarkably little time intervals. Although simultaneous interpreting is not literally ‘simultaneous’, it is the immediacy of these cognitive tasks which makes SI even more difficult and perplexing and therefore, even more stimulating to study on for many disciplines.

Immediacy, however, is not the only challenging factor of SI. Apart from the immediacy, multiplicity of these tasks also presents considerable difficulty. Throughout the interpreting process, the source language is first perceived, and then encoded, meaning is decoded, a code switch occurs, meaning is re-coded into target language speech and then speech is produced (Anderson, 1994, p. 110). This seemingly sequential cycle of listening and interpreting (speaking) is already cognitively compelling for the interpreter. Yet, in today’s conference context, the process is also accompanied by other likewise cognitive operations, creating incrementality in the brain due to continuous and diversified input. In other words, interpreters have to deal with or benefit from multiple sources of information along with the traditional auditory input. In this respect, although SI seems to be a completely phonetic/auditory activity at first glance, the

interpreter necessitates to perceive the speaker and the audience visually in order to make extra-linguistic inferences, to begin with. It is empirically proved that body and lip movements of the speaker assist the interpreter to create a context and thereby yield positive changes in interpreting performance (see Jesse, Vrignaud, Cohen and Massaro, 2000/01, pp. 95-115).

However, there are also other non-viable, image-based and text-based visual materials involved in the SI process whether they are digitised or printed. They may be pictures, drawings, graphics, presentation slides, notes, schedule of the event, notes of the interpreter or full text of the speech etc. Based on their format and technological infrastructure of the conference hall, they may be presented on the screen of the conference hall, delivered to the interpreter as a hardcopy, presented on the screen of the portable computer belonging to the interpreter or presented on the small-sized screen installed in the booth. What is presented on the screen or what the interpreter has at hand to use in the booth constitutes the primary type of the visual source of information that the interpreter needs to process. All these types of visual materials help the interpreter to create a linguistic context. On the other hand, they may create additional mental load for the interpreter. Thus, what is important here is the interpreter's cognitive management strategy regarding different sources of information during SI. The delivery parameters such as input rate and psycholinguistics concepts, which are significant for SI alone such as allocation of memory capacity, concentration, divided attention and such, become even more important when another input is involved into the process.

As mentioned in the previous paragraph, there are numerous visual sources to be taken into account during a SI process. Yet in this study, for the ease and accuracy of the research, vast field of visual aids are limited with probably one of the most frequently used and the most manageable one during SI: written texts of the speeches. Within this context, processing of texts is to be understood as following the written text read simultaneously as presented on the screen while retaining and rendering oral text heard from the headphones.

Ideally, interpreters are to have the texts or other available documents regarding the speech in advance. However, personal observations and experience demonstrate that in real world conference settings, interpreters may request the text from speakers themselves, if available and thus, have the text just before the speech delivery. Then, they may have a short period of time to study on it, or rather, they may benefit from the text during the speech delivery. These two different scenarios constitute challenges for the interpreter and hence, selected for the test design to record eye gaze data and determine visual focal loci. In this regard, the expression in the title 'visual focal loci in SI' refers to two different domains within the scope of this study: (1) the locations on the texts where the eyes of the interpreter fixate during text processing in SI and (2) the locations in the brain of the interpreter, being activated by the visual stimuli in the text. The latter was not analysed by neuroimaging techniques yet eye gaze data provides values about cognitive load in this regard (see p. 90). These loci are assumed to be in correlation with each other and are hypothesized to affect the performance of the interpreter and overall quality of interpreting.

The process of reading texts and interpreting them into the target language within the overall process of SI with text refers to sight interpreting. In contrast with 'sight translation', this mode is practised in real time for immediate use by the audience and therefore, would thus be labelled more correctly as 'sight interpreting' (Pöchhacker, 2004, p. 19). However, the cognitive tasks that are required to process the texts on the screen during SI, *i.e.* tasks for sight interpreting, are rather different from those required for sight translation. First, visual material is not the only informational input in SI and second, the interpreter needs to 'grasp' the information out of the text on the screen literally at one glance coupling it with the continuously flowing auditory input, making use of all the extra-linguistic cues. More importantly, the pace is set by the speaker and out of the interpreter's control. In this regard, the text presented on the screen in SI can be regarded as a visual aid, which can help the interpreter to produce better output, if used effectively, but if not, as a distractor, which

consequently impedes the interpreting process. This is especially the case in which there exists a strong interplay between the speech and the text. In other words, when speakers both follow the text rigidly and deviate from it during speech delivery. The specific modality described above, where sight interpreting is involved, and which will constitute the very topic of this study, defined as **SI with text** in the booth by Pöchhacker (2004). He details this modality as follows:

> Since authoritative input still arrives through the acoustic channel, with many speakers departing from their text for asides or time-saving omissions, this variant of the simultaneous mode is not subsumed under sight interpreting but rather regarded as a complex form of SI with a more or less important sight interpreting component (ibid., p. 19).

Hence, this thesis aims to study the modality of 'SI with text' and text processing during SI (with text) in two different and comparative working conditions. Thereby, it may be possible to understand the inner nature and cognitive mechanisms of SI with text. The study is expected to yield two practical benefits: (1) Courses regarding the management of visual input or more specifically text processing (reading for and during SI) may be included in curricula of interpreting programmes (see 5.3) and (2) it may be possible to increase the overall performance of professional conference interpreters with regard to SI with text.

The first chapter of this study consists the following parts: Following this brief introduction, the problem situation of the research, role and importance of visual material in SI and the nature of visual processing will be presented, underscoring the aim and the importance of the research. Then the research question and sub-questions will be presenting the scope of the research. The assumptions, on which the research will be built and limitations, which will draw the borderline of the scope and the abbreviations to be used in the research, will be given in this first part. In Chapter 2, theoretical background will be laid

down in order to establish a solid basis for the research and provide information in a vast spectrum from conference interpreting technology to reading skills from a cognitive point of view in order to evaluate and comment on the data and draw conclusions based on them. Methodology to be used to conduct the research will be specified in Chapter 3, where subjects, data collecting instruments, an overall view of the procedure and data analysis techniques will be specified. In Chapter 4, the results of the data analyses will be demonstrated in tables, graphics and writing and then, results will be discussed individually and generally in detail. The fifth and last part will be allocated to the presentation of the conclusion drawn from this research and some suggestions for training, future action and research will be made accordingly.

1.1. PROBLEM SITUATION

Interpreters very rarely rely on solely auditory input while performing SI in today's conference settings. Visual materials of various types accompany interpreters during their SI performance most of the times. This is a result of the developments in conference and SI technologies, international standards and organizations regularizing conference interpreting and an overall awareness towards the cognitively complicated task of the interpreter. Therefore, interpreters have to deal with two main sources of information during SI: auditory and visual.

However, processing visual input during SI is not an easy task for a number of reasons: First, visual input sheds additional load on the already loaded mental mechanisms of the interpreter. Hence, in addition to the interference between speaker's auditory output and interpreter's auditory output, interference between the dual sources of information is a challenging factor as for SI *per se*. Second, allocated time to process a text during SI is extremely limited. While speech is resuming with only minor pauses and other interruptions, the interpreter cannot maintain her/his own pace to read the material as in the case

of sight translation, instead, the speaker, thus the auditory input, sets the pace. It is in fact a tricky situation because in most cases, it is difficult to know in advance whether the speaker will deliver the speech by reading the written text or not. Both scenarios have individual hardships. In the first case, the speaker's pace and intonation will not be as natural as in an extemporaneous speech. In the second case, where the speaker and the interpreter have written texts; however, the speaker does follow the text with major deviations, the interpreter may not be able to skim and scan the text quickly in order to select and extract the required information out of the concerned written text during SI.

This brings us to the third reason, which also constitutes the one of the focuses of this study. To select and extract information out of a text during SI is more or less related to semantic, pragmatic and syntactic features of the text. From the text-linguistic point of view, there is no such thing as a homogeneous and monolithic text. Instead, texts have diverse text-linguistic features. They may even include icons or iconographic elements and pictures. Considering the fact that every word in a text is an iconographic element in a sense, which stimulates the passive meaning unit within the contextual universe and the mental lexicon of the interpreter, the importance of the text-linguistics in visual processing, becomes much more visible. Furthermore, linguistic and syntactic structure of the text may have a direct effect on the processing of visual material and the quality of SI accordingly. The question here, as to which syntactic structure may have what sort of an effect during SI, is of importance. It can be argued that word order within sentences, which is called branching in linguistics, may create a considerable difference in terms of SI. Sentences can be right, mid or left branching (see Tufte, 1971) and eye movements, mental processing of the interpreter and the overall quality of interpreting while rendering these three types of sentences may be different from each other. Branching direction is an important parameter in terms of SI for two more reasons: First, parsing and chunking is a frequently used interpreting strategy, which is based on branching. Second, apart from the sentences and texts, languages are also classified as right, mid and left branching languages. While Turkish language is

more of a left branching language, English language is more of a right branching one and therefore, both interpreting and processing texts between these languages pose further hardships. This is hypothesized to reflect on reading patterns of the subjects during tasks of the main test of this study. In this respect, cognitive load of the subjects with respect to predesigned interpreting-related tasks was included in the study.

It should also be noted that with the development of the ICTs, the interpreter frequently benefits from a computer or a digital monitor in order to perceive visual materials in question. Hence, it can be argued that today SI has become an example of Human-Computer Interaction (HCI). The visual information flow between the text and the monitor on which the text is read should be flawless for an interpreter to deliver a satisfactory SI performance. Reading a text during SI through a monitor, let alone interpreting, may create additional complications if the interaction between the interpreter and the screen is not fine-tuned.

Consequently, it would not be wrong to argue that processing visual input during SI presents a great number of difficulties from different perspectives.

1.2. AIM OF THE STUDY

The main aim of this study is to research the cognitive processing of the texts, composed of different branching structures and projected on the screen, under different conditions during SI performance. The research also aims to find answers to the question as to how interpreters manage (or fail) to integrate the given written information into their processing of meaning assembly and delivery in the mother tongue, which furthers the aim to shed light upon what happens in the ‘black box’ and to what extent interpreters exert cognitive effort during SI with text process, which may finally help draw some prospective ideas to be used in the training of interpreters.

1.3. IMPORTANCE OF THE STUDY

SI has always attracted the attention of various disciplines apart from interpreting research; such as, neurolinguistics, psycholinguistics, cognitive psychology, semantics, sociolinguistics etc. Every branch developed their own paradigm to understand this over-complicated phenomenon. There are, however, still ‘dark areas’ both in the brain while interpreting and SI itself albeit multidisciplinary approaches. Processing visual material during SI is being only one of them. Scholars have so far regarded SI as a mainly auditory activity. Although SI is in fact a primarily auditory activity, the visual dimension of it, text processing in particular, has not been discussed sufficiently. Hence, exploring the nature and mechanism of visual processing during SI under different working conditions may answer some questions about SI and reveal other questions. In this respect, this observational study may be regarded as one of the few studies in the literature up to now that uses eye tracking technique to research text processing in SI. It is expected that new strategies or techniques to enhance the overall performance of the interpreter can be developed in terms of visual processing when the nature of text processing and textual aid in SI with text is understood. Following diligent empirical research, these techniques can be integrated into the curricula of interpreting courses

1.4. RESEARCH QUESTIONS

Considering that there are two groups participating the main test, namely Group 1 (G1) and Group 2 (G2) and G1 receives the full text of the speech before the SI process and studies on it for approximately 5 minutes and G2 receives the full text of the speech with the inception of the SI performance and performs SI along with the text, there are three main research questions of this study:

1.4.1. Main Questions

(1) Is there a difference between G1 and G2 in terms of reading patterns for and during SI?

(2) Is there a significant difference between the cognitive load of G1 during the reading process before SI and G2 during SI with text?[2]

(3) Is there a significant difference between G1 and G2 in terms of SI performance?

1.4.2. Sub-questions

(1) Is there a difference between G1 and G2 and/or within G1 or G2 in terms of reading patterns and SI performance of right, left and mid-branching sentences?

(2) Is there a difference between G1 and G2 in terms of the effect of deviations from text on SI performance?

(3) Is there a difference between G1 and G2 in terms of answers to the shared questions in the questionnaire?

(4) Is there a difference between G1 and G2 in terms of the results of the retention test?

(5) Is there a relation between cognitive load and SI performance, between cognitive load and retention test and between SI performance and retention test?

[2] Alternatively, is there a significant difference between the required cognitive load for reading for SI and reading during SI?

1.5. LIMITATIONS

(1) Visual material in question is confined to full written texts of the speech with deviations, which is to be presented on the screen.

(2) Auditory input throughout the experiments will not be taken as a variable in eye tracking analysis but a pace-maker in order to make subjects depend on the texts and to simulate the realistic SI setting under laboratory conditions.

(3) The directionality is from B language to A language, namely from English into Turkish.

(4) Neither G1 nor G2 are allowed to take notes during interpreting.

(5) The sample of the main test will be constituted of senior students attending the Interpreting Group of the English Division at the Department of Translation and Interpreting at Hacettepe University in 2010-2011 academic year.

1.6. ASSUMPTIONS

(1) The subjects in the Group 1 are assumed to be affected from the laboratory conditions in the same way as the Group 2.

(2) Subjects are assumed to participate in the tasks with their full concentration.

(3) Subjects are assumed to answer the questions in the questionnaire and evaluate their own performances sincerely.

(4) Presentation rate of the speech is determined as reading rate in order to create realistic laboratory conditions.

1.7. ABBREVIATIONS

(1) AIIC : International Association of Conference Interpreters
(2) CAIT : Computer Assisted Interpreting Training
(3) CI : Consecutive Interpreting
(4) HCI : Human-Computer Interaction
(5) HCIRAL : Human-Computer Interaction Research and Application Laboratory
(6) ICT : Information and Communication Technology
(7) IR : Interpreting Research
(8) IS : Interpreting Studies
(9) LSP : Language for Specific Purposes
(10) LTM : Long Term Memory
(11) Ms : Millisecond (a thousandth (1/1,000) of a second)
(12) MT : Machine Translation
(13) RI : Remote Interpreting
(14) SI : Simultaneous Interpreting
(15) SIT : Sight Interpreting
(16) SL : Source Language
(17) SPSS : Statistical Package for the Social Sciences
(18) SS : Source Speech
(19) ST : Source Text
(20) STR : Sight Translation
(21) TI : Translation and Interpreting
(22) TKTD : Conference Interpreters Association of Turkey
(23) TL : Target Language
(24) TS : Target Speech
(25) TT : Target Text
(26) WPM : Words Per Minute

1.8. DEFINITIONS

Sight translation: Sight translation refers to the oral translation of a written text. The pace of the interpreter is set by her/himself in sight translation (see 2.1.3.3 for further details).

Sight interpreting: Sight interpreting is the task of oral translation of a written text during interpreting. The pace of the interpreter is not set by her/himself yet by the speaker (see 2.1.3.3 for further details).

Simultaneous interpreting with text: Simultaneous interpreting with text is an extreme working modality of simultaneous interpreting, in which the interpreter performs simultaneous interpreting while both listening to the speech and following the written text or any other written material regarding the speech, integrating the information in the written text into the performance where and when necessary. In this regard, simultaneous interpreting with text refers to the whole process, while sight interpreting refers to a specific task within simultaneous interpreting with text (see 2.1.3.4 for further details).

Written text: Text refers to a general context, which is not necessarily written. As a result, the expression written text is used within the scope of this study to refer specifically to the full text of the speech used in the interpreting context.

1.9. RELEVANT RESEARCH

With the second half of 1970s, researchers in interpreting field were mostly ‘practisearchers’, who are interpreters and have academic background in domains such as IS, linguistics or psychology etc. Practisearchers have taken their study cases from their own experience, considering that academic studies are to answer and propose robust solutions for practical problems. In this regard, this study, in conformity with the general trend in IR, is a conclusion of

the researcher's own SI experience as well and accordingly, of the problems he has experienced as a conference interpreter in numerous cases. Hence, it is first of all the practice that gave inspiration, lay the basis, provide material and serve as a starting point for the interpreting research and for focusing on SI with text. Along with that, there exists an extensive amount of research within the borders of interpreting in general.

Using the eye tracking method in TI studies can be regarded under the title of its usage in psycholinguistics and reading studies. Although, specific studies focusing on TI and using eye trackers have recently begun, there are already ample in the literature. Thus, it could be claimed that eye trackers are increasing their popularity following the other abovementioned research fields. Theoretically, Dam-Jensen and Heine (2009) classified eye tracking studies within the field of TI as a method for data analysis and under the title of online observation behaviour, in which the task and the observation take place at the same time (p. 3).

As mentioned in the previous chapters, translation and in particular, interpreting, necessitates high amount of cognitive load and cognitive effort of different types. Since it is practically impossible to observe the cognitive operations of the translator or interpreter directly, researchers who would like to monitor and gauge these efforts, in other words mind of the translator or interpreter or the 'black box', have used various functional neuroimaging tools such as electroencephalography (EEG) (see Kurz, 1995), magneto encephalography (MEG), functional magnetic resonance imaging (fMRI), near-infrared spectroscopy (NIRS) or positron emission tomography (PET) scan etc. (see Tommola, Laine, Sunnari and Rinne, 2000/01).

Using eye trackers in TI studies have begun with a similar trend and with the presupposition that eye movement data may provide information on the cognitive load of the translator or interpreter based on four indicators, namely, gaze time, average fixation duration, total task length and in some cases, pupil

dilation. Pavlović and Jensen (2009) have compared the required cognitive efforts of different translation tasks with 16 subjects based on language directionality paradigm using the abovementioned indicators and keystroke logging data, with a Tobii 1750 Eye Tracker™ (pp. 93-109). Again, within the field of translation studies, O'Brien (2006) studied machine translation (MT) memory using eye tracker and Doherty and O'Brien (2009) tested the processing ease of MT output; *i.e.*, sentences translated with MT tools, using the same eye tracker in various studies. Likewise, Špakov and Räihä (2008) investigated reading and writing processes in translation of a text with an eye tracker and again based on gaze data analysis (pp. 107-110). Furthermore, Sharmin, Špakov, Räihä and Jakobsen (2008) studied the effects of time pressure and text complexity on translators' fixations (pp. 123-126). Temizöz (2009) also used eye tracker in her minor PhD dissertation focusing on translation directionality. Eye tracking method has also paved a new way in cognitive reading studies. Within this trend and in the field of IR, the first study was conducted by Hyönä, Tommola and Alaja (1995), in which, pupil dilation was taken as a measure of processing load in SI and other language tasks (pp. 598-612). A recent study was conducted by Dragsted and Hansen (2009) based on gaze data (hotspot analyses, source text fixation count and average fixation duration), in which researchers compared translation with STR with eye tracker and key logger and concluded that interpreters are more self-assured with less pauses in eye movements and faster based on words per minute and compared to translators. However, researches to date have not empirically addressed the question of text processing abilities of simultaneous interpreters and the effect of preparatory study on the quality using gaze data.

On the other hand, there are also researchers who used similar text and preparation paradigms without eye tracking technique. For instance, in his unpublished MA thesis, Nejedlý (2004) compared SI with text performances with and without previous preparation and obviously found that a read speech can be interpreted optimally only with previous preparation. Similarly, Lamberger-Felber and Schneider (2008) studied SI with text and more

specifically linguistic interference under three working scenarios and with three texts accordingly. In this study, interpreters were divided into three groups and interpreted three speeches of 8-10 minutes. Each group interpreted the speech 1 with preparation and with text, interpreted the speech 2 with text but without preparation and interpreted speech 3 without ever seeing the text. Results show only linguistic interference not SI performance and therefore, it is concluded that availability of texts results in less linguistic interference compared to pure SI. Agrifoglio (2004) described STR by comparing it to SI and CI by conducting an experimental test on six professional interpreters and concluded that interpreters face different difficulties and use different efforts in each mode and STR demands no less effort compared to others.

CHAPTER 2

THEORETICAL BACKGROUND

"It is the theory that decides what can be observed."
Albert Einstein, Physicist

This chapter will lay the conceptual and theoretical basis of the study. The first part of the chapter will introduce the general overview on interpreting, inclusive of definitions, history, settings and modalities of it with a particular concentration on SI and SI with text. Peripheral dimensions of SI, which are intimately, affiliated with the underlying theme of this study, in other words, technology and SI, multi-tasking, expertise, cognitive processes, syntactic strategies in SI and reading for/during SI, will also be discussed in this chapter.

2.1. INTERPRETING: A GENERAL OVERVIEW

Interpreting studies (IS) has been evolving towards new horizons since the first academic study in IS was published by Paneth (1957/2002). In parallel with other practical branches of science, research in IS has been mostly triggered by the concrete problems that interpreters or interpreting face, such as ethics, quality, training or performance etc. rather than theoretical or ontological questions. Along with that, since interpreting is an act mostly taking place in the mind of the interpreter regardless of the modality, the paradigms of translation and interpreting (TI) studies *per se* have fallen short to illuminate these phenomena from a holistic point of view for a certain period. As a result, from the beginning of the sixties and early seventies, various factors such as source

language, noise, speed of speech delivery etc. have been the topics that researchers from other disciplines have diverted their attention (Gile, 1994, p. 149). Overall, cognitive studies in interpreting cover a great deal of space in IS, which makes interdisciplinary cooperation a must for the researcher. Now, after 53 years, IS sets new targets and horizons from different courses with the new generation of researchers.

However, without structuring the base with solid knowledge, it is not feasible to draw new horizons let alone reaching them. From this point of view, discussing interpreting in general at the very beginning with its terminological, historical, cognitive and social dimensions before moving forward to more specific sub-fields and coming to sound results by observing new cognitive challenges within SI, appears as a pre-condition before a holistic study. Theoretical background for empirical and observational studies matters in IS because as Pöchhacker (2010) specified, first, this kind of background meets an epistemological need (p. 4). And second, linking different kinds of data collected from tests with each other, evaluating and discussing it may become out of context and even doubtful without background information.

In this regard, terms and definitions play a vital role in accessing a new field with its theory. Terms are to be seen as keys, which touch and open semantic fields within the mental lexicon of human cognition. Furthermore, based on the principle stating that any scientific text must be concise, precise and appropriate to the communicative situation in which it is produced; terminology should be attached a major role achieving these objectives (Cabré, 1999, p. 47). Accordingly, it would be applicable to begin with highlighting differences between confused terms in IS. Indeed, defining concepts precisely, utilizing theory to determine the scope of the study and to that end, presenting terminology precisely at the outset appear as vital tasks. Definitions of research domains within the general universe of interpreting is also significant particularly in this case given that this study handles a relatively new (and a hybrid) working

modality, which both intersects with and differ from others in accordance with the standpoint of the researcher.

2.1.1. Terms and Definitions

Interpreting is a considerably generic and polysemous word/term. Denotative (or dictionary) meaning of the word *interpreting* reads mostly as an explanation of something that is not immediately obvious as in the example of *interpreting/interpretation of dreams*. That being said, interpreting is also used as a term in various contexts from law to philosophy, with several sense and references. For one thing, in the context of translation studies, interpreting is vaguely defined as oral (or signed) translation of oral (or signed) language from one to another. As seen from the very definition, even in translation studies, the term covers more than one domain. Yet, the terminological problem is not limited to the definition. There are seemingly two terms referring to the profession: interpreting and interpretation. Even the names to the profession and/or act thereof are the allomorphs of the same term. Below the mentioned domains and allomorphs will be elucidated in details.

2.1.1.1. Translation vs. Interpreting

The conceptual distinction between *translation* and *interpreting* is self-evident. In other words, these two terms and activities are not synonyms in terms of the source material being written or oral. What is more, translation differs from interpreting in a number of important aspects, including required communication skills, operation time, cognitive effort and load, stress factor etc. (Shuttleworth and Cowie, 1997, p. 84). Nonetheless, the dichotomy of translation and interpreting is far more complicated than the segregation by the type of linguistic material and immediacy.

To begin with, translation has been regarded as an overarching theme over interpreting for quite a long time among scholars and practitioners. In spite of the fact that invention of writing and hence, translational activities are posterior to oral tradition for quite obvious reasons, emergence of TI studies showed an opposite pattern. As a result, translation has been defined to include interpreting in several reference works, especially among linguistic circles. To name one of them, Longman Dictionary of Language Teaching and Applied Linguistics defines translation as "the process of changing *speech* or writing from one language (the source language (SL)) into another (the target language (TL)), or the TL version that results from this process" (Richards, Platt and Platt, 1992, p. 389). Although the dictionary in question cross-references to interpretation, here, the definition of translation clearly covers interpreting. Again, the dictionary defines interpretation as "the 'translation' by an interpreter…" (*ibid*., p. 188). It goes without saying that encapsulation of the word *translation* in definitions of interpreting is a salient proof of overarching and dominant feature of translation over interpreting.

On the other hand, there are varied approaches towards the distinction between translation and interpreting. For instance, Ingram (1985) has suggested that the distinction is not between writing and speech but between natural language and secondary representations of language (p. 91). In his analysis, 'secondary representations of language' stand for written language and sign systems. As a result, definitions of interpreting including only orality would be gappy, to say the least. Albeit intermingled definitions, the study will leave out translation at this point forward, and concentrate solely on interpreting.

2.1.1.2. Interpretation vs. Interpreting

Interpreting itself is not free of contradiction with regard to terminology. Although interpretation was more widely used when IS first emerged, the words *interpreting* and *interpretation* are now used interchangeably in the same

context seemingly without much semantic variation. Drawing a lexical parallelism with *translation* by using the derivational nominalizer affix, -tion, can be one of the reasons for this choice. However, in the last decades, there is an inclination among translation/interpreting scholars and practitioners towards using the word interpreting, instead of interpretation. The main reason behind the preference is that interpretation as a term has different denotative and connotative meanings in various semantic fields as briefly specified above. In accordance with the "one designation corresponds to one concept" principle (Cabré, 1999, p. 108), terms should be unique and should not be mistaken by others. In that sense, preferring interpreting would be a feasible choice. By the same token, Pym (2011) has pointed out that

> Interpreting and interpretation are two terms for spoken mediation between languages. 'Interpreting' began to replace 'interpretation' in the 1990s, on the argument that it was slightly less likely to be mixed up with 'interpretation' as the general making sense of texts. Many theorists and practitioners in the United States have nevertheless clung to 'interpretation', perhaps with the same self-sufficiency with which they measure the world with miles and gallons. However, interpreting is recommended (pp. 11-12).

Likewise, the designation of interpretation refers to another concept within translation studies, that is to say, 'interpretive theory', which will not be detailed here. Here, the word *interpretive* connotes the concept of making general sense of texts, as abovementioned. In that sense, Shuttleworth and Cowie (1997) defined interpreting as one of the seven possible strategies for translating poetry (p. 83).

Given all perspectives, *interpreting* will be used instead of *interpretation* throughout this study, citations being the only exemption.

2.1.1.3. Defining Interpreting

Interpreting itself is a broad and difficult-to-define concept that takes place in various settings and modalities. When the *ad hoc* nature of and growing professionalism in interpreting at the same time are added, it is difficult to decide where the act in question begins and ends. To put it differently, the difficulty associated with the definition does not stem from the concept itself but the broadness of it. As a matter of fact, contouring already fuzzy borders and drawing a taxonomy map for interpreting appear as both a *sine qua non* and a compelling act. Still, confined definitions of interpreting hardly differentiate, which are elucidated as follows:

General reference books such as Routledge Encyclopaedia of Language Teaching and Learning defines *interpreting* as “the transfer of oral or written message from a SL, into an oral message in the TL, not only help to further global communication but also serve a number of other purposes” (Byram, 2004, p. 312). This definition touches upon two important features of interpreting: (1) The source is not only oral and (2) interpreting is not employed only in conference settings. Therefore, it entails that interpreting has different modalities to be performed in different settings that will be detailed in the following sub-chapters. Correspondingly, Routledge Encyclopaedia of Translation Studies defines interpreting as “the oral or signed translation of oral or signed discourse, as opposed to oral translation of written texts” (Gile, 2009, p. 51). Here, inclusion of sign language and a limitation in definition draw attention. Lastly, Dictionary of Translation Studies defines *interpreting* “as a term used to refer to the oral translation of a spoken message or text” (Shuttleworth and Cowie, 1997, p. 84), which more or less highlights similar features of the act.

Apart from these general views towards interpreting, sources that are more specific underline certain components of interpreting. In his definition, Riccardi (2002), both refers to the difference between *interpreting* and *interpretation* and

points out the nature of interpreting by stating that “interpretation, used in the sense of interlinguistically mediated communication, and interpreting, understood as the mental process and communicative act of reproducing orally in a target language what a speaker is expressing in a source language…” (p. 75). Therefore, from a more extensive point of view, interpreting implies a code transfer process between two (or in some cases more than two) different set of symbols.

Some other sources define interpreting by taking the actor to the core: interpreter. Being one of them, Paneth (1957/2002), defines interpreter as “a person who *repeats* a speech in a different language from that in which it is first pronounced, either simultaneously with, or consecutively to, the original speaker” (p. 31). What is interesting here is that interpreter’s task was considered as mere ‘repeating’ then, ignoring the ‘interpretive’ part of interpreting. Indeed, the role of interpreter in IS and in practice has been regarded as secondary and ‘conduit-like’ for a long period of time. However, following researchers studying on the identity of interpreter and interpreter in a broader social context re-established the role of the interpreter s/he deserves and by doing so, re-defined interpreting. In his seminal paper, Anderson (1976/2002) stated that typically *translation* occurs in social situations involving interaction among at least three persons: producer, interpreter, consumer and the role of interpreter is pivotal to the entire social process. (p. 210). Here, it is noteworthy that he refers to interpreting by using the word *translation*. It can be argued that interpreter is both a ‘consumer’ and ‘producer’ at once. Defining interpreting from solely linguistic and cognitive dimension would not be sufficient. Interpreting clearly has a social role, which is hand-to-hand with social and technological developments in the world.

The concept of interpreting is not only problematic in English language. Etymological differences in other languages with regard to interpreting illuminate different aspects of the act. For instance, Seleskovitch (1985) made a distinction between *interpretation* and *interpretariat* in French. The latter is used

for the infrastructure established in France for interpreters. However, she rejected it as a ‘barbarism’ associated with the practice of untrained bilinguals (as cited in Pöchhacker, 2008, p. 22). To name others, the root meaning of Finnish word for interpreter *tulkata* and Swedish word *tolk*, which share the same etymologic source, are to speak and make sense in English language. As for these words, the focus on output and the importance of conveying message instead of words only are remarkable. On the other hand, Indo-European Languages such as Modern Greek, Czech, Ukrainian and Hindi have all made clear-cut distinctions between translation and interpreting. It is of particular interest that Sanskrit words for interpreting *dvibhãsãvãdî* and *bhãsãntaravaktã* literally means ‘two-language speaker’ and ‘other language speaker’ respectively, highlight output and bilingualism rather than input and understanding (Chesterman, 2006, p. 7). It is also usually possible to observe similar lexical dichotomies in other language families; however, the root meanings may not be necessarily the same. In Turkish, for instance, the word *çeviri* literally means to make turn or to change, may refer both translation and interpreting when used alone. On the other hand, Chinese uses the word *kouyi* for interpreting, where *kuo* means ‘mouth’ (*ibid*., p. 7). In terms of Sapir-Whorf Hypothesis (see Kay and Kempton, 1984), these equivalences stand out as salient and different features of interpreting from the perceptions of different languages and cultures. From an etymological point of view, it could be put forward that interpreting is all of the above and even more.

2.1.2. History of Interpreting

The history of interpreting is the history of communication in a sense. Intercultural communication, in particular, has been established with the help of countless interpreters throughout the history. Angelelli (2004) states that every cross-linguistic communicative event includes (or *should* include) an interpreter (p. 98). Wherefore, beyond all definitions, interpreting is a reality, encountered in nearly every moment throughout the life whether the observers notice or not.

This statement is not only valid for today but also for the history. Reference books within the literature of translation studies state that interpreting is an ancient human practice (e.g. Pöchhacker, 2004). Although, IS has only emerged recently, the history of interpreting as a form of communication is nearly as old as the communication itself. The main aim here, therefore, is not to question whether interpreting is a deeply rooted activity or to value interpreting by drawing connections with history, but rather, it is to understand the nature and illuminate the future of interpreting by shedding a light on the history. It would be wrong to comprehend technological advances in interpreting as a *deus-ex machina*, appearing abruptly on the stage and without any connection with past.

Translation is an act conducted in written form in nature and has a documented history accordingly. On the other hand, although the history of interpreting is not as well documented as translation, it is deep-rooted as well. Giambruno (2008) clarifies this assumption by stating, “there is evidence of the use of interpreters that dates as far back as 3000 BC in Egypt (hieroglyphs and tomb inscriptions) and documentary references to the important role interpreters played in ancient Greece and the Roman Empire” (p. 28). Be that as it may, it is difficult to track down interpreting and interpreters in the archives. Firstly, interpreting is in a sense ‘intangible’ as in the saying ‘*verba volant scripta manent’* (spoken words fly away; written words remain). It is ironic, though; since they are interpreters who have been there at important events and milestones what constitute history as a whole (see Lung and Li, 2005). Secondly, as invisibility has been a merit for interpreters, they were generally not included in the official minutes or notes of observers. Still, researches like Cary (1956), Hermann (1956/2002), Kurz (1985), Roland (1999) and Lewis (2004) penned noteworthy studies on the history of interpreting.

Etymologically, the word interpreting is derived from Latin word *interpres*, meaning *inter-partes* (between the parties). Another probable etymological root of the Latin word is ‘between prices’. According to this view, the origin comes

from trade, where goods are exchanged. As a result, the interpreter stood between the prices or values and ensured that there is adequate equivalence (Chesterman, 2006, p. 6). From the Latin, the word passed via Old French into Anglo-French and so into the modern English language (Taylor-Bouladon, 2001, p. 8). Furthermore, expressions in Germanic, Scandinavian and Slavic languages referring to a person performing the activity of interpreting can be traced back to Acadian, the ancient Semitic language of Assyria and Babylonia, around 1900 BC (see Vermeer, 1992, p. 59). The Acadian root *targumãnu* via an etymological sideline from Arabic also gave rise to the autonomous English term for interpreter, *dragoman* (Pöchhacker, 2004, p. 9). The word dragoman is also the root of interpreter in Turkish, *tercüman*.

It is of particular interest that the word *interpreting* in many languages, associates a divine, prophetic and even vaticinationing activity, rather than a lingual one. Interpreter, in that sense, was more or less perceived as a prophet, seer and sage, relying on inspiration and mediating between man and deity (Hermann, 1956/2002, p. 18). It is a common practice to see interpreters as the messenger of god in various religious disciplines. A similar semantic correlation emerges in the word *hermeneutics*, which is also interrelated with the act and science of translation and interpreting, considering that the word is derived from Greek deity, Hermes, the messenger of God. Likewise, monotheistic religions do not keep indifferent to the reality of languages and interpreting. Bible, for instance, refers to interpreting directly in numerous stories. One of the most famous among them is in Genesis 42:23, in which Joseph, the governor of Egypt, benefited from interpreters to understand his brothers, coming from other tribes to request food from him after famine. In the same sense, Moses was the interpreter for Jehovah (Taylor-Bouladon, 2001, p. 8).

As a result, at one point, myths, divine sources and retrospective studies direct similar regions: It would not be wrong to assert that Mesopotamian civilizations, Ancient Egypt, Ancient Greece and Roman Empire have given rise to interpreting thanks to dense diplomatic, military and commercial relation in the

region. Egyptians created a vocational cast for interpreters among others and this structure was headed by a man titled ‘Overseer of Dragomans’ (Hermann, 1956/2002, p. 16). A similar practice can be observed in Carthage even between fifth and first centuries before BC, where interpreters could be identified by means of a parrot motif tattooed on their forearms (Taylor-Bouladon, 2001, p. 8). Many young men were raised and trained to interpret markedly between Egyptian and Ancient Greek. Natural bilingualism was a happenstance then, therefore, not only Egypt but also Greece selected their own citizens to train as interpreters and send them to the civilization of the ‘target language’ (Roland, 1999, p. 11). Roman Empire was a bilingual state, in which every educated man was to study Greek with Latin and hence, Roman Empire did not normally necessitate interpreting. However, Greeks almost always had to rely on interpreters (Hermann, 1956/2002, p. 18). In the 14th century, the discipline of interpreting gained status, which is even more important when French lawyer Pierre Dubois proposed the establishment of institutions in Europe to train interpreters who would function as intercultural communicators with the Muslims in order to convert them in a peaceful way eventually. Spanish colonialists in the 15th and 16th century, including Columbus, preferred to ‘recruit’ interpreters, by selecting young natives among the tribes and sending them to their motherland to learn the language of the dominant (Angelli, 2004, p. 9). The social status of interpreters at that period in Ottoman Empire was considerably higher from their pairs in other countries. “There were more important interpreters at government level, who served between the Ottoman government and the various European embassies” (Lewis, 2004, p. 24).

During the 19th and 20th centuries, the world witnessed two world wars and reconciliation efforts for the world peace following the wars. In order to meet that aim, international organizations such as League of Nations (which would form United Nations) and European Coal and Steel Community (which would form European Union) were established. These organizations held numerous meetings and conferences at regular intervals. At these international

conferences, French was the official diplomatic language and interpreters were not mainly required especially before the WW1 since diplomats, participating these events had normally good command of French.

However, WW1 and its aftermath have witnessed multilingual conferences and hence, English and German languages were added to French language as the medium of communication. As a result, these conferences brought about communication problems and a necessity for interpreting. The problem here was different from that of the past. In ancient ages, interpreting was mostly utilized in order to establish **dyadic communication**, in other words, communication between two individuals, two groups or two different parties. Thus, the flow of interpreting was mostly bidirectional. However, with the emergence of multilingual conferences, the direction became multi as well. Furthermore, the density and duration of information transfer and interaction between different parties have increased immensely. As a result, there was no tolerance for delay in the information transfer, considering the criticality of the matters discussed in these conferences. Various interpreting solutions appeared in order to eliminate the language problem of multilingual conferences. For instance, the conferences of League of Nations in Geneva and conferences of International Labour Organization (ILO) were one of the most important multilingual events at that time. The discussions at these meetings were not only diplomatic matters, but also issues that did not normally appear on the agenda of international conferences, such as economic issues of recovery or labour issues. Thus, interpreting became more than necessary and language barriers were mostly overcome with consecutive interpreting (CI), in which the interpreter renders the source speech (SS) only after the speaker finished uttering it, and whispering or whisper interpreting (*chuchotage*), in which interpreter interprets the speech by whispering for no more than a couple of listeners (Gaiba, 1998, pp. 27-28). At that period, SI was not yet invented however, simultaneity for interpreting became gradually a necessity more than a mere luxury on the grounds that CI doubles the time of events. Hence, SI-like systems were put into practice. For instance, the IBM™ Hushaphone system

was used for the first time on June 4, 1927 at a session of the ILO conference in Geneva (*ibid*., p. 31). With this system, interpreters were seated at a low-level area like the orchestra pit in theatres below the stage. They did not use headphones and instead, listened to the speech from the loudspeakers. They whispered their speech into a sort of box called hushaphone in order to perform interpreting. Delegates instead of interpreters wore headphones in this system (Taylor-Bouladon, 2001, p. 14).

Following the WW2, the first major multilingual event was Nuremberg Trials. It was held between 1945 and 1946 to prosecute major war criminals of the war. Real-time, that is simultaneous interpreting (SI) of today, was introduced and utilized for the first time in history during the military tribunals on the ground that CI would decelerate the already-cumbersome process. Another rationale for demanding such a system is that Nuremberg Trials were very critical in terms of the words uttered by the defendants, which made interpreting even more vital. Furthermore, Nuremberg Trials was indeed a genuine and huge multinational and therefore, multilingual event. It has been estimated that the complete record of this high-profile trial is composed of circa six million words and without the technique of SI, the trials would have taken four times as long (Gaiba, 1998, p. 11). If the utilization of SI technique had been a failure, it would not be taken as granted as the optimum solution for language barriers at the international conferences, let alone researching on it. Consequently, Nuremberg Trials and use of SI in the event constitute a landmark and a true revolution in SI history. To be more accurate, it is the origin of SI and in that sense, demands a closer look.

During the process, which lasted more than 10 months, four languages were actively used as trial languages at the courtroom. It is though that U.S. Chief Prosecutor, Justice Jackson or the Chief of the Translation Division and General Eisenhower's former interpreter, Colonel Léon Dostert was the first bringing SI equipment from Geneva to Nuremberg. As it was the case in ILO conferences in 1927, the system, officially named as 'International Translator

System', was supplied and installed by IBM™. The system was similar to the ones used today with some pros and cons. For instance, interpreters perform in glass booths which are not enclosed at the top, resembling 'aquariums' with a clear view of the speaker; however, they also used clumsy headphones during the trials. The system itself allowed relay interpreting, that is, any booth could take the SS from another booth, instead of floor and interpret. Probably the main difference compared to SI practice of today is that three teams of interpreters of twelve has their monitors to supervise them in the booth and interpreters may switch on red or yellow lights in order to warn the speakers to slow down or speed up in delivering their pleas or defences (see Taylor-Bouladon, 2001 and Gaiba, 1998). The invention of the system and Nuremberg Trials proved that SI is being the optimum solution for large scaled multilingual events and accordingly, SI has become the most frequently used interpreting mode. On the other hand, SI made interpreters invisible in a sense, a mere voice from the headphones, in contrast to well-known speaker-interpreters of the previous era, such as Jean Herbert, Antoine Belleman, Robert Confino, André and Georges Kaminker etc. (Taylor-Bouladon, 2001, pp. 18-19). Still, it also made the interaction possible with more discussion and question-answer sessions as parts of speech deliveries.

In the following years, emergence and rising of global and regional settlements such as United Nations, European Union, Group of Twenty Finance Ministers and Central Bank Governors (G20) or Organization for Economic Co-operation and Development (OECD) following the WW2 marked a remarkable convergence between nations, cultures and eventually, languages. When the term 'global village' was introduced and then popularized, the year was 1962 (see McLuhan, 1962). Now, after 48 years, we reside in such a world that even stating that the world has shrunk and turned into a global village, referring multilingual global networks, is a mere cliché.

As Diriker (2004) stated "simultaneous conference interpreting has been the most salient type of interpreting in the 20th century". The boom in the number of

international meetings of all sizes has created significant demand for experts in interlingual and intercultural communication, leading to SI and SI-related technologies (p. 1). There seems to be a closer relation in the market demand for interpreting and global crises such as wars. In that sense, global financial crisis of 2007, Al-Qaeda's September 11, 2001 attacks on the World Trade Centre and Pentagon, in response, US leaded war in Afghanistan launched in 2001 and Iraq, launched in 2003, increased the demand for interpreters. As the operations occurred in East mainly, the demand for Eastern languages, in particular, has risen and for the first time an English-speaking country, USA has become aware of the importance of other languages and interpreting. This awareness reflected in the number of recruited interpreters and language specialists within the bodies of the USA. Apter (2006) pointed this issue stating, "nontranslation, mistranslation and the disputed translation of evidentiary visual information, have figured centre stage throughout the Iraq War and its aftermath" (p. 14). In order to meet the demand for professional linguists in general, modern interpreting schools have been established in many parts of the world since then.

To put in a nutshell, interpreting and interpreters have existed and are going to exist in every global multilingual event, whether in the past or in the future or whether between two simple tradesmen or at huge conferences designating the future of the humanity. Thus, interpreting deserves scientific inquiry in every aspect considering the fact that better interpreting will result in better communication and better communication, a better functioning world.

2.1.3. Settings and Modalities of Interpreting

As seen from 2.1.2, interpreting has always been existent as a mediating activity. Yet, parties, demands, density, identity regarding interpreting and interpreter have gained new shapes since its inception. As the expectations from customers and settings of interpreting change, so do the conducting styles

and therefore, types of interpreting (modalities). Nevertheless, before moving forward with these settings and modalities, it would be reasonable to identify the concepts of setting and modality and set the differences between them: Setting of an interpreting activity can be defined as a social context of interaction in which interpreting activity takes place (Pöchhacker, 2004, p. 13). Setting, in that sense, is not limited to the space but encompasses a larger context including interpreter and the parties subject to interpreting. For instance, interpreting has begun as a mediating activity between tradesmen and military men and hence, liaison interpreting, as one of most basic settings, has emerged herewith. This subtype of interpreting is called liaison because there are two different parties involved in the transfer of information. On the other hand, modality of interpreting refers to a different categorization for interpreting. Modality is the actual realization of interpreting, that is, 'how' the interpreter conducts interpreting, e.g. whether s/he uses auxiliary equipment or not. In fact, practitioners and researchers usually mean *working modality* or *mode* when they use the term *modality* since modality of interpreting includes many other sub-categorizations such as directionality or professional status. Figure 1 visualizes the general settings and modalities of interpreting.

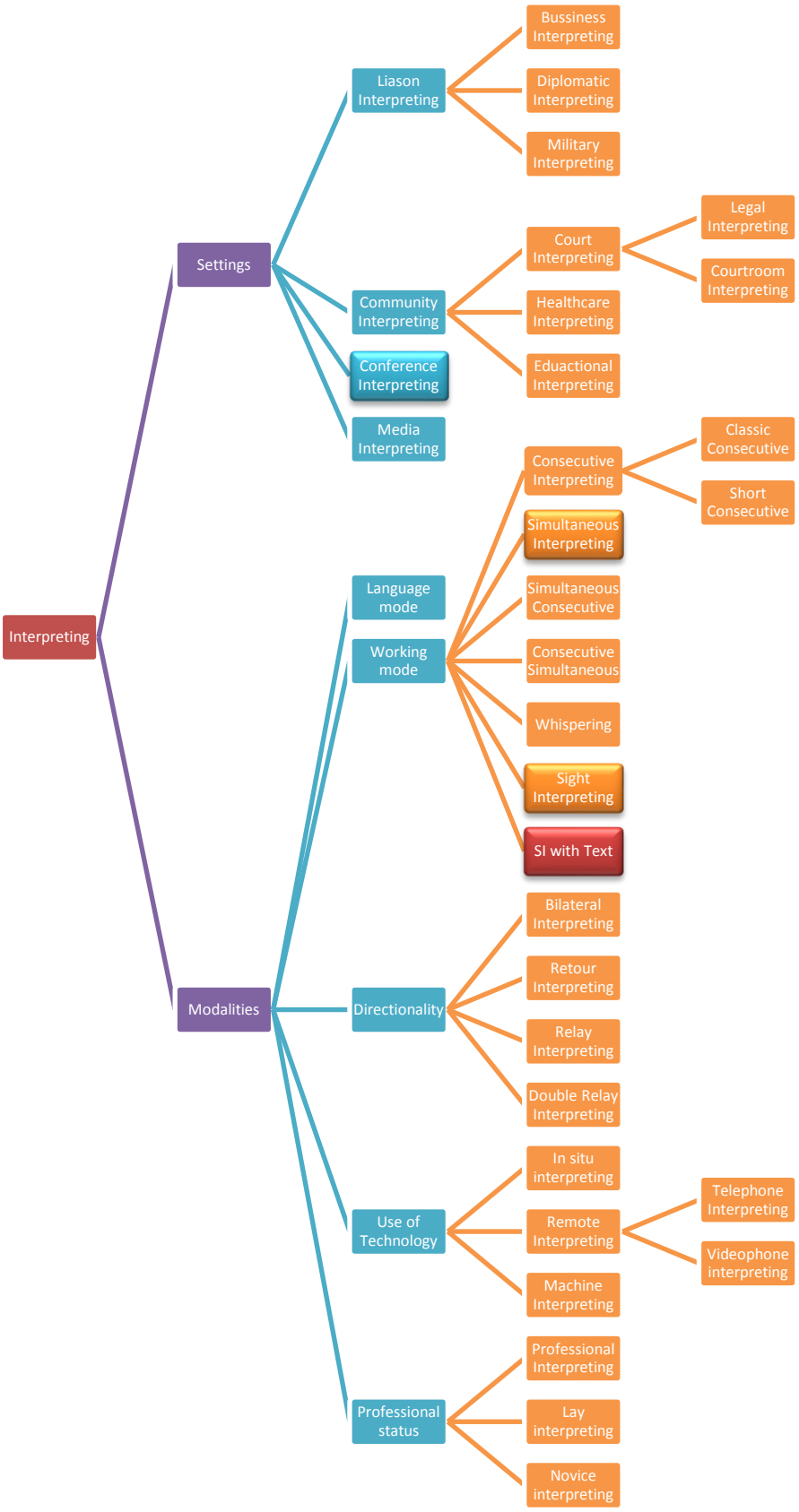


Figure 1: Settings and modalities of interpreting.

As clearly seen from the Figure, even working modes of interpreting is highly varied. In order to keep within the borders of the study, following chapters will only focus on conference interpreting as setting and as for the modality; it will only deal with SI, sight translation (STR), sight interpreting (SIT) and SI with text.

2.1.3.1. Conference Interpreting

Conference interpreting, as a setting, simply refers to interpreting conducted at conference settings. Institutional organizations or private companies may demand conference interpreting at conferences, which may vary from small-sized humble meetings to large-scale international summits with thousands of participants and numerous speakers. Accordingly, the number of languages to be interpreted may vary according to the number and delivery language of speakers. Although, mostly SI is used as working mode, CI and other SI modalities may be used if they suit with the conditions of the concerned conference. Since SI is the most frequently used working mode as for conference interpreting, general public and even practitioners use the terms conference interpreting and SI as synonyms mistakenly despite the fact that the former refers to an interpreting setting rather than a modality.

2.1.3.2. Simultaneous Interpreting

SI is the type or mode of interpreting, in which the interpreter performs interpreting at the ‘same time’ with the speaker delivers her/his speech, in contrast with CI. It is assumed that SI is one of the most cognitively complicated and the most frequently used working modality among all modes of interpreting. Thus, majority of the scientific studies in IS takes SI as case. As Diriker (2004) stated, “SI has always had an aura about it, possibly due to large conference halls and highly specialized/institutionalized setting of simultaneous interpreter-

mediated conferences" (p. 1). In SI, retrieval of the SS, rendering it and producing target speech (TS) occur more or less simultaneously, that is, interpreter overlaps the speaker with a short lag. In fact, what is simultaneous in SI is not interpreting but speaking (Doğan, 2009, p. 51). Since interpreting requires cognitive operations, which take certain amount of time to conduct. In order to perform SI, interpreter usually sits in a soundproof booth with a partner, with a clear view of the speaker and the audience as for visual cues. In very rare cases and albeit not recommended, simultaneous interpreters may have to interpret without a booth but with a portable SI equipment, which is called *bidule* ("Bidule", AIIC's Conference Interpretation Glossary). The interpreting booth is equipped with a SI equipment, usually consisted of two headsets (headphone and microphone) connected to a console. Interpreter listens to SS from the headphone and interprets it into the microphone. With the help of advanced systems, participants can listen to the interpreting by using wireless infrared receivers, that is, light personal headphones with channel switches on it. Interpreters in the booth usually switch turns in approximately 20-30 minutes since after this duration; interpreters may incline to make more errors due to weakening concentration and heavy mental load (see Moser-Mercer, Künzli and Korac, 1998).

SI is a mentally burdening act, in which interpreters have to switch from one linguistic mind setting (source) to another (target) rapidly and conduct more than one task at one unit of time. Therefore, one has to split her/his attention and allocate it for different tasks almost at the same time. As a result, short-term memory and working memory and even long-term memory (LTM) play vital roles in performing SI (see 2.3). Whether bilingualism or cerebral laterization are the case for simultaneous interpreters, time lag and segmentation, pauses, ear-voice span (EVS), comprehension and delivery strategies, fidelity, accuracy and quality of the production, input variables such as intonation, different accents, speed and mode of delivery are among other fields of research in SI (see Pöchhacker, 2004). In order to conduct these tasks, interpreters may benefit from auxiliary equipment such as notebooks, laptops or booth monitors

etc. “In SI the information is retrieved mainly from sound (but also from the speaker’s body language and from visual information displayed on a screen as slides or overhead transparencies as well as in hand-outs)” (Gile, 1997/2002, p. 169).[3]

2.1.3.3. Sight Translation and Sight Interpreting

In STR, the translator or interpreter translates an SL text aloud into TL while reading it (Gile, 1997/2002, p. 168). At the first sight, it sounds similar to CI, in which the interpreter also reads her/his notes and interprets the SS based on them. However, first, there is simply no auditory input in STR. Interpreter has to rely on the text as the only source of information. Second, it is almost impossible and unnecessary for the interpreter to write every word of the speaker like a stenograph in CI and therefore, notes are only there to remind her/him segments of speech s/he has just listened. In contrast, sight translator has two tasks to be performed only with a very short lag between them, that is, reading and interpreting. In other words, in STR, “reading effort carries the burden of the initial comprehension of the text” but on the bright side, “there is no memory effort because the SL information is available on paper at any time” (*ibid*., p. 169). The other advantage of STR is that the interpreter has the flexibility to manage her/his own time span, as the only input in this specific modality is the written text. In real-world conference settings, STR, in its narrow sense, is not a frequently used working modality. However, it is a functional and effective practice method for SI in creating mind maps or a complimentary task for other interpreting modes (Doğan, 1996, p. 26). Furthermore, it may be used to transfer short written information such as e-mails or notes into another language quickly in business settings. It is also of use in certain types of community interpreting settings such as health interpreting. On the other hand, when STR is practised in real time for immediate use by an audience, it would be better labelled as sight interpreting (SIT). Since in STR, the interpreter’s

[3] These aspects of SI will be detailed in 2.2 and 2.2.1.

target text (TT) production is simultaneous not with the delivery of the source text (ST) but rather, with the interpreter's real time visual perception of the written ST (Pöchhacker, 2004, p. 19).

2.1.3.4. Simultaneous Interpreting with Text

SI with text is a special mode of SI, in which the interpreter is still in the booth, performing SI with auditory input, however, s/he also makes use of visual material such as presentation slides, transcript of the concerned speech or other types of documents regarding SS. Laplace (1999) defined SI with text stating that the interpreter is given a copy of a speech which will be read by a speaker and which will have to be interpreted simultaneously in the booth. As a result, this technique is more appropriately referred to in the literature as simultaneous interpreting with text (as cited in Sandrelli, 2003, p. 272).

Gile (1997/2002), on the other hand, defined SI with text as "a mixture or a combination of SI and sight translation going from pure SI (without any reference to text) to pure STR (without any reference to the sound)" (p. 169) (See Figure 2).

Figure 2: Place of SI with text in interpreting continuum.

In spite of the fact that the literature of IS acknowledges the existence of SI with text, there may be two main questions in mind regarding this specific working modality: (1) Is it necessary to specify SI with text as an individual modality? (2) What is the difference between SIT and SI with text? As for the first question, although there are researchers claim just the opposite (cf. Lamberger-Felber and Schneider, 2008, p. 232), there are plenty of justifications to allocate a

separate space for SI with text. First, SI with text is located at a different place within the sphere of interpreting in terms of sub-tasks and therefore, cognitive efforts and load of the interpreter (see 2.3 and Chapter 4). Second, the availability of the text poses a wholly different working condition considering the linguistic and extra linguistic parameters of the text. Third, working with a text is deliberately defined and specified in working principles of national and international interpreting associations (see 2.4.2), which is a remarkable sign that professional circles acknowledge the existence of SI with text. As for the second question, again, there are authors regard SIT and SI with text as synonyms. One of them, Lambert (2004), defined SIT, as “sight interpretation also known as ‘simultaneous interpreting with text’ is one facet of simultaneous interpretation”. However, she continues her definition by stating that in aptitude tests candidates are given five to ten minutes to prepare the written version of the message under SIT conditions. Accordingly, she structured her experimental study by allocating ten minutes to the subjects to prepare the speech, by simply reading it (p. 299). Thus, it can be inferred that from this point of view, SIT and SI with text, does not cover cases in which interpreters do not undergo a preparatory study before SI. However, SI with text refers to real-time simultaneous interpreting with both the auditory and the visual input, irrespective of the preparatory study. On the other hand, various authors clearly separated SIT and SI with text. Being one of them, Pöchhacker (2004) stated that SI with text is not subsumed under SIT or simply regarded as SI and rather defined as a complex and a more difficult form of SI with sight interpreting components varying degree of importance (p. 19). In conclusion, we will stick to Pöchhacker’s and Gile’s definitions for SI with text and therefore, differentiate it from SIT not to cause misnaming or misconception (see 1.8 for definitions).

As a matter of fact, interpreters during SI and all of its sub-modalities still have to read different kinds of material, whether being their own notes, schedule of the conference or full text of the speech. In this regard, it is safe to assume that pure SI, with only auditory input, is performed only for very short durations and in amateur, small-sized events. Hence, the interpreter operates in SI with text

mode at nearly every simultaneous interpreter mediated conference, since reading is a highly entrenched element of SI process, although the density of the reading process may vary. From the organizers point of view, they are to supply interpreters with related written documents beforehand in order to familiarise interpreters with the topic and terminology, which makes SI with text a more prevalent type of interpreting. In addition to its frequent usage in real-world conference settings, SI with text can also be used as an advanced-level interpreting exercise in classroom settings. For instance, Déjean Le Féal (1998) outlines an ideal interpreting course beginning with CI and STR, then progressing with SI and only then, SI with text (as cited in Sawyer, 2004, p. 23).

From a cognitive point of view, Gile (1995) regards SI with text on a balance between positive and negative ends. For the positive aspects, he counts “vocal indications from the speaker, though these may not be helpful as in ad-libbed speeches” and “visual presence of all information, reducing the memory effort and deleterious effects of acoustic difficulties”. And for the negative aspects, he enumerates “high density and peculiar linguistic constructions of written texts as opposed to oral discourse”, “risks of linguistic interference”, “difficulty of following both the vocal speech and written text and the temptation to focus more on written text”, which may create additional difficulties for the interpreter (pp. 184-185).

Another important aspect and challenge for the interpreter within SI with text context is speaker’s deviations from text in speech delivery. Deviations in SI with text can frequently be observed due to a number of reasons. For instance, speakers may skip or paraphrase certain parts in text due to time constraint. Technical problems, such as a dysfunctional computer or a projector, may cause speakers to skip certain parts in the text and speech, as well. Furthermore, to attract the attention of the audience, speakers may begin their speech with an anecdote, a story or a question, which is not included in the text. A question or a comment from the audience during delivery may change the direction of the speech and lead in deviations. Lastly, a new idea or thought

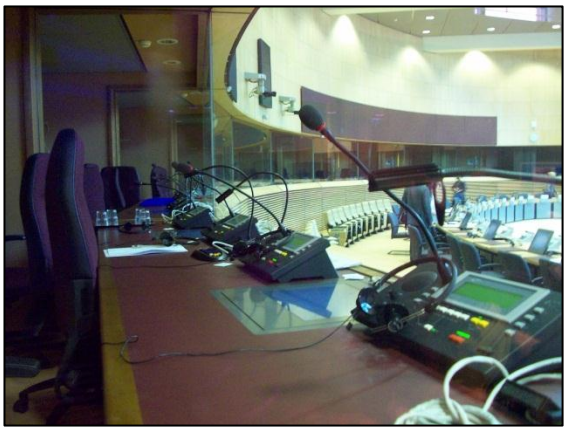
shaped in the mind of the speaker may cause additions in the speech. Even if the speaker does not deviate from the text s/he has with her/him on the rostrum, there are still a number of difficulties associated with SI with text. First, the speaker obviously has drafted the speech for weeks if not for months, therefore, the texts are usually information-intensive. Second, delivery time allocated for each speaker, especially in large symposiums with many participants is usually limited with 15-20 minutes at the most. As a result, a speaker reading a text prepared by herself or himself, will obviously read it at a very fast pace and without any pauses for thinking or 'silent intervals' (see Goldman-Eisler, 1961) intonations, stresses which are more or less embedded in a natural speech delivery. This will result in serious problems in understanding and establishing links between ideas in speech from the interpreter's point of view. Poor understanding will affect interpreter and interpreting in a negative way and causes poor interpreting, as might be expected. As Seleskovitch (1978) stated "even a poor speaker, is easier to understand than one who simply reads a paper" and "a written text is meant to be read and can be read over and over again, whereas the spoken word is intended to be heard once and once only" (pp. 133-134). Furthermore, in such cases, since all the information is present in the text, interpreters often leave the speech aside and by focusing on the text itself, try to interpret all of it and since delivery is very fast, they become outdistanced and may lose the speaker completely (Gile, 1995, p. 185). In this context, another related difficulty of SI with text is the **linguistic interference**. Linguistic interference is defined as "the result of the auditory and/or visual influence of the SL or ST on structure/elements of the TT that results in a deviation from the norms of the TL" (Lamberger-Felber and Schneider, 2008, p. 218). If SI without text is already prone to linguistic interference considering the auditory input and also to acoustic interference, one can conclude that SI with text is even more risky in terms of linguistic interference and hence, errors due to uninterrupted existence of the text along with the auditory input. Since any kind of error in SI will result in decline in interpreting quality, linguistic interference makes SI with text a more difficult modality compared to pure SI and other modalities. Considering also additional mental efforts the interpreter

has to exert during SI with text, the nature of this specific modality is better to be understood to develop coping strategies and therefore, for better training and interpreting performances. One of the main issues in researching SI with text is the difficulty of defining and manipulating the text. First, when we refer ‘text’, we mean plethora of structures with varying degrees of complexity. It is for sure that in contrast to notes of a consecutive interpreter, full text of a speech includes “all the information content of the author’s message, plus language components associated with rules of syntax” (Gile, 1997/2002, p. 169). Furthermore, lexical aspects such as excessive technical terminology or syntactic aspects such as the branching of sentences of a text would be other parameters when gauging the performance of interpreters (see 2.4.2). In order to design accurate and distinctive tests for research, text-linguistics factors should not be disregarded.

In conclusion, it can be stated that SI with text is commonly practiced by professional conference interpreters and IS research has not stayed indifference to the fact by baptizing this particular act. However, empirical studies, which focus solely on SI with text, are available yet limited. It is inferred from these studies that although SI with text is acknowledged as more cognitively demanding due to dual inputs and multi-tasking but less demanding in terms of memory effort, it has not been decided yet whether the availability of text provides concrete advantages for the interpreter or not. For instance, Gile (1997/2002) pointed out a this ambiguity by stating that “implications of SI with text in terms of cooperation or interference between the SL reading input and the spoken TL output are not clear” (p. 169). Following this pattern, implications of the cooperation or interference between SL reading input and SL listening input are not clear, either. On that account, interpreter’s mind at work is to be scrutinized in order to make this point and other unilluminated components of SI with text. In accordance, research questions of this study focus very primarily on SI with text as modality and attempt to shed a light on text processing patterns by locating the text in different phases throughout the process.

2.2. SIMULTANEOUS INTERPRETING AND TECHNOLOGY: TODAY AND FUTURE

Technology is generally defined as “a manner of accomplishing a task especially using technical processes, methods, or knowledge” (“Technology”, Merriam-Webster Online). According to this definition, first and foremost, SI itself can be regarded as technology. In any case and apart from the definition, there has always been a close connection between SI and technology. In other words, SI, with all of its sub-modalities, has evolved in parallel with the evolution of technology, as mentioned in 2.1.2. To be more specific, SI with text as a sub-modality became more widespread if not feasible with (specifically visual) conference technologies. For instance, today, texts are not only existent in printed form but also in digitalized formats whether they are on the screen of interpreters’ notebooks or monitors that are already installed in the booth; *i.e.*, ‘booth monitors’. Booth monitors are small-sized screens usually fixed in the booth, which display the visual material such as presentations, written texts, web sites, charts, figures, infographs etc. as they are screened on the projector screen of the conference hall (see Photograph 1). Booth monitors can be said to have made SI with text a widespread modality and thus, they are of particular importance in terms of SI with text (see 2.2.1 for details).



Photograph 1: Interpreting booth in one of the conference halls of the European Commission.[4]

[4] Photo courtesy of Res. Asst. Cihan ALAN.

On the other hand, information and communication technologies (ICTs) in general, also affect conference and hence, interpreting technologies. To illustrate, the emergence of new conference techniques such as teleconferencing and videoconferencing brought about a new modality of SI; *i.e.*, **remote interpreting** (RI). As opposed to traditional conference settings, parties of communication including interpreter do not necessarily share the same physical environment today, thanks to audio-visual systems. As for teleconferencing, delegates and the interpreter are connected by dint of a telephone system. For the interpreter, performing interpreting only based on auditory input and without seeing the gestures and mimics of the speaker is an arduous act and affects the overall quality of interpreting (Doğan, 2009, p. 56). This dimension of teleconferencing is remarkable in terms of the importance of the visual cues in meaning assembly during SI. As for videoconferencing systems, interpreter has the opportunity to perceive the speaker visually but not naturally, instead, via screens that transfer simultaneous images of the speaker and other persons and materials s/he would use during the delivery of speeches. Yet more, with the emergence of high-end tele-presence systems, interlocutors experience the physical approximately of other individuals by virtual reality tools such as large high definition screens situated in particular places in the conference halls to substitute real human beings. Advanced tele-presence systems even include sophisticated conference technologies such as gesture recognition, facial recognition and voice recognition as well. In terms of visual assistance, videoconferencing and tele-presence systems provide better opportunities for the interpreter. However, the quality of these auxiliary devices and their conformity to international standards, which are acknowledged also by national and international interpreting organizations such as the International Association of Conference Interpreters (AIIC) and the Conference Interpreters Association of Turkey (TKTD), are of utmost importance for the output quality of these technology-assisted distance-interpreting modalities. Another salient example for recently developed and technology-mediated working modalities is **simultaneous consecutive interpreting**, in which storage of the original message in the interpreter's notes and LTM is replaced by a digital recording of

the original speech that the interpreter plays back into earphones and renders in the simultaneous mode (Hamidi and Pöchhacker, 2007, p. 277). Merging technology with interpreting also yields different solutions for the hearing-impaired and therefore, **sign language interpreting**. For instance, **print interpreting**, in other words, interpreting of spoken language simultaneously into written text of the speech, now provides an alternative for situations, where sign language interpreting is not available (see Tiittula, 2009). Even in traditional SI, interpreters use more and more sophisticated SI consoles with multi-channels and features. For instance, today, in large conference settings with many languages, networked booths may send small-sized text messages to each other to be displayed on the screen of the console (see Photograph 2).

Photograph 2: An advanced SI console with an LCD.[5]

Interpreters benefit from technology not only in booths but also before the events by storing and managing their terminology in terminology management software. Furthermore, thanks to computer-assisted interpreting training (CAIT) tools, students of interpreting schools can make use of a wide variety of means from speech repositories including podcasts, webcasts and webinars on the World Wide Web, to authoring software, consisting audio-visual materials and even to virtual learning environments, simulating real-world settings and allowing distance-learning (see Irabien, 2010). Finally, technology is also used in IS in the format of data collecting instruments etc. This study, for instance,

[5] Photograph was taken by the researcher himself.

sets an example for technology-assisted research in the field of interpreting. Along with the advantages of technological advancements in both practice and research of interpreting, these advancements also bring along several health issues as in the case of other fields. As a result, the relation between interpreting technology and health has been the topic of various studies within IS. To name one of them, Diriker and Şeker (2005) investigated the electromagnetic fields in and around interpreting booths in Turkey (pp. 45-56).

The majority of the above-mentioned interpreting technologies point to the importance of visual dimension of SI. Hence, it can be assumed that the future of interpreting will be shaped by the dominance of visual input in accordance with the development of conference technology. In this regard, it is not false to reason that SI with text will gain much more importance. Thus, we will narrow down our focus to the visual technologies *per se* considering the multifariousness of ICTs and interpreting technologies as well. It would be befitting (1) to shed light on SI with text from the equipment viewpoint rather than the interpreter and (2) to provide information about the main data collection instrument of this study, namely eye tracker.

2.2.1. Visuality and Visual Technologies in SI

SI has been traditionally associated with audio and therefore, auditory input and related topics such as noise, presentation rate, ear-voice span etc. have constituted the main fields of interest in IS. As a result, numerous authors have highlighted the importance and quality of technical devices but mostly auditory ones; *i.e.*, earphone and microphones (Seleskovitch, 1978, pp. 128-132; Taylor-Bouladon, 2001, pp. 162-163; Jones, 2002, p. 67; Doğan, 2009, pp. 66-68).

However, as mentioned in 2.1.3.4, it is becoming gradually rare for the interpreters to function only with auditory input; *i.e.*, do pure SI in 21st century's conference and SI settings on the grounds that there exist various type of visual

material and it is becoming easier to prepare and use them thanks to ICTs. Apart from the technology, the importance of visual cues has a communicative value as well. It is generally accepted that communication is based 7 per cent on the meaning of words, 38 per cent on intonation and 55 per cent on visual cues (Taylor-Bouladon, 2001, p. 163). Visual material that are mostly utilized at a conference interpreting setting with SI modality are numerous yet can be grouped under certain types (see Figure 3).

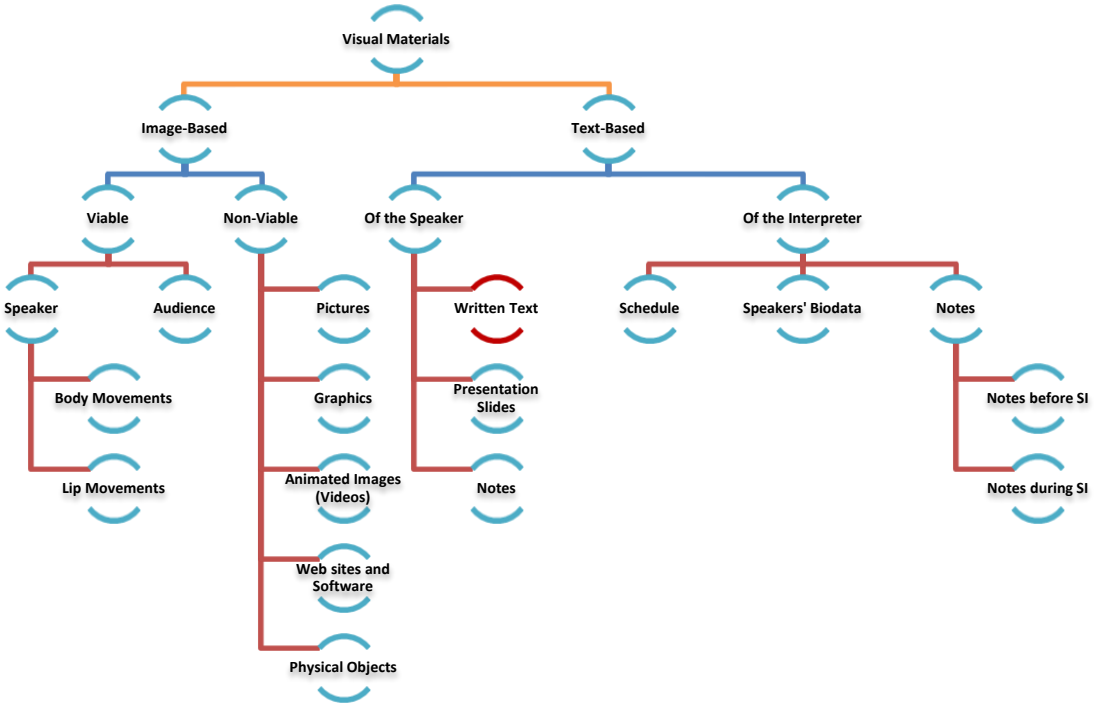


Figure 3: Visual materials that can be utilized during SI.

An initial distinction can be made based on the type of visual material, in other words, whether the material in question is an image or it is composed of any kind of texts. Image based materials can further be divided into viable and non-viable images. Here, it is important to acknowledge that even speaker and the audience themselves are to be regarded as visual 'material' on the grounds that the interpreter may infer extralinguistic cues regarding speech and the general course of interpreting from both. While it is clear that gestures and mimics of the speaker would certainly support meaning assembly process of the interpreter, it

also noteworthy that immediate reactions of the audience such as laughing at a joke (or not giving any response), nodding, applauding, turning head to the booth and looking at the interpreter, raising hands in reply of a question directed by the speaker etc. are invaluable visual cues for the interpreter in having an idea about her/his own SI performance. As for non-viable image-based visual materials, web sites and software are of utmost importance since in cases where the speaker demonstrates a web site or software using the computer s/he will do it in an unpredictable manner in contrast to images or videos. It is therefore a very difficult task for the interpreter to both follow the same steps with the speaker in browsing through the web site or using the computer and perform interpreting. As a result, having a monitor booth in these cases is of vital importance, since booth monitor would display what is reflected on the main conference screen. Text based visual materials are also voluminous; as a result, it is for the ease of study to separate them into two main groups based on the main user of these materials. In fact, text based visual materials prepared by the speaker such as the written text of the speech and presentation slides are used by the interpreter herself/himself. On the other hand, the interpreter may take notes during discussions with the speaker or during SI to be used in SI performance. Here, speakers' biodata are important for two reasons: (1) background information of speakers is articulated by the chairpersons in nearly every conference and (2) the background information is usually packed with numbers in years and long proper names such as the names of the institutions and organizations etc. that are difficult for the interpreter even to pronounce at once, let alone interpreting.[6] This study focuses solely on the written text as for visual material since they are one of the most frequent types of visual material within conference settings and more importantly, since full written texts contain excessive information, they can be useless or even distracting if managing strategies are not properly employed. In this regard, text processing strategies (see 2.4) and visual technology become considerably significant.

[6] Such background information is already available in the text used for the main test of this study (see Appendix 1, 2 and 3).

It can be easily inferred that the augmentation in visual materials in SI is in direct relation with the tendency of speakers to utilize audio-visual speech delivery techniques, available with the breakthroughs in general ICTs. Although ICTs in SI are often interrelated with new learning environments such as distance learning, multilingual conferences mostly depend upon them, as well. Visual devices and technologies cover an important place among overall conference technologies. Stable, portable and overhead projectors, projector screens, cables transferring still or animated images, personal computers of any kind, Liquid Crystal Display (LCD) or plasma booth monitors can be regarded under the overarching title of visual technologies of conference interpreting. The advantages of using visual devices during speech delivery are numerous: First, it catalyses the communication between the speaker-interpreter-listener triangle. While it does so even in monolingual communicative events for the listeners to follow the speech, it gains more and more importance for the multilingual conferences, considering the involvement of the interpreter and her/his requirement to understand and analyse the speech.

Along with that, the critical issue is the usability of visual devices; therefore, visual materials. In this regard, the interpreting booth should be located in a place to enable the interpreter easily see the speaker and visual material s/he uses during the speech (Doğan, 2009, p. 108). However, this may not be the case every now and then and interpreters cannot clearly see the speaker and speech materials. The importance of the abovementioned visual technologies and devices comes in sight in such cases. Usage of such devices is vital for two practical reasons: with these devices (1) interpreters can easily follow the speaker and visual material even if the podium or the main screen is far from the booth or they are not visible for locational reasons; (2) there may be various reasons blocking the visibility range of the interpreter, even if the interpreter can see the speaker and visual material. The followings can be listed as for these reasons:

(1) **Fixed obstacles blocking the booth:** a stationery obstacle such as a wall or a pillar in front of the booth may block the view of the interpreter. This visual problem mostly stems from designing the conference hall without taking the requirements of the interpreter into consideration. Some designers even would like to cover the booth or make it entirely invisible with the justification that it flaws the overall symmetrical view of the conference hall and interpreting booth is a defect in the design. This problem is in many cases cannot be solved since it is not possible the remove the obstacles in question. Still, using portable booths may be a solution, as long as the problem is noticed by the interpreter in advance.

(2) **Any person or removable material blocking the booth:** The way between the booth and the hall may be blocked not only with stable obstacles but also with portable ones for a certain period. These obstacles may be human such as delegates, technical staff, conference hosts or objects such as banners, flags, posters, technical equipment etc. In contrast to stable obstacles, they may be removed although it takes time in some cases. Since SI is a highly rapid process and concentration of the interpreter is of utmost importance, noticing these obstacles, warning conference staff to remove them and finally the removal will certainly distract the interpreter. In addition to the distraction caused by the removal process, the interpreter loses contact with the speaker and the visual materials for a certain period, which will definitely affect the quality of the performance.

(3) **Poor enlightenment:** Considering the distance between the booth and the podium, it may become difficult for the interpreter to see the speaker clearly, on the occasion that the platform where s/he stands is not enlightened sufficiently.

(4) **Inappropriate interior design of the booth:** Even if the booth itself is located at a proper place without any stable or portable obstacles and

> the critical visual spots for the interpreter are enlightened perfectly, the interpreter may still have strain in perceiving the speaker and the visual material. It is mostly due to the architectural errors within in the booth. Height of the platform under the interpreter, type and dimensions of the chair, height of the desk and the angle of the glass wall are components, which directly affect the visibility.

In order to prevent these visibility problems, international standards regarding booths and equipment were adopted. ISO 2603:1998 (TS ISO 2603) and ISO 4043:1998 (TS ISO 4043) are the ones regulating SI booths and mobile SI booths, respectively. Documents regarding working conditions of interpreting associations such as AIIC and TKTD refer to these standards and members of these organizations do not accept to work under conditions that are not in conformity with the technical and hence, professional standards. However, in real-world conditions, there are conference halls and booths, which do not comply with the standards regarding visibility, and there are conference interpreters who are not members of these professional organizations and are forced to perform interpreting under such poor visibility situations. Under these circumstances, auxiliary visual devices of any kind and the booth monitor, in particular, play a very crucial role: Making the invisible visible again.

The relation between the interpreter and the booth monitor can further be analysed in the scope of human-computer interaction (HCI). In its broader sense, HCI is defined as the interaction and between people and electronic devices, particularly, computers. It is also an interdisciplinary study focusing on the interaction and interfaces between human and computers of any kind. As a result, branches of science from a wide spectrum such as computer science, artificial intelligence, behavioural sciences such as psychology and social psychology, in particular, cognitive sciences, neurolinguistics etc. intersect under the title of HCI. It is obvious that designing interfaces for visual devices in the conference hall and in the booth is not the subject of IS. However, SI performance and overall interpreting quality partly depend on the interaction

between these devices and the interpreter. In this regard, conducting the main test in a HCI laboratory becomes meaningful. From HCI point of view, analysing and understanding the process of using visual devices in the booth and the interaction between the human and computer in that sense may provide some thoughts on SI with text. Accordingly, strategies with regard to the management of visual devices during SI can be developed and included in the curricula of the interpreter training programmes.

It is unclear whether there is a significant difference in terms of cognitive load between text processing with the help of conventional methods such as reading from papers and with the help of visual devices.[7] However, this study assumes that interpreters (the subjects) use booth monitor to follow the written text of the speech during SI on the grounds of two practical reasons: (1) In order to design a realistic test, which simulates real-life conference conditions, considering interpreters' preference to use electronic devices whether they are personal computers or booth monitors. (2) The main data collection instrument of the study, *i.e.*, eye tracker, entails the use of a monitor during SI performance.

2.2.2. Eye Tracking

Eye tracking does not fall under the title of technology in SI, since apparently, it is not used in conferences and the applications of eye tracking in translation and interpreting (TI) studies have a recent history. However, as this study utilizes eye tracker as the main data collection tool, a general overview on the technology and technique in question including working mechanism, types, fields of usage and potentials it provides for TI studies are specified in this part.

Eye tracking is a method and a technology, in which a device called eye tracker monitors and records eye movements and related gaze data, in order to provide information on how users visually perceive any kind of stimuli; *i.e.,* the material

[7] This issue was asked to the subjects in the questionnaire (see Appendix 4 and 5).

at which the subject looks in eye tracking tests. Eye tracker simply allows the researcher to track down the inside of the user's mind and to see the world from her/his eyes. More specifically, with eye tracker, researcher can precisely observe and gauge where the subject looks, where the subject focuses on, how many times the subject fixates on a particular section, pupil dilation and oculomotor functions of the subject, the distance between eye and the eye tracker, the movements of eye on a stimuli and where the subject misses to see etc. Eye tracker uses various materials as stimuli, including physical objects, instructions, images, movies, web sites, Portable Document Files (PDFs), questionnaires, scene cameras or external videos. In addition to gaze data, most eye trackers can also record microphone sound, keystrokes, mouse clicks, manually logged events, web surfing behaviours with scrolling down and page transitions etc. (Tobii Studio 2.X User Manual, 2010).

Eye tracking studies and observations using eye trackers as the instrument first started in the second half of the 19th century. At that period, eye trackers are excessively intrusive and therefore, difficult to apply on individuals. They are mostly mounted on the subject head and accordingly called as head-mounted systems (Mohamed, Da Silva and Courboulay, 2007, p. 4). Other historical methods are electrooculography techniques, relying on electrodes mounted on the skin around the eye that could measure differences in electric potential to detect eye movements (Poole and Ball, 2006, p. 211). However, with the developed technology, eye trackers now fall into two main types: mobile and remote eye trackers. Mobile eye trackers use small devices attached to the subjects' eye such as glasses or contact lens with magnetic field sensors and other recording components. Mobile eye tracking devices are mainly used for eye tracking studies in real-world environments. On the other hand, remote eye trackers are not attached to the subject's eye, but rather, they are integrated with a computer monitor or placed from a distance from the eye of the subject and record eye movement data by emitting light or more frequently, infrared signals to the subject's eye and records data based on the reflection (see Photograph 3).

Photograph 3: Tobii T120™, a typical remote eye tracker.[8]

More sensitive remote eye trackers also use retinal blood vessels for tracking eye movements. Nonetheless, most commercial eye tracking systems available today measure point-of-regard (or point of interest) by the 'corneal-reflection/pupil-centre' method (Goldberg and Wichansky, 2003). Since remote eye trackers are optical, unobtrusive and non-invasive; they are favoured by majority of the researchers. As to be specified in Chapter 3, this study benefits from a remote eye tracker as well.

A typical eye tracker provides different kind of relevant information regarding eye movements as mentioned above. However, researcher needs additional software in order to replay, visualize, statically formulate and hence, interpret these data, in addition to the eye tracker device. The software in question is usually integrated into the general eye tracker systems and costly. Nevertheless, there are also open-source and free eye tracking software as well. ITU Gaze Tracker, developed by IT University of Copenhagen, is one of these open source initiatives in the eye tracking field. Gaze path videos, clusters, heat maps, batches, statistics are some of the visualization methods that most of the analysis software can provide. Even with these options; selecting, handling and interpreting excessive volume of eye tracking data constitute one of the main technical and methodological issues of eye tracking studies. Subjects with eyes that are not compatible with eye tracking devices for

[8] From http://www.pstnet.com/images/hw_parent/parent_tobii.png.

physiological reasons, may also create difficulties. Along with these problems, maps of gaze path and other visualization options mostly answer the question ‘how subjects read to find relevant information and key words throughout a text’. Even this piece of information may provide valuable insight in answering research questions of this study and hence, improving the text-processing skills of simultaneous interpreters.

Although eye tracking is mainly regarded an HCI tool, it can be used to conduct research in a wide array of fields. Industry and universities are main customers of the eye tracking methods. As for the industry, it can be used in countless cases, from testing the usability of new products, interfaces of software and web sites to developing 3D games and even arranging shelves in supermarkets. The customer focuses when s/he is having a new experience with the product or environment in question, provides valuable information for product designers and developers. Eye tracker is also used in the academic field and most of the research fields under the academic title intercepts with the research in business sector. Usability research, developmental psychology, ophthalmology, neuroscience, nonhuman primate research, advertising research, package design, shopper research, psycholinguistics and reading research are leading ones to which eye tracking has considerably contributed (Tobii Studio 2.X User Manual, 2010). Apart from the traditional eye tracking methods only for recording, eye trackers are also getting used as control devices such as onscreen keyboard controlled by gazes and interfaces or as means to communicate for the disabled and for those who cannot use traditional input devices such as keyboard and mouse. From a general point of view, this study may be regarded as associated with psycholinguistics and reading research. However, eye tracking has also been used in TI research as specified in 1.9.

2.3. COGNITIVE DIMENSION OF SIMULTANEOUS INTERPRETING (WITH TEXT): INTO THE MIND OF THE INTERPETER

Different approaches pertaining to different disciplines can be employed the different to analyse various components of interpreting. Indeed, interpreting is a virtually multi-dimensional reality; thus, the approaches adopted to elucidate various components of interpreting should be treated in a holistic view. All these different approaches have their own frames, models and paradigms. Pöchhacker (2004) used the term 'memes of interpreting' to discuss the approaches and he elaborated on four main memes in the universe of IS; namely, language, cognition, culture and interaction (p. 60). This study and, specifically this part, endeavour to shed a light on interpreting and SI from a cognitive point of view. Cognitive dimension of SI is significant within the scope of this study; thus, the third research question intends to tap whether there is a significant difference between the two test groups in terms of cognitive load, cognitive mechanisms of SI and SI with text.

2.3.1. Cognitive Tasks

It goes without saying that SI is a cognitive act above all things. In this regard, Lederer (1978/2002) put forward that "interpreting is a human performance in which cognitive activity is first and foremost" (p. 131). Evidence suggests that interpreting of all kinds push the interpreter to their cognitive edges. Indeed, "SI is a decision-making process, most of which are made under fire at a given point in a constantly changing situation" (Tijus, 1997, p. 35). What users of interpreting, in other words, the audience, perceive as error from their headphones mostly stems from the adverse effects of mental overloading due to multiple cognitive operations of interpreting. In this respect, Gile (1997/2004) stated that frequent errors, such as omissions, slips and shifts in interpreting are not associated with the lack of knowledge of the interpreter but with cognitive load (p. 166). Compared to all other interpreting modalities, SI is rather

significant and distinctive from the cognitive or psycholinguistic aspect. Christofells (2004) stated, “SI can be argued one of the most complex language tasks imaginable because many processes take place at the same time” (p. 4). Apart from the multiplicity of processes, the elusive pace of the cognitive tasks presents grave cognitive difficulties for the interpreter. Switching from CI to SI may well have represented a quantum leap in the interpreter’s level of cognitive performance; however, human brain is able to make only minor adjustments to adapt to the new cognitive levels (Moser-Mercer, 2000/01, p. 91). Switching from SI to SI with text poses similar strains on the interpreter. Many determinants influence the performance of the simultaneous interpreter. In this regard, it could be stated that interpreting involves three obvious processes and skills: comprehension, translation and production as presented below (Liu, 2008, p. 160)”.

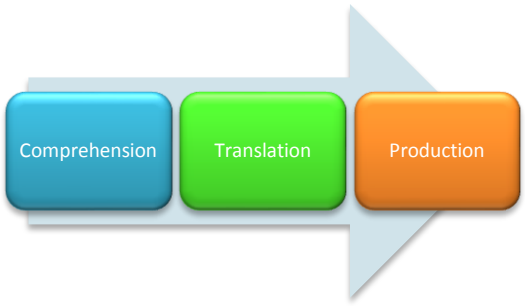


Figure 4: Main cognitive processes in SI.

However, these sub-processes become more complicated and interpenetrated, rather than being separate tasks during the general process of interpreting. First, by definition, SI involves speaking and listening and in the case of SI with text, reading in different languages at the same time. Second, all these tasks are to be performed in very short durations considering the incessant course of the speech and successive ‘interpreting units’ or ‘chunks’. Third, all these tasks push interpreters to their cognitive limits and as a result, impose heavy loads on their short term memory, although the memory effort may change depending on

the working mode. Accordingly, the main reasons for these cognitive difficulties and of SI can be grouped under three titles as follows:

(1) Simultaneity, which is performing two and even more tasks at the same time, can be regarded in three phases: (a) simultaneity of cognitive, perceptual and kinetic tasks taking place within the interpreter, (b) simultaneity of auditory and visual stimuli originating from the speaker and perceived by the interpreter and (c) simultaneity of (a) and (b).

(2) Immediacy; *i.e.*, extremely fast flowing of information and the compulsion to render it in due time.

(3) Incrementality; *i.e.*, conglomeration in the short-term memory (Doğan, 2009, p. 74).

Plurality of these tasks can also be added as a fourth dimension, considering the multiple sources of information during SI. Hence, rather than an individual task, SI is the convergence of many sub-tasks, which have varying degrees of effects on the general interpreting process even in the duration of one speech. The sub-tasks for SI are mainly listening, speaking and interpreting and they require corresponding sub-skills. Here, interpreting appears as an additional task apart from speaking, since numerous studies show that cerebral activation is rather different in SI than in shadowing, which does not require the input to be transcoded yet only repeated in the same language (e.g. Rinne, *et al.*, 2000). It is empirically demonstrated that interpreters develop production organizations based on internal feedback system, which enable them to curtail the detrimental effects of interference between concurrent listening and speaking, that is delayed auditory feedback (Fabbro and Gran, 1997, p. 12). In the case of SI with text, another sub-task and therefore, another sub-skill, namely reading, is involved in the process visualised below (see Figure 5). There are two noteworthy points in the diagram: First, these sub-tasks are performed almost at the same time based on the simultaneity dimension of SI and thus, they are

presented in a basic Venn scheme rather than a linear process. Second, these sub-tasks continuously overlap and affect each other during SI performance.

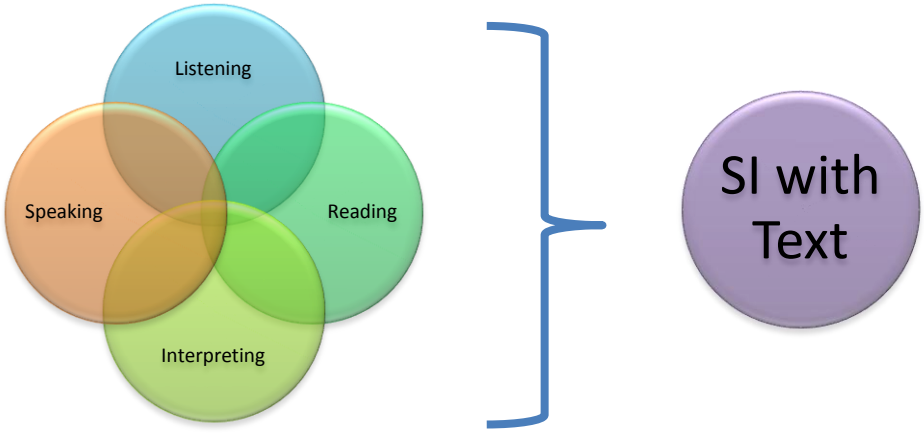


Figure 5: Sub-tasks of simultaneous interpreting with text.

From a neurolinguistic point of view, language-related tasks including interpreting are associated with the functioning of the brain and interconnected neurons. It is known that "cognitive and as well as lower-level brain function emerges from the biochemical and electrochemical activation and interaction of multiple neurons" (Ullman, 2006, p. 238). In this respect, there are certain main sections in the brain, responsible for language-related tasks. These are frontal lobe for the language management, occipital lobe for processing visual stimuli and temporal lobe for recognition of auditory stimuli and memory (see Figure 6). As for SI with text and performing mental tasks related with SI with text, both hemispheres may be considered to be used very actively. The left hemisphere is preoccupied with the recognition of the original message, interpreting and speech production and the primary role of the right hemisphere is the control of attention and monitoring of nonverbal, emotional and pragmatic features of SS (Mildner, 2008, pp. 17, 226). More specifically, four certain sections in the left hemisphere of the brain, responsible for logic and language, are assumed to be activated during SI with text (see Figure 7). These sections are Wernicke's area (42) for the speech comprehension (listening), Broca's area (44) for the speech production (speaking), the *arcuate fasciculus* for the connection between

listening and producing speech and occipital lobe (17) for reading and processing visual stimuli (Yule, 2004, pp. 163-164). Studies suggest that Broca's area, in particular, clearly plays an important role in syntactic processing and syntactically complex and branched sentences yield more activation in Broca's area (44) (Ullman, 2006, p. 264). As for the interpreting task from A language into B specifically, as the case in this study, activation is observed in the left frontal lobe, in the premotor cortex (supplementary motor area) and dorsolateral regions of the frontal cortex (Tommola, Laine, Sunnari and Rinne, 2000/01, p. 160). However, as it is acknowledged that working memory and LTM are involved in the SI process, amygdala and hippocampus located in the mid-brain, whose role is to process memory and amalgamation of information from STM to LTM respectively, may be among the activated sections as well. The activated regions within the brain are important in terms of understanding the neurophysiologic nature of cognitive tasks involved in SI (with text). Fabbro and Gran (1994) concluded that SI is a particularly complex cognitive task which requires massive and concurrent activation of both cerebral hemispheres and which engages more cerebral structures than mere listening and speaking (shadowing) (as cited in Moser-Mercer, 2000/01, p. 85). It is also noteworthy that both source and target languages are activated during SI, but probably not to the same extent at all times and that bilingualism and SI are different skills and therefore, even balanced bilinguals do not necessarily make good simultaneous interpreters (Mildner, 2008, p. 227).

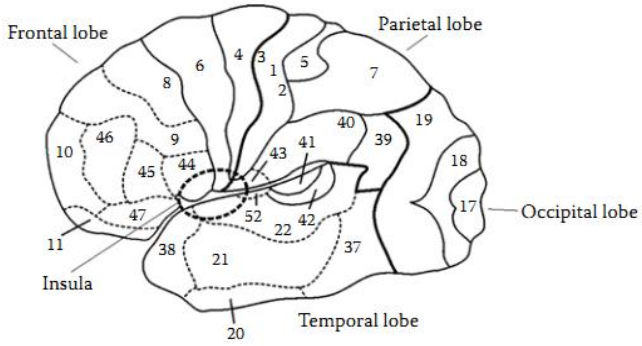


Figure 6: Main sections of the brain related with language-related tasks (Mildner, 2008, p. 17).

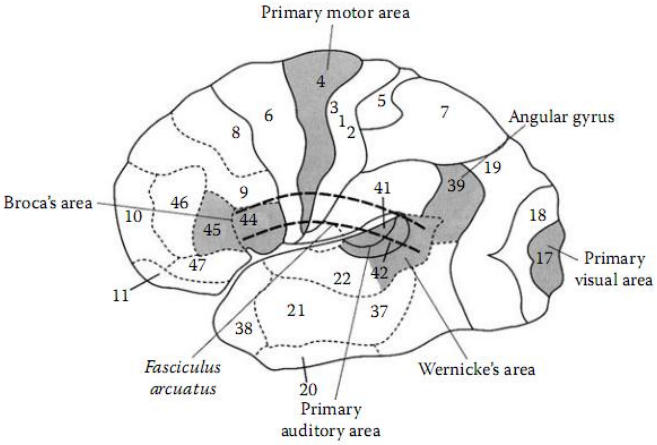


Figure 7: Sections of brain related with language and SI (Mildner, 2008, p. 76).

In a conference context, listening and reading tasks are performed by the listener, and speaking task (and/or reading task depending on the delivery style of the speaker) is performed by the speaker as well. However, all these tasks are conducted at a cognitively different level compared to other persons at an interpreter-mediated event. It is safe to assume that the interpreter has to exert remarkably more cognitive effort compared to other parties, despite the fact that the others seemingly perform the same sub-tasks. For instance, as for the listening sub-task, the interpreter has to perform 'attentive (active) listening', in which s/he listens to comprehend and analyse the speech in detail and reflect the speaker. Furthermore, s/he has to pay attention to the visual cues and to sustain her/his attention during the speech delivery. On the other hand, the listener may lose her/his attention at any time while tracking the speech and it does not create any disturbance as for the event. However, the same is not true for the interpreter. For the speaking sub-task, the interpreter is confronted with time constraint and her/his pace is set by the pace of the speaker, in contrast with the speaker herself/himself. Apart from these main tasks, there are assisting sub-tasks as well. Being one of them, kinaesthetic sub-task is related with the psychomotor skills of the interpreter and regulates the interconnection between the interpreter and her/his (electronic) environment. This sub-task and sub-skill is critical for the success of the interpreting process as well, as SI with

text is associated with the electronic devices more than any other modalities (see 2.2.2).

Apart from the main tasks and regarding cognitive difficulties, there are various parameters and sub-parameters of SI, which directly or indirectly affect the cognitive state of the interpreter and as a result, the overall interpreting performance. It is applicable to classify these parameters under three sub-titles as speech delivery parameters associated with the speaker and the speech, interpreting parameters associated with the interpreter and her/his cognitive, perceptual or kinaesthetic skills and external parameters, such as technical conditions that affect the mind-set of the interpreter. These parameters can be used either as variables in SI research or as indicators to contrast SI with text from pure SI and other working modalities. With regard to the specific research model and the main test of this study, only parameters, which would pose important insights about cognitive mechanisms of SI with text, are handled in this part, that is, input rate in delivery parameters and memory and attention in interpreting parameters.

2.3.2. Parameters

2.3.2.1. Delivery Parameters

Input rate, in other words, delivery speed of the speaker, has a direct effect on the speed of the interpreter and as a result, excessive delivery speed may result in unfavourable conditions by creating a time pressure on the interpreter. Thus, it is one of the most important parameters determining the output quality. It is also noteworthy that ‘excessively slow’ speeches may also evoke mental overload (Doğan, 2009, p. 146). Another point is that “some speakers may speak very rapidly but provide little information, in which speech density remains low” (Gile, 1995, p. 173). Hence, information density of an utterance should also be taken into consideration in discussing input rate. In pure SI, the

importance of input rate is far more important than SI with text since the interpreter has to rely on only auditory input. However, SI with text bears another complication regarding input rate of the speech. In most SI with text scenarios, it is a common practice for speakers to read the text if they prepare a full-fledged one. Although, the ideal input rate for interpreting is specified as about 100-200 wpm (Gile, 1995, p. 112), an adult can read a text as fast as about 200-350 wpm (Rayner and Pollatsek, 1989, p. 440). Furthermore, experiments show that preparation by silent reading and reading aloud, increases reading speed and reliability (see Zagoruikoa and Tambovtseva, 1982). Preparation and reading aloud depict the exact case for speakers in majority of SI with text situations. What is more, even in these cases there would be deviations from the text as specified in 2.1.3.4. In this regard, it could be claimed that there would be fluctuations in the input rate from the reading end to the speaking one and one speech may demonstrate different input rates accordingly. As for the input at reading pace, lack of pauses becomes another cause of difficulty in SI with text. It is thought that pauses in speaking may alleviate the cognitive load of the interpreter by allocating her/him additional time. However, as Goldman-Eisler (1961) specified “the majority of pauses in speech are less than 0.5 in duration, while only 20% to 40% lie between .5 and 1 second, 12% to 20% between 1 and 2 seconds, and very few above 2 seconds” (as cited in Gerver, 1969/2002, p. 53). Hence, even with pauses, the interpreter may not manage the time under fast delivery rate conditions since pauses may not provide sufficient time to compensate losses in interpreting. Yet, there may be relatively long pauses between switching from reading and speaking tasks of the speaker. In cases of such deviations, that is, when the speaker leaves out the text, Sandrelli (2003) advises that it is safer for the interpreter to give priority to oral channel (the actual speech) over the written text (p. 272). However, under extreme input rate conditions, mostly stemming from the time pressure on the speaker to deliver information-dense material in relatively short durations in order to follow the time rules of the concerned conference, written material may become the only input to follow up for the interpreter at times. Therefore, the line between SIT and SI with text may not be

clear-cut considering the effect of input rate. In the main test of this study, the input is delivered at a reading rate and there are deviations from the text, which pose additional mental difficulty for subjects and an intriguing and realistic case to study.

2.3.2.2. Interpreting Parameters

Memory is one of the primary elements to be taken into consideration in terms of the cognitive operations in interpreting. In chronological order, there have been three important approaches towards memory regarding SI (with text), in particular. (1) It is widely accepted that for any kind of cognitive activity, certain amount of cognitive 'energy' is required and the total amount of cognitive resources is limited. The cognitive concept of limited resources began by Miller's approach to STM (1956), in which STM is limited with the 'magical number' seven plus or minus two. This concept is already significant for SI considering simultaneity, immediacy, incrementality and plurality dimensions as specified by various authors (e.g. Daró, 1997). As for SI with text, it could be asserted that the increase in the number of tasks and loci of attention would decrease the allocated cognitive energy for each task. (2) Later on, Atkinson and Shiffrin (1968) proposed a memory model, in which STM is limited with 15-30 seconds rather than number of inputs. In the following periods, Gillund and Shiffrin (1984) categorized input types under three titles as visual, auditory and tactile, thereby recognizing the visual input to be processed (as cited in Moser-Mercer, Lambert, Daró and Williams, 1997, p. 141). (3) When STM modelling fell short to illuminate a number of cognitive operations, Baddeley and Hitch (1974) suggested 'working memory', in other words, the memory functioning for a certain period to process task-based information, in which again the duration or total load is limited. With regard to SI with text, it could be asserted that the concept of working memory is the most illuminating model in terms of SI with text considering the components of it. These components are (1) the central executive system, which is located at the core position and responsible for

processing information and temporary storage (2) phonological loop dealing with sound and auditory information (3) visuo-spatial sketchpad, regarding visual processing (4) episodic buffer, which is a linking unit in between the components and with LTM (Baddeley, 1990 and 2000). Here, it could be safe to argue that phonological loop corresponds to the auditory input; *i.e.*, SS and TS; and visuo-spatial sketchpad corresponds to the visual input; *i.e.*, written text. However, these assumptions are highly oversimplified models of memory and it is rather difficult to draw bold lines between input types and segments of working memory in terms of interpreting. In addition, although phonological loop and visuo-spatial sketchpad process different kinds of information, there is little interference between verbal and spatial information in memory (Cowan, 2000/01, p. 120). Yet, when cognitive effort in SI is articulated, mostly, cognitive load on the memory is referred. Within the scope of this study, it is also worth noting that as for G1, both reading for SI task and the time interval between preparatory reading and SI task necessitate various degrees of STM efforts as well.

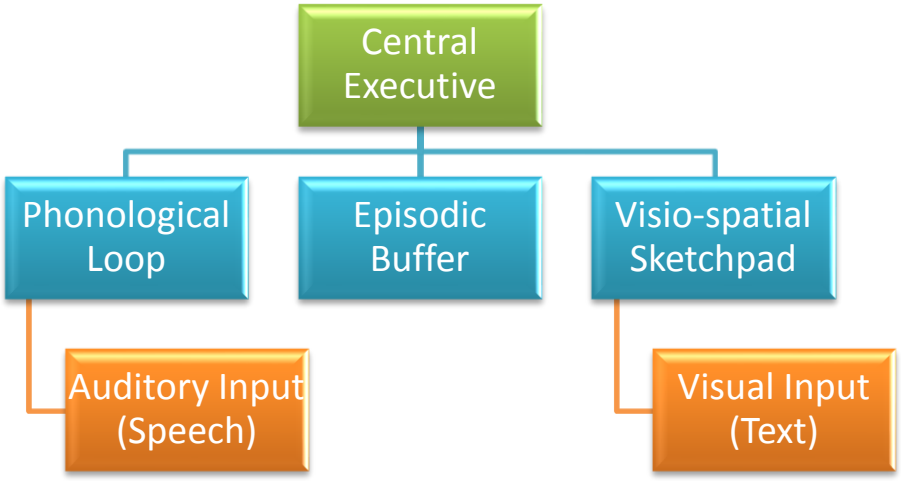


Figure 8: Components of working memory from SI with text point of view.

Attention, as a cognitive operation, a difficulty, an obligation and a parameter for SI is directly related with the multiple sources of information and managing visual and auditory input together in SI with text. Generally, attention is defined

as “a condition of readiness for such attention involving especially a selective narrowing or focusing of consciousness and receptivity (“Attention”, n.d.). It is particularly important that attention is a matter of selecting the relevant information while discarding others. It can be inferred from the definitions of both interpreting and attention that SI, as a multi-tasking activity by definition, requires considerably certain amount of attention. Furthermore, in order to perform SI with text, which requires extreme multi-tasking abilities, attention is to be divided between both SS-TS and auditory-visual channels. Hence, the main question here is (1) how brain (or the interpreter) shares attention between the abovementioned tasks regarding SI with text; *i.e.*, listening, reading, interpreting and speaking. This question directs us to the second question, that is, (2) whether dividing attention is a conscious act or not. Providing an answer for these questions may yield important information regarding SI with text because if sharing attention can be controlled between both retrieval of ‘chunks’ from auditory and visual input and furthermore, between retrieval and production, then strategies can be developed accordingly. In this regard, in a study, Dillinger (1989) concluded that expert interpreters seemed to have learned to be more selective in the surface information they will process semantically (as cited in Liu, 2008, p. 162). On the other hand, “paradoxically, if professional interpreters are asked to consciously focus their attention either to the input or to the output and thus, revert back to the behaviour expected of beginners, their performance deteriorates significantly” (as cited in Lambert, 2004, p. 297).

There exist various models of attention as in the case of memory. For instance, Cowan (2000/01) relates attention with working memory. As per this view, it is assumed that working memory is an activated portion of LTM and attention is located within this activated portion and control short-term memory (p.117).

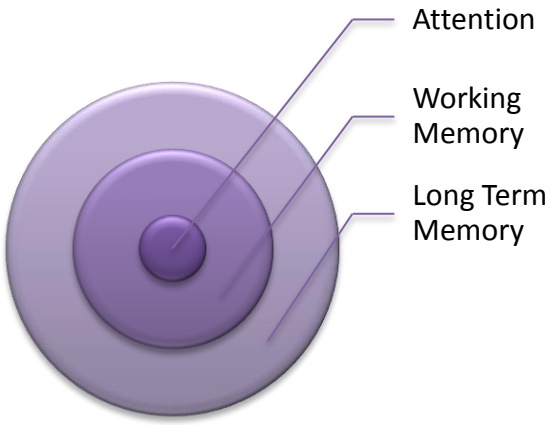


Figure 9: The relation between attention, working memory and LTM.

The connection between these three vital parts can be adapted to SI with text and used to answer the abovementioned questions. Here, the main principle about attention, or rather, divided or selective attention gains importance; that is, “when performing multiple tasks, one’s attention either has to be shared by the tasks or has to be switched back and forth between tasks” (Liu, 2008, p. 171). Thus, it could be asserted that using the activated attentional section within working memory, the interpreter can manage her/his attention by sharing cognitive sources or allocating the whole source for one or another task. However, allocating attention between tasks is only one part of the matter. When it comes to SI with text, there emerges another cognitive problem: limited attentional resources (De Bot, 2000, p. 65). The interpreter is also confronted with a limited attentional resource that is to be shared. This fact makes the interpreter’s decision as to the time to switch her/his attention between the channels even more important, given the fact that every bit of attention is invaluable to perform SI with text. When it comes to the question, what are the elements of attentional loci, to which attention is to be shared, Baddeley and Hitch’s working memory model (1974) with its constituents, provides a valuable insight. If the interference between auditory and visual attention is limited as discussed in the section above, then, it could be put forward that the existence of visual material may alleviate the mental load and increase the overall performance in any way. However, there exists another phenomenon regarding attention called **attentional filtering** or **inhibition**. According to our research

scenario, interpreters have to filter both textual information and auditory information at different times and for certain periods, that is, they have to inhibit one stimulus, which have helped them from the beginning of the task and focus another at their full concentration in due time. Concentration, in this respect, could be regarded as to sustain attention for a certain period while supressing and filtering out external or internal distractors or 'noise'. In other words, subjects not only have to share their limited attention between two stimuli, but also have to filter one of them and switch auditory channel to visual and *vice versa*. Hence, the question is whether it is possible or not and if so, how? Cowan (2000/01) suggests that although all information is processed with the brain, "only a physically changed or voluntarily-attended channel enters focus of attention" and completes the information processing cycle (p. 134). Given the case of this research, the interpreter follows the speech via dual channels while interpreting when one of the channels become irrelevant. However, this would not be a traditional 'physical change' such as a change in the voice, frequency or timbre. Therefore, it is intriguing for the researcher to observe whether the subjects 'voluntarily' divert their attention between stimuli or between the cognitive tasks of SI with text. In this regard, it is also important to know that "distractors are only distracting to the extent we are attracted to them" (Tijus, 1997, p. 46). Whether attention sharing is a conscious act or not may be a metacognitive matter and very difficult to observe; however, inhibiting distractors may presumably depend on the interpreter and hence, manageable and learnable. On the other hand, Fabbro and Gran (1997) argues that attention and multi-tasking can be developed with daily training of 6 to 12 months and the operation can be automated with development of cerebellum (p. 11). In any case, attention with memory, constitute two vital parameters for SI with text.

2.3.3. Models and Flow Charts

SI itself is a part of human-information process and hypothesized to be explained by models of human information processing. However, high variability

of parameters in SI, as specified in 2.3.2, poses great difficulties to develop a complete model of SI. However, they can also be used as dependent or independent variables. Considering also that monolingual language processing is already difficult, certain degree of abstraction and generalization is needed to draw models and diagrams illustrating verbal data processing. Although, initial models focus only partial processes of SI such as STM, there are fine-tuned and nearly complete models and flow charts as well. Accordingly, researchers take sub-tasks and parameters of SI as sources in order to develop cognitive models and flow chart algorithms to clarify mystifying psycholinguistic acts and attributes of the interpreter and SI process.

It could be stated that modelling the process as a trend in IS has started with Gerver (1976). He modelled the SI process based on the information-processing theory, in which, human cognitive skills are analogized to working mechanisms of computers. Indeed, information processing has been one of the main paradigms in explaining cognitive processes of SI, although it is being transformed into neural network models (Pöchhacker, 2004, p. 56). Gerver's model initially intended to find the effect of ear-voice span and memory to SI process. It could be claimed that this model is a trailblazer with regard to drawing attention to buffer zones (temporary stores) in memory to store incoming and outgoing information during the online process (De Bot, 2000, pp. 67-68). However, Gerver's model is far from being complete even for SI since it does not explain how transfer of information to the other code system occurs (Moser-Mercer, 1997/2002, p. 150). Naturally, he did not mention about text processing or visual encoding/decoding in his model. Moser (1978) has also developed a model based on Massaro's model (1977) of understanding speech. This flow diagram takes the process from the very beginning to the end by considering buffer zones, LTM, semantic and syntactic processing etc. However, again in Moser's abstraction, it can be inferred from the initial steps, *i.e.*, 'sound-wave pattern' and 'auditory receptor system' that there is only auditory input in this model.

Thirdly, Gile (1983) has developed an intuitive model called as the **Effort Model**, based on two principle ideas: (1) "interpreting requires some sort of mental energy that is only available in limited supply" and (2) interpreting takes up almost all of this mental energy, and sometimes requires more than available, during which the performance deteriorates (Gile, 1995, p. 161). According to these main principles of the effort model, cognitive resources of human are limited and thus, it must be shared among the abovementioned sub-tasks of SI. Although this model is not based on flow chart algorithms as previous models, it is probably the most suitable model that explains the cognitive processing in the case of visual input during SI with text. Accordingly, Gile (1997/2002) himself extended the scope of the Effort Model to include other working modalities of interpreting, namely CI and STR.

As per the Effort Model, effort can be regarded as the 'energy', which is required for any mental activity. However, some mental operations are non-automatic and therefore, requires attention and processing capacity, while some are automatic operations and do not require mental effort (Gile, 1995, p. 161). Sub-tasks of SI are non-automatic mental operations and require certain amount of energy. Accordingly, there are three tasks and hence, three concerned efforts within SI process; *i.e.*, (1) Listening and Analysis (L), (2) Short-Term Memory (M) and (3) Speech Production (P). Furthermore, another effort, namely (4) Coordination (C), is also needed in order to conduct the other three. As a result, required efforts for SI can be formulized as follows:

$$SI = L + M + P + C$$

Earls *et al.* (2009) added another element to this set of efforts, which is 'managing syntactic discrepancy effort' in cases where A language and B language of the event have remarkable syntactic discrepancies such as English and Turkish languages (p. 104).[9] As mentioned above, total mental energy has

[9] Syntactic discrepancy is also one of the cases of this research considering that the interpreting direction is from English into Turkish.

to be distributed among these certain efforts. If efforts in question are more than the total required effort, than errors and deteriorations occur in interpreting. In this respect, total requirement of interpreting can be formulized as follows:

TR = LR + MR + PR + C
LR capacity requirements for L
MR capacity requirements for M
PR capacity requirements for C

For STR, some efforts need to switch; *i.e.*, the Listening and Analysis Effort (L) becomes Reading Effort (R), but Production Effort (P) remains, as output is necessary by definition in all working modalities. As for the Memory Effort (M), Gile (1995) pointed out that “there does not seem to be a Memory Effort similar to the one in SI or CI, since the information is available at any time on the paper” (p. 183).

From this point forth, it could be said that SI with text poses peculiar advantages and disadvantages in terms of efforts (see 2.1.3.4). Hence, in SI with text, Listening and Analysis Effort (L) is involved in the process along with the Reading Effort (R) since auditory and visual inputs co-exist. However, Memory Effort (M) is only involved in case of deviations from text and when SI with text converges towards to pure SI. Furthermore, in cases, where the speaker constantly roams throughout the text from here to there, inserts additional information, and omits redundant information; the interpreter has to utilize her/his STM or more precisely, buffer zones to store uttered information pieces before s/he finds these information segments on the text. During a speech with many deviations, this becomes a constant cycle. Furthermore, these segments do not have to be necessarily on the text. In this respect, it is not safe to omit Memory Effort (M) totally from SI with text process, although it may not be always present throughout the performance. As a result, if we assume that the interpreter relies on both auditory and visual input; one hypothesized formulation of efforts in SI with text can be as follows:

SI with Text = L + R + (M) + P+ C

This intuitive formula shows that there are five different efforts taking part in the overall SI with text performance. Since the total mental capacity of the interpreter is limited, particular share per effort would be lower compared to other working modalities of interpreting. It would call forth errors of different kinds and as a result, a general performance loss in interpreting. Hence, from the Effort Model point of view, deterioration in performance can be expected in SI with text compared to other modalities.

To conclude, from cognitive point of view, SI with text is an extreme working modality and a very difficult exercise, as also put forward by other authors (e.g. Gile, 1995 and Pöchhacker, 2004). It should not be forgotten, though, that first, there are also numerous non-cognitive and unmanageable parameters determining the output or the SI performance and second, SI (with text) is partly depended on individual (cognitive) skills and strategies of the interpreter as other cognitive tasks. However, as Moser-Mercer (2000/01) claims, if we are to develop training models, we have to assume that every human being can cognitively become simultaneous interpreter, so SI does not require innate ability (p. 89). With this in mind, successful interpreters still have two common and important features: (1) They manage to maintain delicate balance between their cognitive strengths and weaknesses (2) They develop coping skills with the extreme conditions (*ibid*., p. 90).

2.4. TEXT PROCESSING: READING WITHIN INTERPRETING

This section is specifically dedicated to text and reading dimensions of SI. Given that the main challenge is to follow the text along with other SI tasks in SI with text, the initiating question of the research; *i.e.*, 'how do interpreters process texts, or more specifically, read for and during interpreting?' would be the main issue. Pym (2008) states that "one of the long-standing debate in IS

would pit ‘contextualists’ who see interpreters’ performances as being conditioned by contextual determinants and ‘cognitivists’ who analyse performances in terms of cognitive constraints that would be same for all professionals regardless of context” (p. 83). Text processing, in this regard, stands at a delicate balance between cognitive abilities of the interpreter and contextual features of text. Therefore, it is possible to state that text processing has both contextual and linguistics dimensions as well as cognitive ones. The following sub-sections are accordingly addressing the abovementioned dimensions of text processing within the context of SI with text.

2.4.1. Oral vs. Written Language

The specifics of oral and written language, which are at the two ends of natural language production, constitute the linguistic dimension of text processing. The gap between these two language production methods is important in terms of reading process and interpreting, specifically as far as SI with text is concerned. To begin with, written language has traditionally been regarded as ‘unnatural’ compared to oral language on the basis that written language has a cultural history, in contrast, speech has a biologic one and writing has developed over far too short a time span to allow epigenetic changes (Marshall, 1987, p. 20).

From the linguistic point of view, discrepancies between oral and written language are abundant. These discrepancies initiate even from the preparation phase. The author of the written text has the time to prepare the text through an elaboration process by making use of the opportunity to re-read, edit, correct or if necessary, delete linguistic items within the text. In contrast, the speaker, making an extemporaneous speech delivers the speech in real-time and without the ‘help’ of the text and hence, this process is prone to any kind of errors and deviations. In this respect, oral language may be assumed to bear resemblance to interpreting. As a result, at first sight, it is obvious that written language is more grammatical, wordy, strict, formal and organized compared to oral

language. Thus, one can easily assume that processing oral input during SI is relatively effortless yet; it is not the case anyhow. In terms of SI with text, oral language has its own peculiarities along with written language. Or rather, what is seemed as advantageous of oral language over written language for interpreting may turn out to be a challenge itself. On the other hand, written language may clearly pose interpreting 'traps' as well as informative cues.

Messina (1998) compared oral and written language within the interpreting context and determined four characteristics of written language: (1) lexical density, (2) lack of redundancy, (3) hypotaxis (4) departures from the written text (5) pauses and (6) speech rate (pp. 149-152). Hypotaxis; *i.e.*, unequal sentence constructions, corresponds to subordination clauses and branches in language, which is detailed below. Similarly, Table 1 compares the most salient features of oral and written language within interpreting context.

Table 1

Discrepancies between Oral and Written Language

Oral Language	**Written Language**
Prone to improvisation	Planned
Less grammatical	Grammatical
Unstructured	Structured
Less formal	Formal
Pronunciation	Lack of pronunciation
Volatile	Non-volatile
Redundancy	Non-redundancy
Short and simple sentences	Long and complex sentences with branches

Oral language is delivered in a rather improvised manner even if the speaker has notes with her/him including the key points to mention or even s/he rehearses the speech before the delivery. Although there may also be frequent

deviations such as mixing parts, omitting or adding, even if the speaker follows a text as mentioned in 2.1.3.4, lack of text obviously allocates more space for deviations in the flow of speech. Therefore, oral language is prone to improvisations and other features regarding oral language mostly stem from this peculiarity. Accordingly, speakers tend to use shorter, less grammatical and less formal sentences compared to written language. Moreover, clear grammatical mistakes, tongue slips, errors in pronunciation may occur during the delivery of a speech. Furthermore, speakers may benefit from gap filling expressions to save time and think about the next utterance to make. Since texts are written and edited in time, it can be assumed that written language is more or less free of such redundant expressions, which do not distract the meaning even if they are omitted. All these aspects make written language considered to be structured in contrast with the oral language.

Written language includes branched and as a result, relatively longer sentences following one another. Indeed, it is a common practice for most writers to insert extra information into the text with right, left or mid-branching. Tufte (1971) designates branching sentences under the title of free modifiers. In speech, segments are indicated by pitch, stress and juncture. On the other hand, in writing, the segments are indicated by the arrangement of words in familiar clause and phrase patterns and punctuations. One way to use these patterns and punctuations is free modifiers. Free modifiers are attached at the beginning of the base clause, inserted in the middle or added at its end and named as left, mid or right branches respectively (pp. 141-142). It is possible to provide examples for left, right and mid-branching sentences as follows:

I sneaked into the suspect's room, expecting to find a clue.
Base clause Right branch

Expecting to find a clue, I sneaked into the suspect's room.
Left branch Base clause

I,	expecting to find a clue,	sneaked into the suspect's room.
Base clause	Mid-branch	Base clause

Within the scope of branching and syntax, it is important to note that English language is more of a left branching language; however, Turkish language is more of a right branching one, when regular sentence structures are considered, as the main verb is usually located at the end of the sentence in Turkish language. Under the title of inverse sentence structure, reversion in branching also creates difficulty for the interpreter using English and Turkish as language pairs. Texts used in this study are structured based on these three branching types to observe SI performance at varying conditions. Sunnari (1995) specified these conditions as the 'interpreter's nightmare', considering also proper names, titles and numbers in the text (p. 111).

Pronunciation is also considerably worth underlining within SI context. Prosody of the speech, including rhythm, stress and intonation can all be regarded under the overarching title of 'pronunciation'. Since globalized world made English *lingua franca*, international and non-native speakers tend to deliver their speech in English medium. This tendency urges simultaneous interpreters to work with irregular and nonstandard pronunciations of English language. It goes without saying that, non-native speakers may make clear pronunciation mistakes. However, problems about rhythm, stress and intonation may be observed even in native utterances. Any kind of pronunciation mistake will result in errors in meaning assembly whether at lexical or syntactical level. As a result, in pure SI, interpreter has to adapt the pronunciation style of the speaker in order to grasp the meaning of the speech. However, in such cases, a channel switching from auditory input to visual one may not help in SI with text, since in addition to speech, the text may be 'noisy' and ungrammatical, too.

It could easily be asserted that well pronounced text would certainly provide linguistic and extra linguistic cues for interpreter. Moreover, the speaker can visualize and articulate implicatures such as puns using her/his voice, gestures

and mimics. A text does not innately include cues about intonation and intertextual implicatures except for the punctuation marks. Indeed, punctuation marks such as exclamation mark in parenthesis ((!)) and quotation marks (“”) may provide valuable contextual information in certain cases. Since interpreters are expected to interpret the message rather than words, these contextual signifiers are of utmost importance. Moreover, written text may include figures, dates, names and acronyms, which make the issue of volatility even more important especially for interpreting. During oral delivery, all these important segments would be heard but stored in limited working memory of the interpreter for a short period. Interpreters use note-taking techniques for this reason: to transcode oral language into written one when such difficult items for memorizing and interpreting are concerned.

However, it is a misconception to regard all written texts as flawless. Irrespective of the time to prepare written texts, they may include a number of linguistic mistakes due to a number of reasons. Furthermore, there are inner differences between texts in terms of readability. In this regard, readability of a text can be thought to have an effect on its **interpretability**. Technical complexity of any specific text with specialized language or LSP (language for specific purposes) and technical terminology is also considerably important in terms of SI since they mostly require relatively heavier reading effort whether before or during interpreting performance. In this respect, indicators such as vocabulary, sentence length, number of prepositional phrases, number of pronouns, number of affixes and number of syllables per hundred words can be taken as parameters to evaluate readability of a text (Ruddell, 1965, p. 270). Similarly, Alexieva (1999) developed parameters and formulas not only to calculate readability but also comprehensibility and listenability of source language texts in SI. Furthermore, Garzone (2000) applied textual-analysis on texts in SI context and regarded conference papers mostly as ‘scientific texts’, and as ‘spoken prose’, if written for oral delivery. Pöchhacker (2005) defined texts in a larger context, in other words, at conferences and named the overall context as ‘hyper-text’. It can be concluded that the textual dimension of SI with

text is related to various linguistic and non-linguistic factors stemming from the discrepancies between oral and written language.

In this regard, the abovementioned features of oral and written language have both pros and cons in terms of interpreting performance. For instance, without a doubt, shorter, simpler and less formal sentences in oral language are much more appropriate for the flow of interpreting. Branched sentence structures in written language on the other hand, may make it difficult to track the beginning and end of the sentences. This issue is especially challenging in cases of interpreting between syntactically inverse language structures such as English and Turkish languages. Furthermore, improvisation in oral delivery is also risky since it becomes difficult for the interpreter to utilize anticipation technique to make an educated guess in order to prepare to interpret the next segment to come. For obvious reasons, well-structured written texts are relatively more suitable for anticipation. However, as Doğan (1996) stated 'over-structured' texts are also difficult to follow especially in cases of video or audio-recorded speech delivery since these utterances are far from natural speech delivery, which facilitate meaning assembly with better use of intonation and thus, meaningful utterance structure (p. 27). Still, availability of text, if used properly, would ease the memory effort of the interpreter in SI with text. One of the most risky features of written text in the context of interpreting is the abovementioned information density due to LSP and technical terminology, which forces the interpreter to utilize better reading strategies including focusing on key words and if possible, taking notes on the text.

To sum up, what is expected from the interpreter during SI with text is to exploit the opportunities of both language types and harmonizes them in a way to enable better interpreting performances. In order to achieve this aim, the interpreter can develop a trade-off mechanism, in which s/he switches the channel from auditory to visual and *vice versa* immediately, whenever one of the channels becomes difficult to process or provides relatively less information. In this regard, it is also important to note that the main test of this study and

texts are designed taking these specifics of oral and written language into consideration.

2.4.2. Texts in Simultaneous Interpreting

Texts occupy a large amount of place in SI settings although they function in the background. In this regard, Sandrelli (2003) states that “text is a useful sort of information, especially regarding names, dates, figures and other types of non-contextualised information” (p. 273). That being said, probably due to overrated value of texts during SI, non-professionals usually justify the intriguing nature of SI and explain the feasibility of it albeit cognitive difficulties by stating that simultaneous interpreters are already delivered the text of the speech. However, text processing in SI is a difficult and individual task, in which the booth partner cannot participate and cooperate unlike other tasks such as note-taking. A booth partner may take notes for the interpreter during SI; however, text is to be processed by the active interpreter her/himself. Moreover, interpreters have the text just before the speech most of the times and naturally do not have the time required for studying on it in depth. More importantly, although text aid may relieve the memory effort, it presents another effort if text processing is not managed properly as mentioned in preceding sections. Hence, there are numerous challenges regarding texts and text processing in SI. Doğan (1996) grouped the problems about texts as time-related, speaker-related, text-related and interpreter-related. For instance, having limited time for the preparation and therefore, limited time for finding equivalents for terms or determining ambiguous parts of the text is a time-related problem. Furthermore, the speaker may skip some parts of the text or the interpreter may not use speed-reading techniques effectively or has stress, which has a considerable effect on perception. These problems are related to speaker and interpreter respectively (p. 27).

Another important point is that visual assistance used by the speaker during the delivery of the speech makes the interpreting process convenient for the interpreter as long as the speaker uses the screen effectively (Doğan, 2009, p. 107). That is to say, texts and other visual material including slides of the presentation may not be prepared and/or presented cohesively and coherently. For instance, each slide in a presentation file may be overloaded with pieces of information and written material, which makes them considerably difficult to follow for both the listener and the interpreter. However, a speaker, preparing concise visual materials and with kinaesthetic and cognitive skills to manage and present them in a well manner is not sufficient alone for a better interpreting performance. Along with it, the interpreter is to use the screen and other devices in the booth effectively and benefit from these documents in the best way possible, as well. Hence, reading and separating the text from auditory input becomes substantially important. For instance, empirical and observational data show that in cases where interpreter is delivered the full text of the speech, s/he sticks to the text excessively and as a result, may lose the track of the speech. What is beneficial here is to learn how to use the text rather than completely rely upon it. Reading the text beforehand, comprehending the underlined message and looking through the terms would relieve the interpreter from being imprisoned by the text (*ibid*., p. 107).

Another important point about texts in SI is their themes. It is evident that texts (or speeches) from the domains that interpreters are familiar with may alleviate the cognitive load since the interpreter would create connections between the new information chunks in the working memory with the established information bits within the LTM. Although in countries, in which there exists a gap between supply and demand for interpreters and specialization is not widespread, it is common to interpret text and speeches from a wide array of domains and themes. Still, it could be stated that throughout their carriers, professional interpreters usually encounter with procedural texts, rather than narrative ones (Liu, 2008, p. 162). Procedural texts are informative texts describing a set of events or items in an organized manner. Thus, within pedagogical context, it is

advisable to focus on such text types but on the other hand, to use texts with as many different themes as possible to make students familiarize with different SI with text conditions. Along with topic; terminology, argument development and contextualized vs. non-contextualized information are being other significant parameters regarding texts in SI (Dodds and Katan, 1997, p. 100).

Despite the challenges, texts are indispensable parts of conference settings. Accordingly, visual assistance in general and the availability of texts in SI in particular has professional basis. As per Article 10 of General Working Conditions and Responsibilities of Conference Interpreter set by TKTD, organizers are liable to deliver all kinds of documents such as speech texts, schedule etc. in due time reasonable enough to allow interpreters make required technical and terminological preparations. As per Article 12 of the same document, the booth shall be installed at a location and distance to allow interpreters easily see the speaker and the visual material presented on the screen. Under adverse working conditions with regard to equipment and location of booths, interpreters shall not be forced to work as long as required arrangements are made ("Türkiye Konferans Tercümanları Derneği Genel Çalışma Koşulları ve Sorumlulukları", n.d.).

In another document titled as Texts of the Speech in the same source, it is stated that a conference interpreter doubtlessly benefits from the text during SI if s/he has one in the booth, however; under every condition interprets what s/he hears. If the speaker deviates from the text, s/he follows the speaker (the speech). Delivery of texts to the interpreter is not only important for preparatory work, but also for following the speech during the performance, especially considering difficult lexical items such as numbers in prices, dates, measures, ratios etc. Considering that these items are difficult even to repeat in the same language, let alone interpreting; it is vital for the interpreter to follow a text during interpreting. Similarly, in some cases, presentation slides are skipped at a certain pace, which may be ideal for the listeners to follow. However, since there is a distance of one or two sentences between the speaker and the

interpreter, presentation slides are better to be delivered to the interpreters. Otherwise, loss of information may occur during interpreting. Again, in cases where the text is read aloud by the speaker, it becomes nearly impossible to interpret the 'speech' without losses considering the linguistic features of a text (see 2.4.1). Therefore, availability of text in the booth during SI enables the interpreter to operate smoothly with relatively less losses and errors ("Konuşma Metinleri", n.d.).

In the final analysis, the problem regarding texts in SI stems from the differences in the flow of information from speaker to the audience and from interpreter to the audience. Although both have one main aim, that is, transfer of information from the source to the target, they handle this communication problem from different perspectives. The speaker's challenge is to shuttle information from her/his mind to the minds of the audience. In contrast, the interpreter processes second-hand information. Thus, the target remains the same yet, the functioning line varies between the speaker and the interpreter. The only exception of it may be question and answer sessions, in which the interpreter addresses both the speaker and the audience in turn. As a result processing texts in SI necessitates not only the orchestration of cognitive skills but also related parties; namely, organizers, speakers, technical staff, interpreters and the audience.

2.4.3. Reading for/during Simultaneous Interpreting

Challenges of oral and written language and the availability and importance of texts within SI context are noteworthy to a certain extent. Yet, without the core actor's; *i.e.*, the interpreter's cognitive abilities regarding text processing, availability of the text becomes futile. Thus, it is important to discuss and understand how interpreters read before and/or during SI process. In this context, Daneman (1987) states that "reading is a problem solving and the reader has to solve to problem of what successively encountered words,

phrases and sentences in a written text mean". According to this definition of Daneman's and from a cognitive point of view, reading has two important features: First, it is a "sequential and integrative" process and second, it is a "problem-solving" task (p. 57). As in the case for SI, there are various tasks involved in an integrated reading operation. Accordingly, there are also various parameters such as working memory, eye movements, and language constraints in a very broad range from lexical level to textual one, reading strategies, orthography, including type fonts and handwriting, reading disorders such dyslexia etc., which determine the process and the output or the product. Despite the fact that reading is taken for granted for many, it is cognitively as remarkable and surprising as SI process. Due to various metacognitive and sub-cognitive operations, it is methodologically difficult to comprehend and analyse reading as a whole. Furthermore, what is meant by 'reading' may refer to different tasks such as reading a map, a novel, a textbook or proofreading to find and correct errors in a text. Hence, the concept is too broad to limit in a single word. Naturally, cognitive tasks and eye movements are expected to alter depending on the visual material, type of reading and aims of the reader. Apart from the types, reading is a non-automatic mental operation regardless of the familiarity of the stimuli to the subject and the subjects' world knowledge. Thus, it clearly consumes the interpreter's total mental energy. As a result, the question how reading process takes place cognitively is important for the inner mechanics of SI with text.

As in SI, researchers have developed cognitive models for reading as well. Cognitive reading models can be classified mainly under **bottom up** and **top down** models. In bottom up perspective, information flows very fast in a passive manner and memory has little impact on the process. In contrast, top down models bias that reading is a relatively slow process since there are numerous bottlenecks in the flow, at which the reader has to slow down and decide what to read next. Thus, bottom up model suggests that we rely heavily on memory to speed up the reading process. For now, evidence supports bottom up reading models (Rayner and Pollatsek, 1989, pp. 25-26).

From a more practical point of view, “the mostly used kind of model for reading alphabetical and syllabic writing systems is a dual-route model, which posits two main strategies for reading: (1) Whole word reading (2) Grapheme-phoneme reading”. While the visual presences of the whole words is read in the first one, the latter means eye movements moving from letters to phonological representations (Ahlsén, 2006, p. 112). Another cognitively important point with regard to reading is that as in SI, reading itself requires a certain share of working memory. Reading theory assumes that reading even the simplest of sentences seem to require the temporary storage of information while new information is being processed (Daneman, 1987, p. 60). As mentioned in 2.3.2, the central executive (in processing and storing bits of information), articulatory loop (in subvocalization) and visuo-spatial sketchpad (in storing and processing visual information) components of working memory are activated during the reading task.

Within the scope of this study, we limit our range of reading and determine two different reading operations: (1) reading for SI and (2) reading during SI. Reading for SI refers to any preparatory reading operation before SI task. Since time is limited in reading for SI, as detailed above, it is hypothesized that interpreters tend to read texts in a faster manner, focus on problematic segments for interpreting such as proper names, dates, numbers etc., and skip others. Still, reading patterns in reading for SI resemble patterns of reading a textbook, in other words, although interpreters endeavour to read as much as possible in a limited time, reading operation is controlled by the interpreter herself/himself. On the other hand, reading during SI can be defined as the reading behaviour performed in SI with text, which is detailed in 2.1.3.4. In this case, reading patterns are thought to be faster and much more erratic and without strict control of the interpreter compared to reading for SI. Reading during SI is a matter of synchronization. For specific reasons, it may even not be possible to define reading during SI as ‘reading’ since interpreters tend to use the text to follow the auditory input, lose track of it easily in cases of deviations and hence, skip numerous words.

Nonetheless, it is possible to generalize reading for/during SI with certain characteristics. Reading for/during SI is a (1) skilled reading, in which the reader skilfully, strategically and consciously uses her/his visually perceptive organs and relevant 'databases' such as mental lexicon to extract information and construct a context and meaning,[10] (2) a silent reading, in which the subject uses her/his inner voice to articulate words and comprehend the text, in other words, **subvocalization** mechanism, rather than reading aloud (3) a second language reading and (4) a reading for information retrieval for specific purpose rather than reading for pleasure or slow reading to increase comprehension. In SI with text, reading is not the final output but a means to realize the main aim, which is, interpreting. In this regard, reading task in SI with text can be associated with note-taking in CI in that both tasks are not regarded as output *per se*, yet *sine qua non* and assisting constituents of both processes. Furthermore, both reading and note-taking tasks put additional cognitive load while alleviating the mental effort required for the total operation at the same time. As a result, interpreters are advised to develop some coping skills and/or reading strategies to manage text processing as in note-taking.

It is also noteworthy that the acquisition of both reading abilities and SI procedures share many features: (1) Children must develop shared attention between the visual input and their linguistic mental system. (2) They must acquire automatic strategies to be able to check their own verbal production while at the same time visually scan the forthcoming words that still have to be pronounced. (3) They also must try to understand the meaning of what they are reading to produce, among other things, the correct intonation. It is therefore reasonable to hypothesize that only students with very good performance in reading aloud may be able to acquire SI procedures successfully (Daró, 1995, p. 7).

[10] It should be taken into consideration that strategic and conscious reading is not always the case in reading during SI, though.

2.4.3.1. Reading Strategies

Individuals process different visual materials and depending on the aim of the reading task, they develop reading strategies consciously or not. In this regard, Smith (2004) lists three important implications for reading, and learning to read:

(1) Reading must be fast.
(2) Reading must be selective.
(3) Reading depends on what the reader already knows (p. 72).

The approach of Smith's towards reading and especially reading for information retrieval fits perfectly with the optimum reading behaviour for/during SI, considering the time and other cognitive constraints. Therefore, particular strategies of reading become vital at this very point.

Speed-reading, an example of nonstandard reading type, is one of these strategies. It may not be a proper strategy considering serious literature or textbook readings; however, in SI with text, it may appear as a prerequisite in order to use the time efficiently and extract as much information as possible from the text. By definition, it is accepted that speed-reading includes **skimming**, in which the reader totally or partly skims over the text without deeply comprehending it and skimming and thus, speed-reading, probably involves strategies and processes that are different from normal silent reading (Rayner and Pollatsek, 1989, pp. 23, 439). Although it is possible to generalize reading behaviours of individuals, it is worth noting that individual differences in reading strategies and cognitive structures may be significant in reading and particularly speed-reading as it is in SI. To begin with, speed-reading is a highly controversial topic considering the commercial dimension of it; *i.e.*, courses and software claiming to increase the speed of the reader and scientifically speaking, its existence is highly questioned. Apart from the controversies, speed-reading implicates different kinds of techniques within reading process in order to increase the speed: (1) **Meta guiding**, in which the reader follows the

reading material with an external tool such as a pen or finger; (2) eliminating inner speech (subvocalization); and (3) eye movement exercises aiming to grasp more words in one fixation. Indeed, the common claim of all speed-reading techniques is to take as many bits of information as possible per eye fixation and therefore, increase speed up to 2.000 wpm and even faster and without any losses in comprehension (*ibid.*, pp. 440-441). Some speed-reading techniques aim to reach this goal by eliminating stress and doubts and even with breathing exercises (see Bennette, 2001). There is not much research in literature on speed-reading, yet empirical evidence suggests that speed-reading is not as successful as it is thought to be, in terms of comprehension and recall (see McLaughlin, 1969). Nevertheless, without using extreme methods as eliminating inner speech, interpreters can be trained to read faster. Doğan (1996) also states that reading only key words can be regarded as a speed-reading technique along with extending the perception loci of eye and memory within the scope of interpreting (p. 28). As for SI with text and this research, speed-reading as a technique can be regarded in two phases: (1) before the SI process for preparation and (2) during the SI process with the auditory input. Under the first condition, if possible, faster saccades and fixations that are more effective may increase the reading speed and given the time constraint and stress, it is beneficial for the interpreter to read faster. However, the most critical point with reading for and during SI is the obligation to comprehend the text and therefore, the speech. If subjects cannot recall what they have read during SI, visual material is expected to have no impact on the overall interpreting output.

Parsing and Chunking[11] as termed by Doğan (1996) can also be viewed as a beneficial technique in processing texts for and during SI. In fact, this technique is widely utilized and encouraged during STR. Parsing and chunking is simply the process of dividing the text into small meaningful units by paying regard only to linguistic and syntactic elements of the language. Although it sounds like a mechanical and easy operation, it takes practice to hone this skill due to linguistic and time constraints. Interpreters use notes, numbers or signs to mark

[11] The similar technique has been named differently by other authors. For instance, Jones (2002) called this segmentation technique as ‘Salami technique’.

the abovementioned elements within the text and thereby, prepare the text for interpreting. This step constitutes the parsing part of the technique. Then, interpreter assembles similar units, in other words, groups them in chunks, which is named as ‘chunking’. Parsing and chunking can be regarded as a considerably effective method especially when long, complex and branched sentences are concerned as in the texts in this research are concerned. However, following the text with a paper or via electronic means may differ in terms of parsing and chunking, since it may be difficult to manage text (taking notes, circling words etc.) via electronic means. Whether in the case of reading for or during SI, parsing and chunking is usually conducted in a very limited time. In this regard, it is possible to regard parsing and chunking technique as a component of speed-reading (Doğan, 1996, p. 29).

2.4.3.2. Eye Movements in Reading

For over a century eye movements have been considered as a sensitive indicator of the reading process and it has been quite popular among researchers. It has two solid reasons: (1) it is assumed as a main principle in eye tracking research that “the direction of our eyes can tell us something about the processing that is being conducted by our mind” and (2) the technique of eye monitoring is more ecologically valid compared to other traditional methods, since the subjects can read in a more ‘realistic’ manner even under laboratory conditions with eye tracker. Within the scope of this study, the former reason is especially significant. It is hypothesized that eye movements give an indication of what processes are going on in the reader’s mind. This linkage between eye movements and cognitive processes in mind is expressed as **eye-mind assumption** (Underwood and Batt, 1996, p. 147). Eye-mind assumption is the underlying concept in analysis of cognitive load based on gaze data such as average fixation duration. Analysing cognitive operation using eye movements can be misleading if certain concepts are disregarded. For instance, authors like Kennedy (1987) mention about an **eye-mind span**, a cognitive lag between

mind and eye, which is to be taken into consideration in eye tracking studies (p. 171).

We make eye movements every 250 ms on average to bring a given region of text into foveal vision, in other words, visually perceive any item when the vision is sharpest (Rayner and Pollatsek, 1989, p. 441). Along with that, it is not possible to mention about stable or a standard eye movements. When readers process a page of text, their eyes do not move in a continuous sweep across the page, but rather with jerky movements (*ibid.*, p. 144). Based on this background, we can categorize the main and the most important eye movements during reading under three titles:

(1) Fixation: It is the moment when the eyes are relatively stationary, taking in or 'encoding' information. Fixations last for 218 ms on average. Studies show that fixations are positioned in a very systematic, word-based fashion (Radach and Kennedy, 2004, p. 3).

(2) Saccade: Saccades are eye movements occurring between fixations, typically lasting 20 to 35 ms. The purpose of most saccades is to move the eyes to the next viewing position.

(3) Regression: Regression is a type of saccade that moves back in the direction of text that has already been read (Poole and Ball, 2006, p. 221). Regressions are seen on sentences that are characteristically misinterpreted on the first reading due to either lexical ambiguity or syntactic structure (Underwood and Batt, 1996, p. 146).

Based on these three main eye movements, researchers can infer what readers focus on during reading, what they do (not) comprehend and how much cognitive effort they exert or how much cognitive load they had. As for cognitive load, especially fixation is a valuable indicator. Quantitative measures such as total fixation duration, number of total fixations or average fixation duration

during a specific reading task may give an idea about cognitive operations in the mind of the subject, based on the abovementioned eye-mind assumption.

According to Kennedy (1987) fixations are regarded as ‘first-pass eye movements’ and regressions are as ‘second pass eye movements’. The most potent source of control over the location of fixations is the physical length of the words in a text. In addition to the length of word, word frequency, syntactic function and meaning of individual words, all influence eye movements and fixations, in particular (p. 171). All of these can be considered as determinants regarding fixation. Other factors regarding eye movements in reading can be enlisted as:

- word familiarity,
- age-of-acquisition,
- number of meanings (ambiguity),
- morphological effects,
- contextual constraints,
- plausibility effects.

As for eye movements, it is possible to mention about a ‘standard’ reading pattern. In this regard Holmqvist and Wartenberg (2005) states that “reading is a well-defined movement of the eye from left to right, with approximately one stop at each word and small jumps called saccades between them and it is assumed that readers *process* the text when they do this” (p. 3). However, mislocated fixations launching different sites than intended (called as underscore or undershoot if before the intended zone, overscore or overshoot if after the intended zone) are to be bear in mind in the analysis of reading patterns (see Engbert, Nuthmann and Kliegl, 2007).

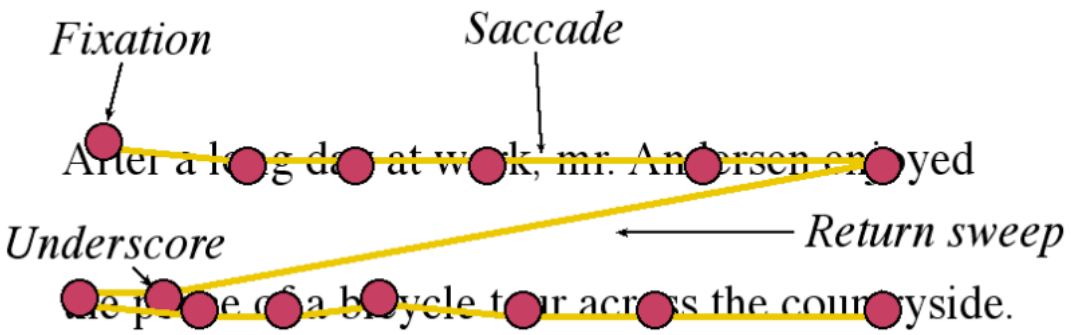


Figure 10: Standard reading behaviour across the text (*ibid.,* p. 4).

In this regard, two most robust findings in studies of eye movements and reading that (1) fixation time on a word is shorter if the reader has a valid preview of the word before fixation (2) fixation time is shorter when the word is easy to identify and understand (Clifton, Staub and Rayner, 2007, pp. 345-348). Another important issue about fixations is mislocated fixations. For some reasons, it is difficult to assert whether the eyes landed on the intended word or refixations occur whether due to oculomotor or linguistic reasons. Thus, some fixations may mislead researchers due to **pseudo-reading** caused by oculomotor fixations. Similarly, Kennedy (1987) states that the influence on current fixation may not be caused by the word fixated but also by prior words and following words to come. It is called as **cognitive overlap** and virtually impossible to discount (p. 171).

As in memory, SI or reading, there are conceptual models for eye movements as well in order to discriminate regular reading patterns from others. In this regard, **E-Z reading model** (see Reichle, Rayner and Pollatsek, 2003) is one of the most elaborated and detailed one. This model assumes that word recognition in reading is a serial process under the control of an attentional beam and only the word(s) in the beam are processed. First, word identification become likely, which is called familiarity check and when it is completed for the currently fixated word (n), eye guidance system programmes a saccade to the next word (n+1). Skipping a word takes place if familiarity check is completed for the next word (n+1); however, programming of the initial eye movement is not reached its final ballistic stage. In this case, the eye movement program for

n+1 can be cancelled and replaced by a new program (n+2). Readers experience it as skipping a word without fixating on it (Drieghe, Brysbaert, Holloway and De Baecke, 2004, p. 86). Within the context of SI, this model is also illuminating especially for skipping words in reading for/during SI. **Scanning**, instead of reading is also distinctive characteristic of reading during SI, in particular. In scanning, different eye movements are observed: Saccades are much longer and can go in practically any direction and only a few words can be processed at each stop (Holmqvist and Wartenberg, 2005, p. 4).

Overall, it could be stated that eye movements are probably the most important indicator for reading studies. In addition to the models and specific types of eye movements, three basic features of the visual system can be considered as regards reading:

(1) We do not see everything that is in front of our eyes.
(2) We do not see anything that is in front of our eyes immediately.
(3) We do not receive information from our eyes continuously (Smith, 2004, p. 72).

Within the scope of text processing, there are numerous issues such as knowledge acquisition from text and discourse production etc. (see Denhiere and Rossi, 1991); however, in order not to wander off from the main subject, they are not dealt in this study.

CHAPTER 3

METHODOLOGY

"The nature science speaks about its results;
the social science speaks about its method."
Henri Poincaré, Mathematician

The methodology used in this study in order to assess and analyse reading patterns, cognitive loads, SI performances and retention levels of the subjects during two different SI scenarios will be further expanded in this chapter by presenting information about the subjects, test design, data collection instruments, test procedure, software and techniques used to analyse the related data.

3.1. SUBJECTS

There are two groups of subjects involved in the main test named as Group 1 and Group 2. However, there are three main stages of the research (see Figure 11) and the three stages have specific groups of subjects, as specified below.

(1) The subjects of the **reliability and validity tests** are **20 students** from **second grade** and **20 students** from **fourth grade** of 2009-2010 academic year. The sample was selected from the general population of students rather than from Interpreting Group specifically, since the Aptitude Test for Interpreting was not applied then. The aim of the structure validity and reliability tests are to assess the measurability of

data collecting instrument and therefore, subject groups were determined based on taking courses on simultaneous interpreting and as a result, two different subject groups were created (see Büyüköztürk, 2003 for further details on structure and content validity and reliability tests for social sciences).

(2) The subjects of the **pilot test** are **four third grade students** (two females and two males) enrolled in the Interpreting Group of the English Division at the Department of Translation and Interpreting at Hacettepe University in 2010-2011 academic year. The subjects were divided into two groups equal in number, namely, Group 1 (G1-P) and Group 2 (G2-P) to simulate the main test groups. All subjects in both groups succeeded in the Aptitude Test for Interpreting administrated at the end of the first semester in 2010-2011 academic year and hence, selected to Interpreting Group.

(3) The subjects of the **main test** are **12 fourth grade students** (eight females and four males) enrolled in the Interpreting Group of the English Division at the Department of Translation and Interpreting at Hacettepe University in 2010-2011 academic year. The subjects were divided into two groups equal in number, namely, **Group 1 (G1)** and **Group 2 (G2)** for the aims of the test design. All subjects in both groups succeeded in the Aptitude Test for Interpreting administrated at the end of the first semester of 2009-2010 academic year and hence, selected to Interpreting Group. Prior to the main test, all subjects have taken and successfully completed the courses, which are related to the content of the test and therefore, may affect the results; namely, Sight Translation and Simultaneous Interpreting I.[12] The subjects were chosen based on homogeneity and eligibility principles. The subjects are assumed to be in homogenous distribution, in order words, all of them are assumed to resemble to each other in terms of cognitive skills and academic

[12] Respective grades from the courses are specified in Table 2.

background (see Table 2). Considering the fact that sex may have a significant effect on the overall cognitive skills including reading and SI, four males were evenly distributed to G1 and G2 to maintain equality in terms of sex between groups. No further language examination was administrated on subjects beforehand in all tests.

There are two main reasons for limiting the number of the subjects with 12 for the main test:

(1) **Limitation as per the subjects:** 12 is the total number of senior students attending Interpreting Group of the English Division at the Department of Translation and Interpreting at Hacettepe University in 2010-2011 academic year. As a result, students in the test have undergone more or less the same stages including examinations, courses etc. and therefore, are assumed to have more or less similar academic backgrounds, cognitive and interpreting skills. In this regard, adding new subjects to the test by selecting from translation and interpreting departments of other universities would distort homogeneity, causing misleading results.

(2) **Limitation as per the instrument:** Eye tracking studies provide extremely high volume of output due to their design, length of the task and high number of parameters involved in eye tracking such as pupil dilation of each eye or horizontal or vertical screen position of each pupil at any given millisecond during the task etc. Accordingly, selecting and analysing all visual data is rather cumbersome with this method of research. Including the auditory data; *i.e.*, voice records of the subjects, it can be stated that fewer subjects enable the researcher to collect and analyse visual data individually and in a more accurate manner and therefore, reach accurate results. Furthermore, eye tracking studies are conducted on the one subject at a time principle, in which the researcher cannot study on multiple subjects at the same time. This factor extends

the duration of tests considerably in proportion with the number of subjects. For these reasons, eye tracking studies are generally conducted with relatively small sample sizes compared with questionnaire based studies, for instance.

(3) Limitation as per the data analysis: In this study, inductive method is preferred for the data analysis technique as detailed in 3.5. In other words, as frequently observed and advised in IS, each subject's performance is analysed individually in a qualitative perspective in addition to general quantitative comparison. In this regard, limiting the number of subjects with 12 becomes advantageous to be able to penetrate into the process to gather data in a much more precise and detailed way; otherwise, it would not be practical to make a subject-based and qualitative analysis with large samples.

For these reasons, limiting the subjects with 12 is assumed to make the research more manageable and accurate. Another important issue about subjects is studying on novice interpreters rather than professionals or experts. The reason behind our preference can be summarized as to avoid **floor effect.** It is generally acknowledged that if the expertise is high in subjects, then researcher cannot see the differences between the two tasks. This illusion is called as floor effect (Moser-Mercer, 2000/01, p. 86). Furthermore, in-class SI performances of the subjects in all tests are known and traced by the researcher and the advisor, which has given the researcher a valuable opportunity to compare SI performance of the subjects on the test day with their general performance. However, further studies with different subject groups taken from different populations are suggested (see 6.3 for further suggestions).

Table 2

Subjects of the Main Test

	G1	**G2**
Number	6 Subjects (4 Females and 2 Males)	6 Subjects (4 Females and 2 Males)
Aptitude Test	+	+
Language Exam (YDS) Scores	95 97 100 92.5 94 97	97.5 91 98 90 96.25 98.75
Language Exam (YDS) Scores (Mean)	95.91666667	95.25
Courses Taken	Sight Translation Simultaneous Interpreting I	Sight Translation Simultaneous Interpreting I
Grades in the Courses	B2/A2 B1/A2 A2/A1 A2/A2 B1/A2 B2/A2	B2/A2 B2/A1 B1/A2 B2/A1 B2/A2 A2/A2

3.2. TEST DESIGN

3.2.1. General Design

The whole study is composed of five tests, namely, (1) content validity test (2) structure validity test (3) reliability test (2) pilot test and (3) main test. Structure validity and reliability tests were administrated on the first of April in 2010 to fourth grade students and 14th of April in 2010 to second grade students. Pilot test was administrated on 21st of March in 2011 and main test was administered on 22nd of March in 2011.

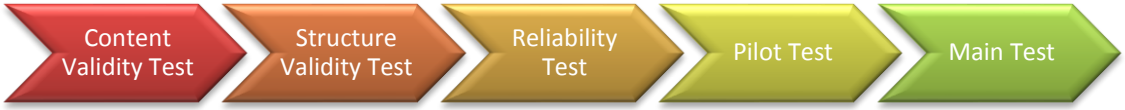


Figure 11: Testing stages of the study.

3.2.2. Validity and Reliability Tests

The text of the main test was subjected to content and structure validity and then reliability tests.

(1) Expert opinion was taken to test the content validity of text to be used as the data collecting material in terms of measurability. A questionnaire about the text was prepared for two field experts and their replies and views regarding the text were recorded by digital means and taken into consideration in preparation of the text.

(2) Following the content validity test, structure validity test was administrated on 20 second grade and 20 fourth grade students, in which subjects were asked to interpret the speech simultaneously with text in the interpreting laboratory of the Department of Translation and Interpreting at Hacettepe University. SI with text performances of both groups were graded and then compared using independent-samples T test on SPSS 16.0™. The expectation in the structure validity test was to find a significant difference between SI performances of fourth grade students and second grade students (see Büyüköztürk, 2003, p. 163).

(3) As for the reliability test, SI performance results of the second and fourth grade students were not compared between each other but assessed within their own classes and compared with other subjects in the same group. The evaluation was rather different compared to structure validity test, since this time each sentence was graded with 0 or 1, in other words, as the subject interpreted the related sentence or not. The expectation in the reliability test was to find similarity in SI performances between subjects in the same group (*ibid*., p. 165). All results regarding validity and reliability tests are specified in 3.4.

3.2.3. Pilot Test

The aim of the pilot test was to simulate laboratory conditions of the main test and to get prepared for the main test day. In this regard, four subjects (G1-P and G2-P) were taken to Human-Computer Interaction Research and Application Laboratory in the Computer Centre of Middle East Technical University (METU-HCIRAL) and conducted the same tasks with the subjects of the main test with eye tracker. Data collected from the pilot test was not used for evaluation yet only for testing and comparing the results with the main test to verify the collected data.

3.2.4. Main Test

The main test was carried out based on the observational test design to research two different SI paradigms, and accordingly, two different subject groups. In this regard, G1 and G2 of the main test performed SI under different conditions as specified below:

G1 received the full written text of the speech and studied it by reading for approximately 5 minutes via computer screen prior to SI task. The duration was determined by considering real-world conference conditions and the scenario, in which the interpreter meets the speaker and has the written text of the speech just before the speech delivery. From another viewpoint, reading the written text of the research from the beginning to the end at an average pace takes approximately 5 minutes. However, further studies may be conducted by manipulating reading durations (see 6.3 for details on recommendations for further research). While subjects in G1 were reading the text, reading patterns and cognitive loads of the subjects based on the gaze data such as average fixation duration were recorded by the eye tracker. Following the preparatory study; *i.e.*, reading task, text was taken back from the subjects and in the next stage of the test, subjects in G1 performed SI without the text (pure SI). During the interpreting task, eye tracker did not collect gaze data, since subjects did not have a visual material. When SI task was completed, subjects were immediately asked to fill out the questionnaire and then answer the questions in the retention test.

On the other hand, G2 received the full text of the speech at the onset of the SI task and performed SI with the availability of the text (SI with text). In other words, subjects in G2 performed SI while they were following the full written text of the speech from the screen of the eye tracker. Thus, the eye tracker recorded the gaze data of the subjects during their SI and reading tasks. When SI task was completed, subjects were immediately asked to fill out the questionnaire and then answer the questions in the retention test.

Neither G1 nor G2 had the opportunity to take notes or physically segment the meaning units on the text, as the stimulus was presented on the screen.

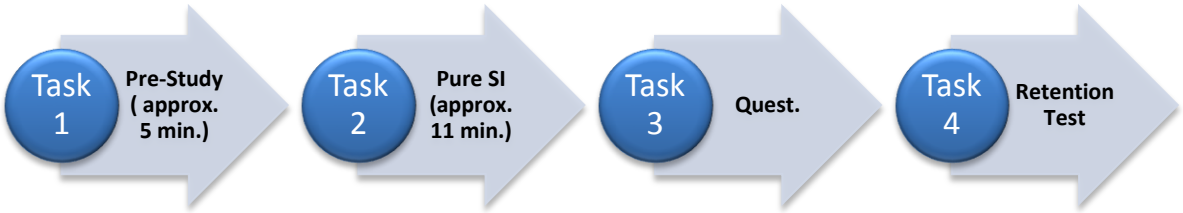
Table 3

Design of the Main Test

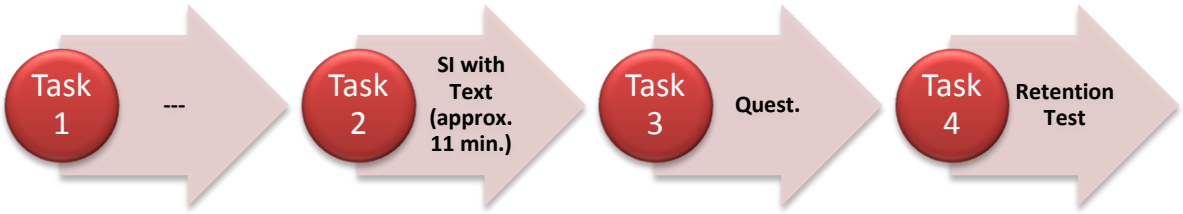
Group	**Pre-Test**	**Main Procedure**	**Post-Test**
G1	Preparatory Study on Text	Pure SI	Questionnaire and Retention Test
G2	-	SI with Text (Text + Pure SI)	Questionnaire and Retention Test

The testing procedure can be visualized for G1 and G2 from the subject's viewpoint as follows:

G1



G2



The testing procedure can be visualized for G1 and G2 from the researcher viewpoint as follows:

G1

G2

Accordingly, independent, dependent and extraneous variables of the main test were determined as shown in Table 4:

Table 4

Variables of the Main Test

Independent Variables (Assumed cause)	**Dependent Variables (Assumed affect)**	**Extraneous variables *(May affect the relationship)***
Preparatory reading before SI	Reading patterns	General cognitive abilities
On-line reading during SI	Cognitive load	SI and reading skills Language skills
	SI performance	World knowledge
	Retention test	Textual familiarity

3.3. DATA COLLECTION INSTRUMENTS

There are four main data collection instruments regarding each test of the study: (1) The text and the auditory record of the concerned text, (2) Tobii T120 Eye Tracker™ to record eye gaze data and eye tracking software, that is, Tobii Studio 2 Enterprise™ to evaluate the eye gaze data recorded by the tracker, (3) questionnaires to collect, analyse and compare self-reflections of the subjects on the test and tasks they have undergone, (4) retention tests.

3.3.1. Text and Auditory Record

The text used in tests is about climate change and global warming and its structure was manipulated to include right, mid and left branching sentences to maintain a balanced difficulty level that is likely to be caused by the syntactic structure. The text was prepared in **three versions** (see Appendix 1, 2 and 3). The first version is the one installed in the eye tracker computer and used for reading for both groups and hence, functioned as the visual input. The second version of the same text is with deviations and it is the one recorded into the digital voice recorder and read aloud by the researcher during the SI task and hence, functioned as the auditory input. The third version is the same one with

the second; *i.e.*, the auditory version, only with grades on it hence, functioned as the evaluation copy. The important point is that there are deviations between the first and the second version, in other words, between the written and auditory versions of the text. These deviations are adding 2 new sentences in paragraph 1 and 5, omission of 1 sentence in paragraph 4 and 1 change in the order of two sentences in paragraph 3 and lastly, 2 changes in the titles of proper names, *Dr.* with *Prof.* and *Prof.* with *Dr.* in paragraph 2.

The auditory version of the text, which the subjects listened to during SI task, was taken as the basis in the evaluation of SI performance, as primarily; an interpreter is to interpret what s/he hears. The auditory text contains 5 warming up sentences, which are not included in the performance and performance evaluation yet only to 'warm up' the subjects in order to familiarize them with the SI operation and the context; 5 right branching (RB) sentences; 5 mid-branching (MB) sentences; 5 left branching (LB) sentences; 6 short sentences (SS) between 7-16 words, which are included in the text in order to alleviate the subjects' mental load for a short period of time and more importantly to enable the text 'sound' more realistic, and lastly, 4 ending remarks (ER) which are again composed of short sentences between 2-17 words. Totally, the text contains 1393 words and 30 sentences, 15 of which were included in the SI performance evaluation (RB, MB and LB sentences), while 15 of which were left out (WU sentences, SS and ER). 15 sentences were graded as per Miller's (1956) definition of propositions or 'bits of information'. According to this criterion, each RB, MB, and LB sentence includes 10 bits of information and graded accordingly, thus, 1 bit of information makes 1 point. Thus, total point that a subject can get from the SI or SI with text task is 150. In contrast, the first version; *i.e.*, the written copy of the text contains 1346 words and 29 sentences due to the abovementioned deviations.

3.3.2. Eye Tracker

Tobii T120 Eye Tracker™ and Tobii Studio 2 Enterprise Recording Edition™ located at METU-HCIRAL were used as the main data-collecting instrument and software. Tobii T120^{TM} is a non-invasive infra-red based eye tracker and it collected various quantitative gaze data during the test as specified above, however, only fixation count, total fixation duration and average fixation duration data were selected for the analysis. For visualization of the gaze data, gaze plot and heat maps were used for the aims of the study.

3.3.3. Questionnaire

A questionnaire for the self-evaluation of the subjects on their own experience, performance and preferences regarding reading and SI tasks was administrated to all subjects following SI task when traces of STM are still accessible. The questionnaire had 20 Likert-scale questions and 2 open-ended questions for additional comments and information. The questionnaire was prepared in Turkish in order to eliminate language barrier and to reach subjects' opinion directly. Results of the questionnaire were used for comparing SI performance of the subjects with their comments and self-evaluations about the tasks in a qualitative perspective.

3.3.4. Retention Test

A retention test including 10 questions was administrated to all subjects in G1 and G2. Out of 10 questions, six are open-ended wh- questions and the rest are yes-no questions. Every question makes 10 points; therefore, a total of 100 points can be taken from the test. The aim of the retention test is to evaluate the memorization level of subjects regarding the text and the auditory record they read and listened. Thus, it was administered right after the SI task along with

questionnaire. Retention tests were used for comparing the retention of the subjects with their SI performance and eye movements.

3.4. PROCEDURE

(1) The text of the research was an authentic material and yet it was syntactically manipulated as mentioned in 3.3 for the aims of the study. Before administration, the text was subjected to **content validity test**, in which two field experts answered a set of questions about the measurability of the text, then their opinions and comments were recorded and analysed. Both experts regarded the text as valid; however, proposed some amendments. The text was amended based on their projections accordingly.

(2) Following the content validity, the text was subjected to a **structure validity test**, whose details are given in 3.2.2. Both groups' SI scores were compared by using independent-samples T test in SPSS 16.0^{TM}. The p value was 0.003. Since $p<0.05$; it was assumed that there is a significant difference between the two groups in the test and the text was regarded as valid.

(3) Following that the text was found valid, it was further subjected to **reliability test** based on intra-class correlations by using Cronbach's Alpha coefficient on SPSS 16.0^{TM}. α coefficient was found to be 0.86. Since $0.86>0.70$; reliability of the text was found acceptable (see Büyükşener, 2003, p. 165).

(4) Following the validity and reliability tests, the second; *i.e.*, auditory version of the text was read aloud and recorded into a digital voice recorder by a non-native speaker, the researcher himself, with reading pace to make the laboratory conditions resemble real world conference

settings and by using an external microphone to record at a better quality. Then, the voice file was transferred into the digital media player to be replayed and listened by the subjects during the pilot and the main test. The first version of the text was converted from a .docx file into a portable document file (.pdf) to be used by the eye tracker.

(5) An exploring visit was made to METU-HCIRAL in order to familiarize with the laboratory conditions and eye tracker. Test instructions for the subjects were prepared based on first-hand experience by the researcher.

(6) Four third grade students (n=2 for G1 and n=2 for G2) from Interpreting Group were selected for the pilot test. The main test was administrated on the subjects to see how to apply it and to eliminate drawbacks of the test design beforehand. Minor amendments were made in test instructions based on the experience gained from the pilot test.

(7) 12 fourth grade students (n=6 for G1 and n=6 for G2) from Interpreting Group were selected for the main test. Both groups performed the test instructions systematically. Before the test, eye movements of each subject were calibrated using eye tracker. As for the auditory input, the voice file was replayed and the subjects listened to the record with a stereo headset connected to the digital media player. Using a headset instead of ear-in headphones has two practical benefits: (1) to enable the subjects listen to the speech via high quality equipment (2) to create real world interpreting booth conditions. While listening to the voice file, subjects performed SI and recorded their voices to the digital voice recorder via external microphone.

(8) Following the test, both groups filled in the questionnaire, answered questions in the retention test, and then handled them to the researcher.

3.5. DATA ANALYSIS

Inductive method, in other words, bottom-up forecasting was used in the analysis of data. Thus, visual and auditory performances of the subjects, as well as the data collected from the questionnaires and retention tests were analysed individually to reach the holistic data. Data from individual analysis were then used to compare both groups and to draw conclusions about the performances of simultaneous interpreting students with regard to visual processing and SI with text performance under two different working conditions. In order to find answers to research questions, five main indicators received from the collected data were analysed and discussed: (1) reading patterns, (2) cognitive load, (3) SI performance, (4) questionnaire and (5) retention test. The technique used to analyse the data can be specified as a hybrid of both qualitative and quantitative methods. To be more specific, reading patterns and questionnaire were analysed and discussed using qualitative method. Cognitive load was analysed and discussed using quantitative method. SI performance and retention test were analysed and discussed using both qualitative and quantitative methods. Details regarding data analysis for each indicator were further detailed below:

(1) Reading patterns: Tobii Studio 2 Enterprise Non-Recording Edition™ was used for replaying and monitoring eye gaze data, in other words, **visual focal loci** of the subjects. During the analysis, eye tracking records of the subjects, which were already saved as videos by the software, were replayed to observe reading patterns. Eye tracking videos were paused at important intervals and screenshots were taken to demonstrate in the study. Thus, eye movements in reading for/during SI were visualized by using these screenshots, in the form of gaze plots and heat maps. In this respect, every dot refers to fixations; lines between dots refer to saccades and regressions in gaze plot visualizations. The larger the dot means the longer fixation, which means heavier cognitive load based on ‘eye-mind hypothesis’ (see Underwood and Batt, 1996, p.

145). Furthermore, there are numbers on each fixation dots, which refer to the order of fixations. In heat maps, the fixation scale is between the extremes of red and yellow. The sites where fixations get denser are visualised by red colour and *vice versa*.

(2) Cognitive load: The number of fixations, total fixation duration and average fixation duration in ms were used in the analysis of cognitive load. Task length in seconds was given for information and comparison between subjects and groups. All gaze data were presented for each subject and for each group in tables and in charts for the ease of comparison. Although average fixation duration is the most important value regarding cognitive load due to the differences in task length between G1 and G2, all measures regarding the gaze data were discussed.

Mann-Whitney U test, which is a non-parametric test ideal for small sized samples, which are not normally distributed, was preferred to compare G1 and G2 based on p value (see Büyüköztürk, 2003, pp. 149-152). SPSS 16.0™ was used for statistical analysis and creating tables regarding statistical analysis. For creating and presenting rest of the tables and charts, MS Excel 2010™ was used.

(3) SI performance: Analysis of the SI performance within this study can be regarded as the detailed study of the output of the interpreting process under varying conditions (Christoffels, 2004, p. 6). As specified above, detailed analysis of SI performance has two dimensions as being quantitative and qualitative.

As for quantitative analysis, graded quality assessment of interpreting was used. Assessment of interpreting quality has been discussed as an important topic for quite a long time among IS scholars and various criteria and rating scales were developed. For this study, the criterion of

Lee's (2008) based on accuracy, TL quality and delivery, were taken as a guide for the assessment of SI performance and the evaluation copy of the text was taken as basis. Accordingly, SI performances of the subjects were assessed by giving full or half marks for each predefined propositional units in the text. At the end of the assessment, the sum of full marks constitutes the total SI score of the subject. However, as per the Lee's criterion, total score was decreased, if necessary, considering accuracy, TL quality and delivery. SI performance scores were presented for each subject and for each group in tables and charts for the ease of comparison. Mean scores were subjected to statistical analysis as specified above.

As for qualitative analysis, SI performance of the subjects, especially those in G2 were analysed along with eye tracking videos. As a result, the relation between SI performance and reading behaviours during SI (with text) were put forward along with critical and noteworthy errors during SI performance of subjects. Qualitative analysis was conducted individually for each subject in both G1 and G2 as well.

(4) Questionnaire: Questionnaires were used to analyse the data to understand preferences and self-evaluations of the subjects to further comment on the reading behaviours and SI performance of them. A general analysis on the questionnaires covering all subjects was presented to draw general conclusions about their experiences, comments and self-evaluations regarding the tasks in the test.

(5) **Retention test:** Retention test of each subject was graded and results were specified in individual analysis. Furthermore, comparative results were presented in tables and charts at the end of the analysis. Mean scores were subjected to statistical analysis as specified above.

CHAPTER 4

FINDINGS AND DISCUSSIONS

"Essentially, all models are wrong, but some are useful."
George E. P. Box, Statistician

Visual and auditory data collected from the reading and SI tasks and data from the questionnaire and the retention test will be presented via tables and charts, and will be discussed using both qualitative and quantitative method in this chapter. Data regarding each subject will first be analysed and discussed individually and then generally on the group base as per the following indicators in a method that is explained in Chapter 3:

(1) Reading patterns
(2) Cognitive load
(3) SI performance
(4) Questionnaire
(5) Retention test

Data regarding the questionnaire will be analysed only on the group base in 4.2.4. Indicators (1), (2) and (3) correspond to main research questions (1), (2) and (3) respectively (see 1.4). Data regarding sub-questions will also be analysed and discussed within this chapter.

4.1. INDIVIDUAL FINDINGS AND DISCUSSIONS

GROUP 1

The subjects of Group 1 (G1) read the written text of the speech for approximately 5 minutes before the SI task. Reading patterns and the gaze data, which will be specified below, belong to the eye tracking record taken during this preparatory study. Subjects in G1 performed SI without the text following reading for SI task and subsequently, they answered questions in the questionnaire and the retention test. Reading patterns and SI performance will be presented and discussed for each subject below, in addition to the general analysis. Individual findings about cognitive load and retention test will be presented for each subject as well, yet they will be discussed in 4.2 in a comparative manner. Findings about questionnaire will only be presented and discussed in 4.2.

SUBJECT 1

Reading Patterns

Subject 1 started reading without a stable pattern, which is unlike the frequently observed case in standard reading tasks, where saccadic eye movements follow a stable pattern (see Holmqvist and Wartenberg, 2005). The subject seems to have moved on the content words, from which she would get an idea about the context, rather than dwelling on the initial address to the audience as seen in Figure 12.

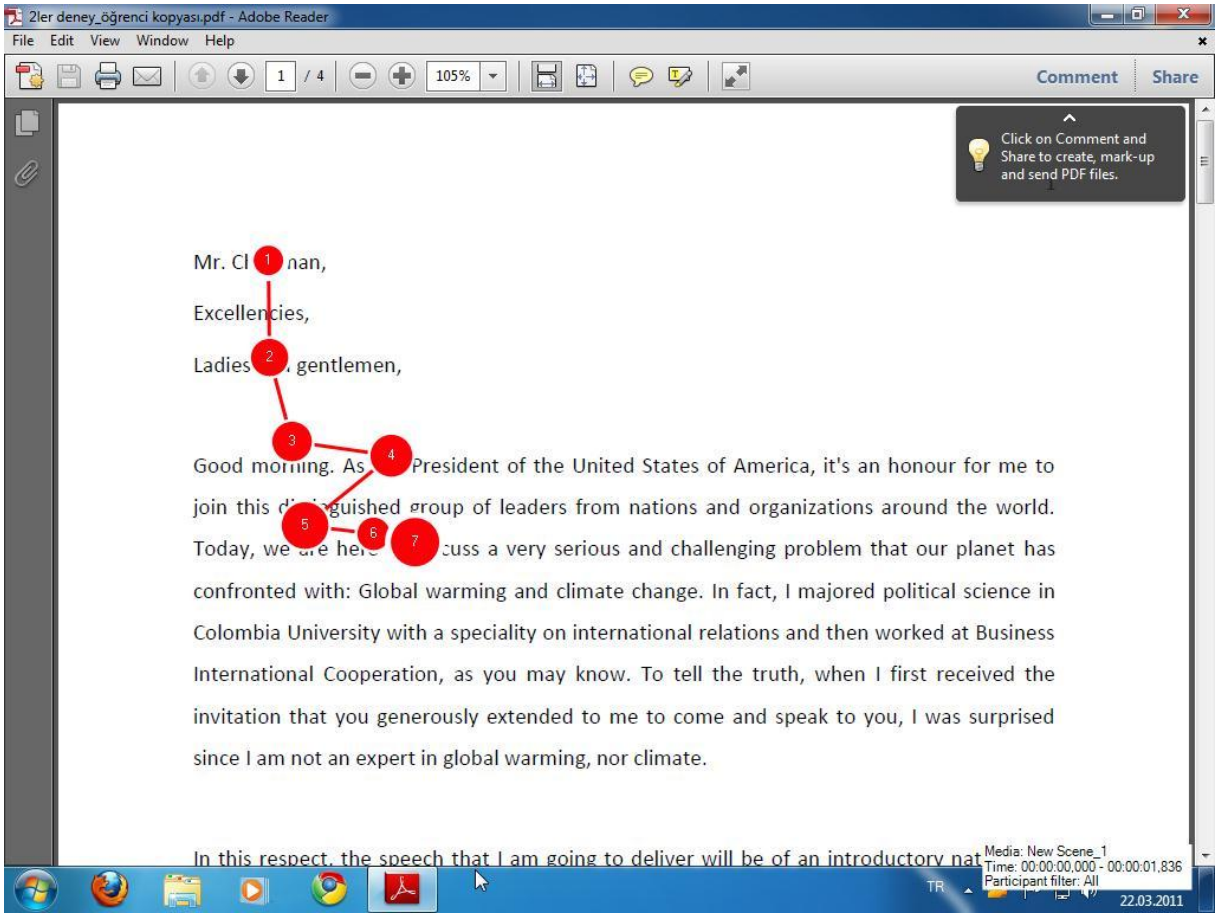


Figure 12

This irregular reading pattern may be caused by the urge to read and understand the text as soon as possible considering the time constraint. At this point, it is noteworthy that subjects did not have any preliminary information about the length of the text before the test. However, they knew how much time they had for reading (approx. 5 min.). A similar explanation can also be made for the following reading pattern of the subject (see Figure 13). When the subject got familiarized with the text and the theme, and more importantly, as soon as she got the idea about the length of the text, eye movements became stable and reading was processed at a normal pace with only small regressions on proper nouns such as *Business International Cooperation* and *Colombia University*.

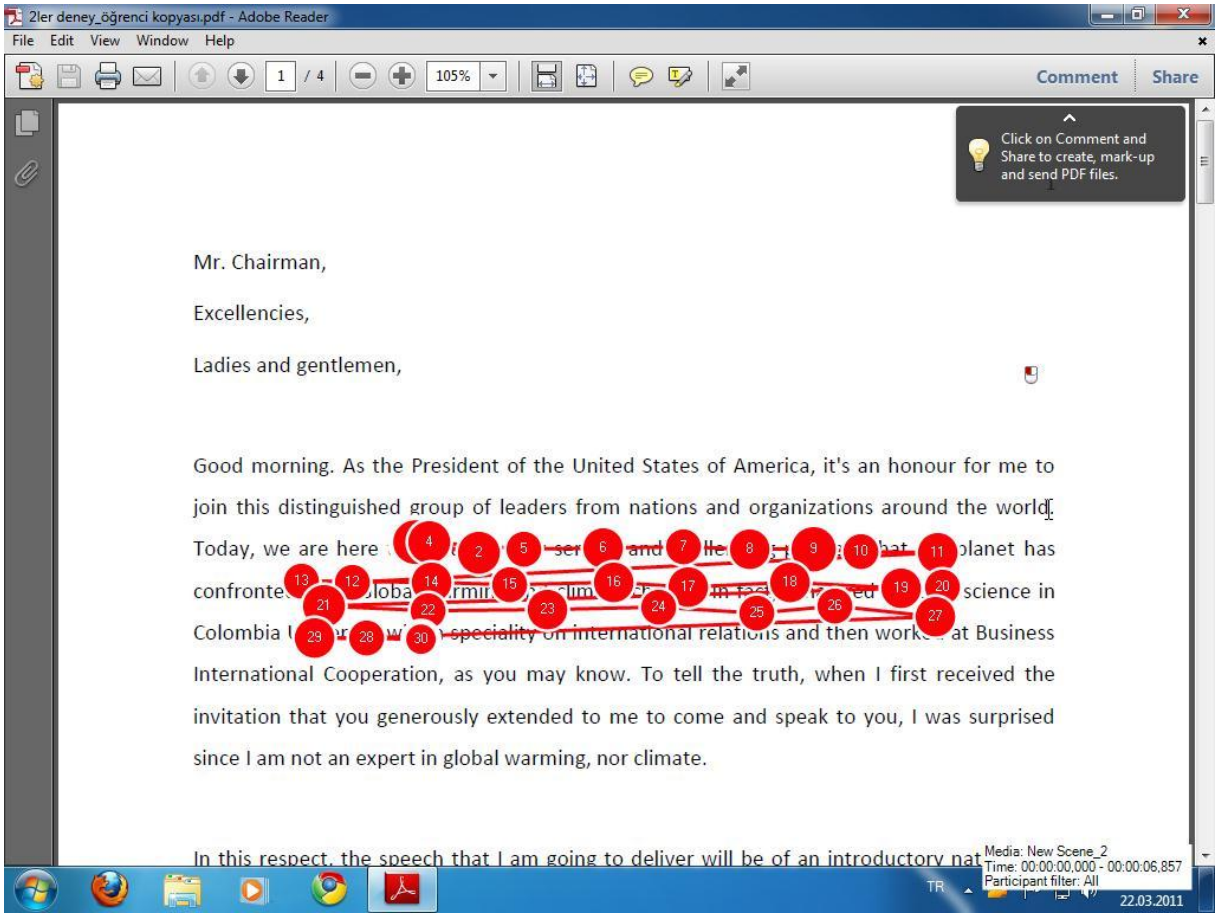


Figure 13

When the cognitive and textual processing of the first paragraph was over, the subject's fixations were launched on blank areas between the first and the second paragraph as seen in Figure 14. This pattern is assumed functional in terms of processing the information acquired in the previous paragraph rather than standard reading behaviour, since obviously there are not any linguistic segments to process at the gaps between paragraphs. However, the observed pattern may not be re-enactment of mental imagery or 'looking at nothing effect', in which subjects gaze on blank areas, however their mind re-visualize the previously perceived visuals, causing the movements to occur. In this context, the latest studies show that eye movements during mental imagery are not re-enactments of perception (see Johansson, Holsanova and Holmqvist, 2010). In other words, it is assumed that the subject did not re-visualize the previous sections literally, while she was fixating on the blank areas between the paragraphs yet she is thought to have processed the previous information.

Thus, fixations seen in Figure 14 may represent the cognitive load of the subject related with the first paragraph.

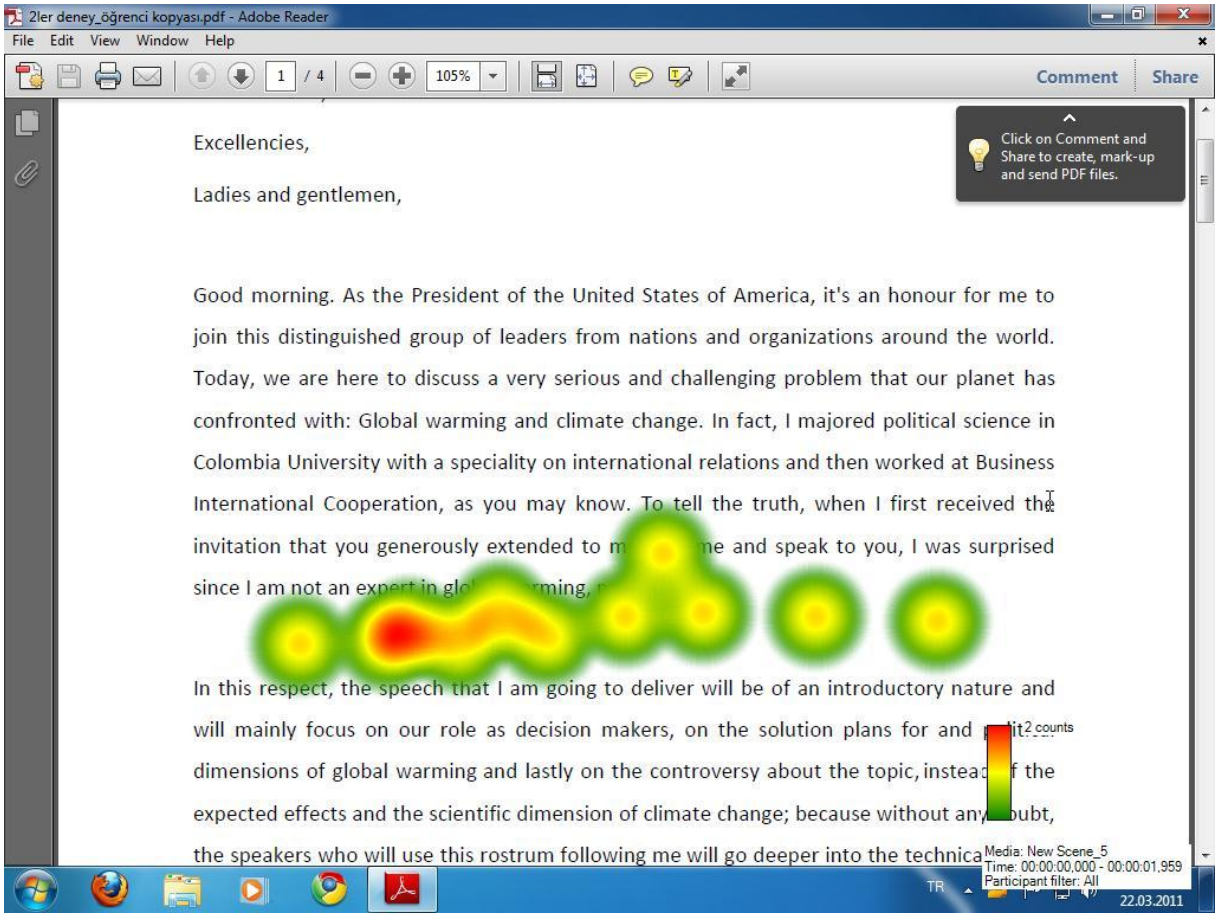


Figure 14

At some point, it was observed that the subject switched her reading mode from stable patterns to erratic eye movements whether deliberately or not (see Figure 15). The sentence concerned here is a left branching one, which is in conformity with the syntax of English language and not packed with numbers or proper nouns compared to some others. As a result, it is not reasonable to assert that the subject was cognitively overloaded with information. The switch is thought to be the result of psychomotor movements or to be more specific, mouse scrolling movements, depending on the empirically proved research claiming that there is a correlation between the scrolling behaviour and the distribution of visual attention on the screen (Buscher, Biedert, Heinesch and Dengel, 2010). Following the text while scrolling at the same time may have

caused rather erratic eye movements as seen below. Scrolling down by mouse or keyboard to continue reading with subsequent pages can be regarded necessary during reading for SI as the written texts in SI are mostly more than one page. In this respect, the subject had to scroll down the page in order to continue reading at that moment. It can be inferred from the movement in question that interpreters risk losing their valuable time without really reading and understanding the concerned section in the event of scrolling down. If the order of fixations is followed in Figure 15, it can be understood that the subject did not read the sentence properly as she did previously. It is also noteworthy that the subject did not return to this sentence to re-read and instead, she resumed reading with the following segments. In this context, re-reading textual segments, which the interpreter misses to read at the first time, due to scrolling down may be regarded as a beneficial strategy in reading for SI.

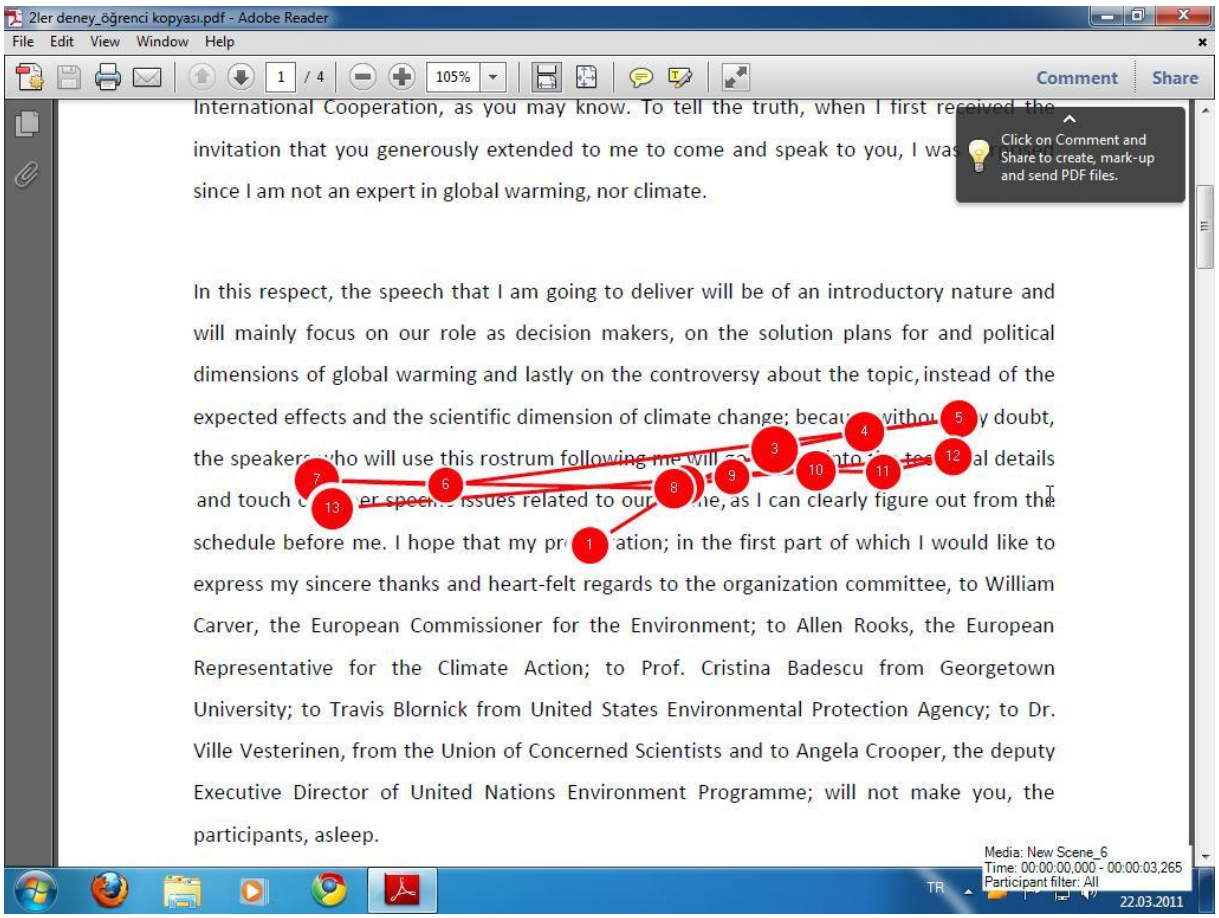


Figure 15

Figure 16 presents a very typical information processing movement with regressions when specific linguistic segments and specifically, proper nouns are concerned. It is of particular interest that the Subject 1 initiated her reading performance with the name (1) *Cristina Badescu*, (2) fixated on the information about *Cristina Badescu* for a rather long duration (*from Georgetown University*), and then returned to the previous bits of information (3, 4) to be sure about what she has read before. These kind of regressive eye movements were found to be typical for the subjects in G1, while they were reading compelling and information-dense segments as illustrated below. In such cases, where the information is embedded in long and branched sentences, longer saccades were frequently observed.

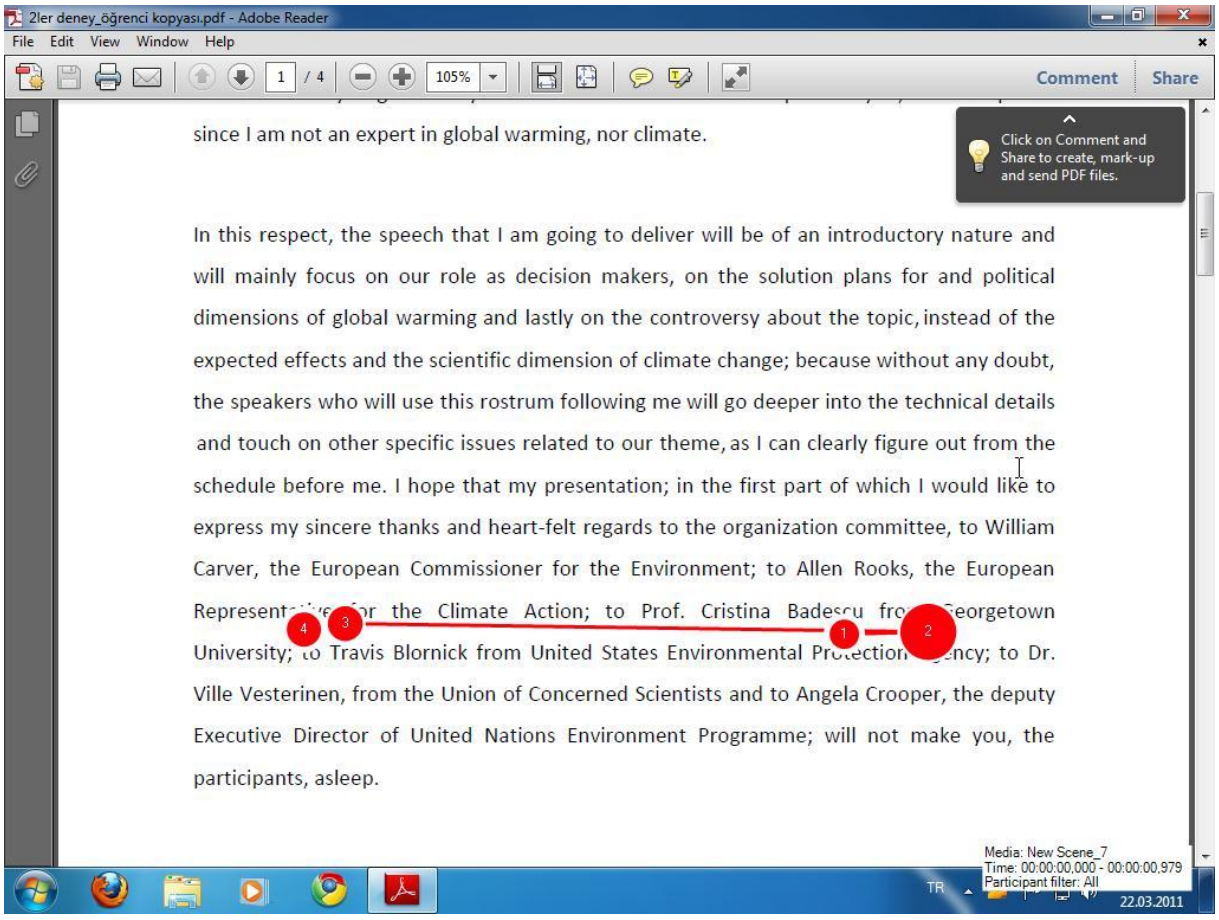


Figure 16

A rather intriguing reading pattern can be seen in Figure 17. Here, the subject skipped a large part of the sentence (*deserve thanks in this regard by being*

here…) and resumed reading from a complicated left branched sentence (*Unless…*), which is syntactically demanding. This particular eye movement may be a proof that reading for SI is rather different from other types of reading types and reading during SI, in particular. As clearly observed, the subject processed only relevant proposals which may pose a challenge for SI and skip those, which can be anticipated or rendered during her SI process without much difficulty compared to others and therefore, which can be interpreted in a relatively easier fashion. Although studies show that it is necessary to read all words for complete accuracy (Taylor, 1965, p. 190), Subject 1 preferred to save time by skipping token words as far as interpreting is concerned. The subject stated in the questionnaire that she did not use any specific reading technique, although she exerted effort to read fast. Given the fact that subjects did not take any specific courses on reading for/during SI, yet took courses on SI and SIT, this reading pattern can be regarded as rather intuitive, considering also the time constraint and previous interpreting experience and leanings of the subjects.

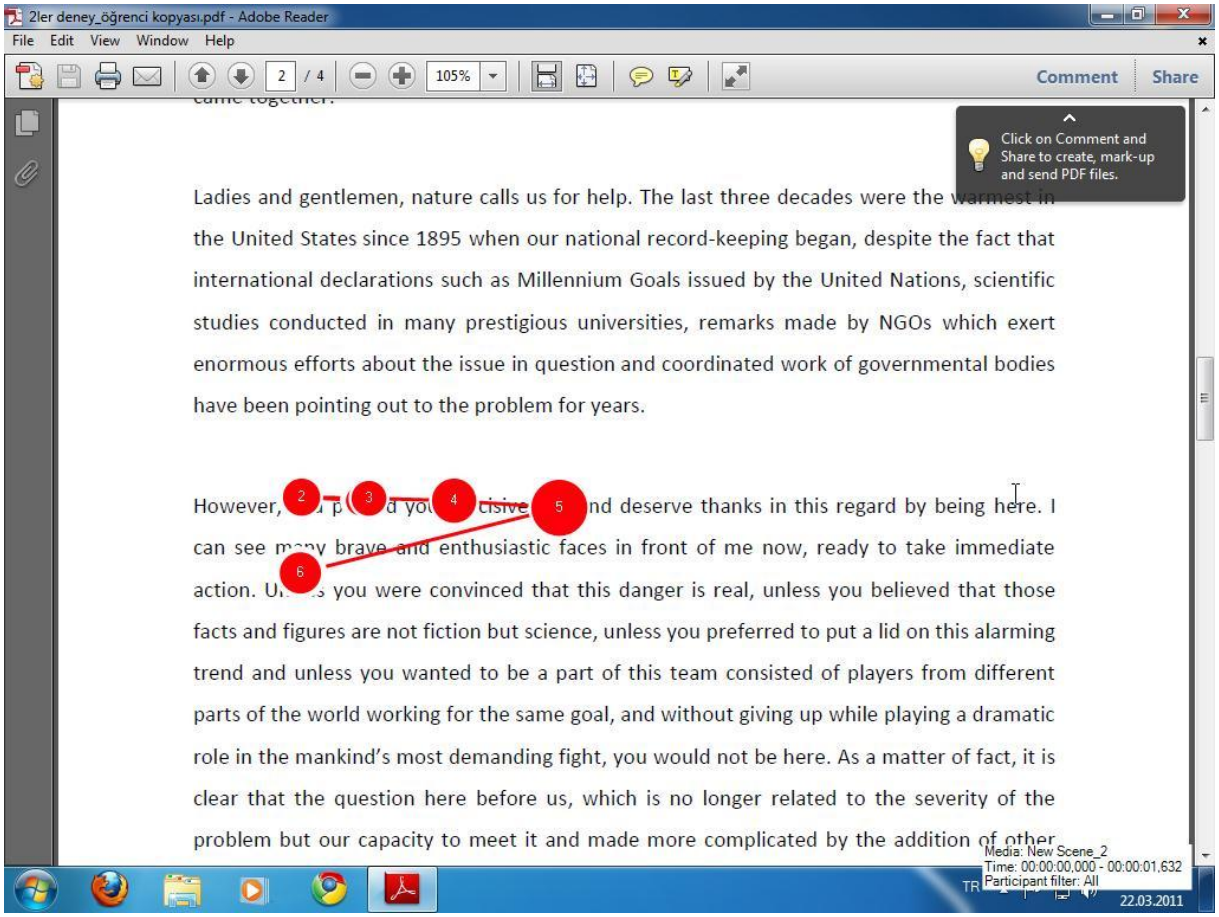


Figure 17

As for the long left branching sentences with numerous subordinate clauses, it is observed that Subject 1 processed the information by long regressions. In this regard, Paragraph 5 constitutes a vivid example for analysing reading patterns when lexical ambiguity due to long and branched sentences is concerned. Subject 1 got familiarized with the syntax of the sentence structured with *unless*… at first. However, when she was encountered with further information structured with subordinate clause (*…consisted of different players…and without giving up while playing a dramatic role…)*, she felt the necessity of returning to the previous propositions to comprehend the sentence as a whole, rather than reading it at once (see Figure 18). This reading pattern may again be regarded as one of the characteristics of reading for SI since a pleasure reader is expected to show relatively shorter saccadic movements with fewer regressions. Hence, it is important for the interpreter to find a balance between fast reading and deep comprehension in order to use the time

efficiently and extract as much information as possible, considering especially long and complicated sentences.

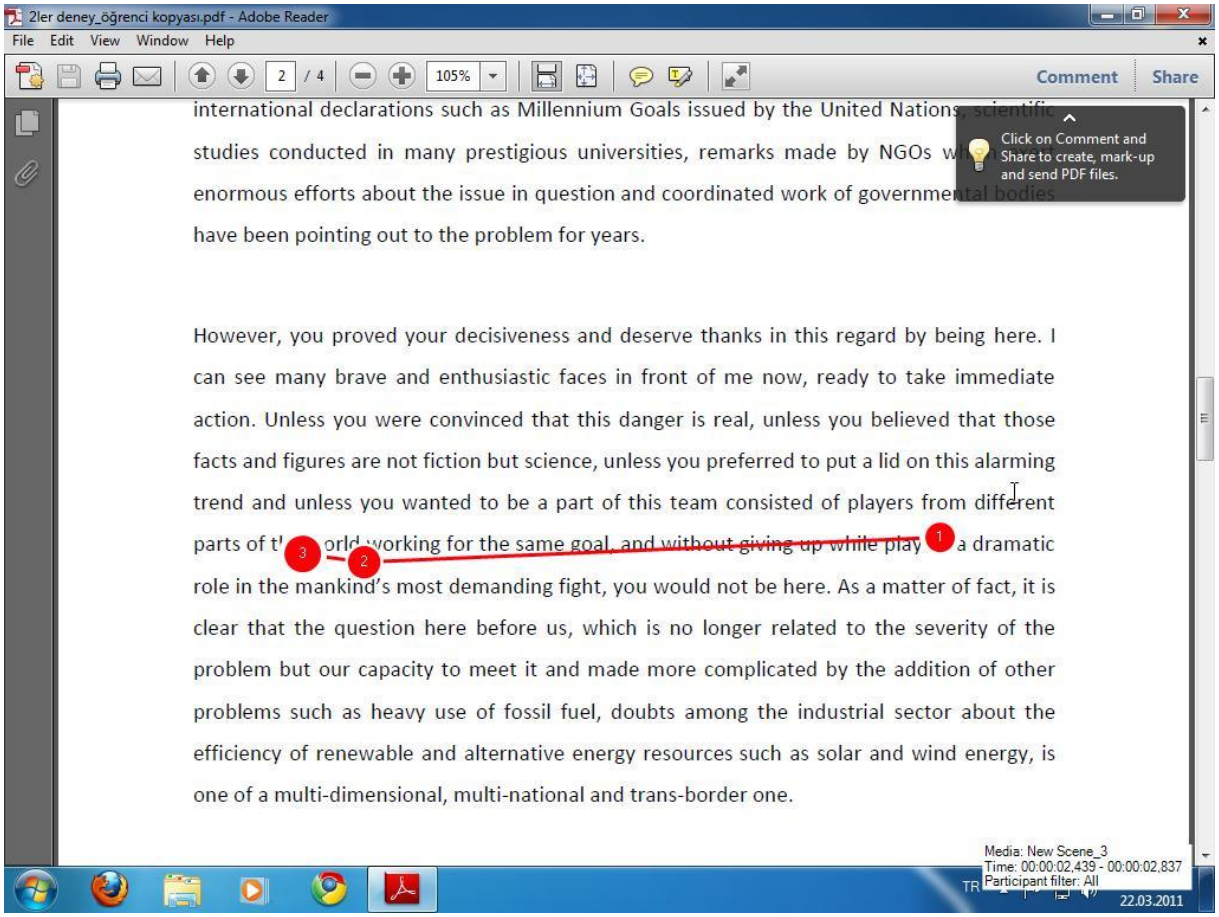


Figure 18

Cognitive Load

Subject 1 fixated on words or other linguistic segments within the text for 1011 times during the reading task, which lasted for 4 minutes and 32.984 seconds. The total duration she spent on all these fixations was approximately 265139 ms and the average duration she spent on one fixation was approximately 262.2542038 ms.

Table 5

Cognitive Load Based on Gaze Data of Subject 1

Indicator	**Value**
Number of Fixations	1011
Total Fixation Duration*	265139
Average Fixation Duration*	262.2542038
Task Length	00:04:32.984

* Values given as milliseconds.

SI Performance

Subject 1's total score from SI task is **57 out of 150**. There were noteworthy errors in the performance: The subject got a wrong or rather the opposite idea from the (1) second, right branching sentence of paragraph 4; (2) third, mid-branching sentence of paragraph 5 and (3) second, left branching sentence of paragraph 11 (see Appendix 2 for sentences in question). In the first and third case, she missed the sentence connectors (*despite the fact that* and *although*) hence, did not interpret the essence or logic of the sentences although she interpreted nearly every proposition. Moreover, the subject gave long pauses in the first, left branching sentence of paragraph 6, which is loaded with numbers and in the first, right branching sentence of paragraph 8, which is loaded with information. The subject made three notable errors in interpreting numbers and interpreted *1895* as *1995*, *2.5* as *2.1* and *1* as *5.1.* Another thought-provoking point about the subject's SI performance is that she started interpreting the second sentence of paragraph 5, which is a negative second condition if clause, with a present and positive sentence and only at the end she understood her error and corrected it. Lastly, the subject adopted a strategy in dealing with long and complicated sentences by dividing the second sentence of paragraph 4 into two short sentences. One of the lexical errors the subject made was interpreting *emission* as *emilim* (*absorption* in Turkish). The most probable cause can be

the phonetic resemblance between the words *emission* and *emilim*. This error was observed very frequently in other subjects as well.

Retention Test

Subject 1 scored **40 out of 100** in the retention test.

SUBJECT 2

Reading Patterns

Subject 2 began reading with a relatively different pattern compared to Subject 1. She fixated on opening addresses for a comparatively longer duration. Then, instead of moving vertically into following sentences (cf. Figure 12), she preferred to skip the first two sentences of paragraph 1 and resumed reading from the third sentence. In this respect, it can be inferred that although subjects, who performed reading for SI, had different approaches towards processing initial sentences, they had a tendency to skip certain parts of opening sentences.

Ironically, the tendency to skip initial segments of the text, whether for being found too plain considering SI task or due to the lack of concentration or the stress of initiating a new task can be assumed as one of the causes that make initial sentences vital for overall SI performance. In other words, initial words are highly risky in terms of SI performance just because most of the subjects skip them. This may be tolerable at a certain extent considering that that both novice and professional interpreters are accustomed to addresses and opening remarks in the initial segments and they may interpret them without visual aid. However, these segments may also include additional comments and remarks and under such a condition, interpreting them would be challenging without

proper reading for SI. Furthermore, it can be claimed that beginning of any task, including reading and SI, may have determinant role for the success in performing the rest of the task. In other words, if the interpreter begins reading or interpreting task in a decent fashion, s/he will increase not only her/his self-confidence but also gain the trust of the audience as well at the very beginning. Hence, it may be advisable for instructors to dwell upon concentration exercises specifically for the initial moments of both reading and SI performances.

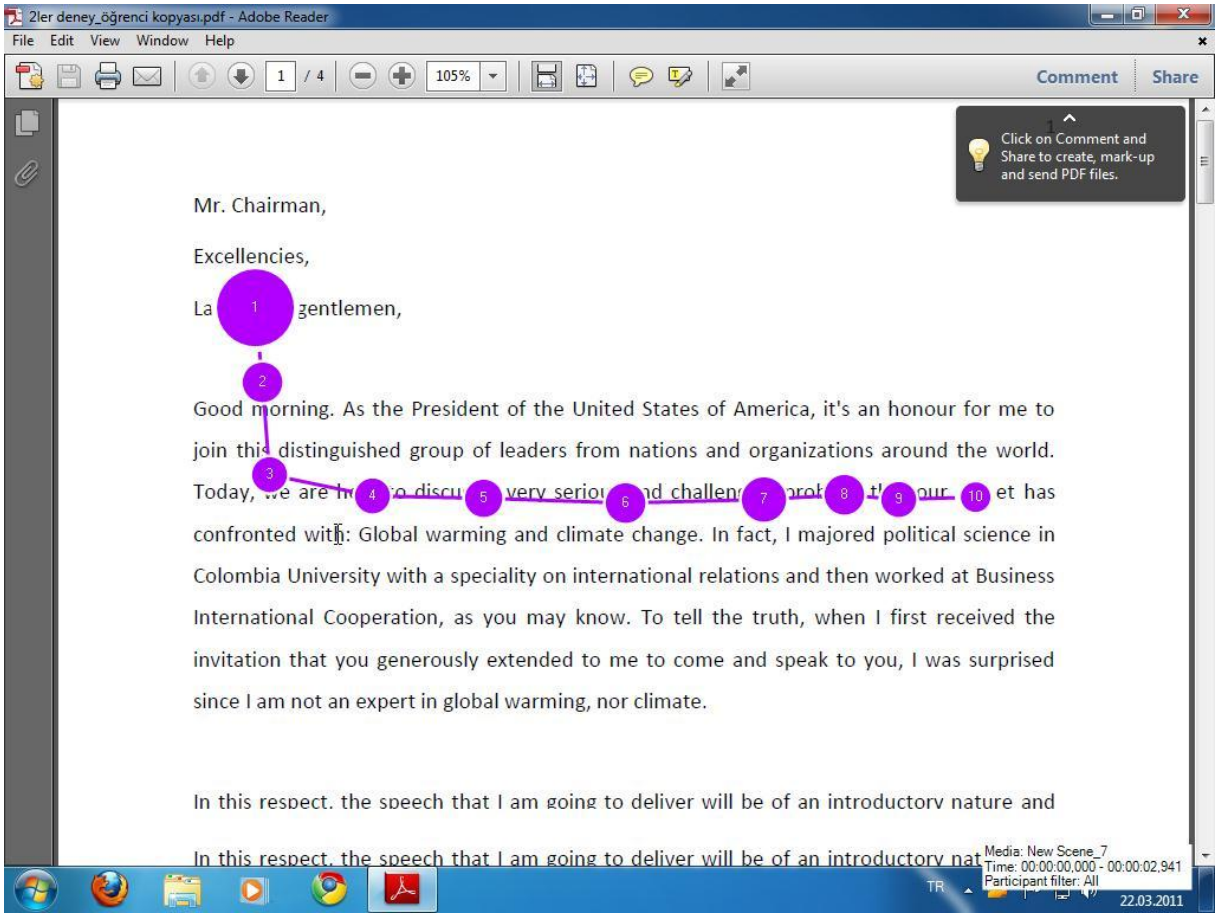


Figure 19

Paragraph 6, as a left branching sentence, sets a good example for processing information in reading for SI, as the information is loaded in multitudinous figures, proper names and terminology in this paragraph. Furthermore, the sentence presents a syntactic ambiguity about *the U.S.A* and *China*. When the statement *with approximately 5 million and 700 hundred thousand metric tonnes annually* was read immediately after *China*, the majority of the subjects thought

that these figures belong to *China* although they are about *the U.S.A*. *China* was in the sentence only to compare carbon emissions of the two countries. Thus, when Subject 2 read the ambiguous statement even for the first time, she felt the necessity to move back and re-read the previous linguistic items to comprehend the overall structure in a better way (see Figure 20). Meanwhile, erratic eye movements were observed not only in Subject 2 but also in other subjects in G1. In the presence of such ambiguous expressions and especially **garden path sentences**, in which false parsing leads in incorrect interpretation of grammatical sentences, shorter reading and longer fixation durations for the very first fixation are frequently seen (see Frazier and Rayner, 1982).

Figure 20 further illustrates that the third fixation was longer than the other fixations. It makes sense in terms of processing ambiguous phrases, as the site of third fixation was the site, where ambiguity began. Thus, the subjects is assumed to have become aware of the vagueness in the sentence, characterized with the third and the short fourth fixation and presented a sharp regressive movement to clarify the ambiguity. Nevertheless, she still made an error when she was interpreting this unit. It is worthy to underline that while such a sharp regressive behaviour may be possible to perform during reading for SI, such a pattern would be quite unlikely in reading during SI due to continuous auditory input. It makes SI with text more challenging compared to other SI modalities.

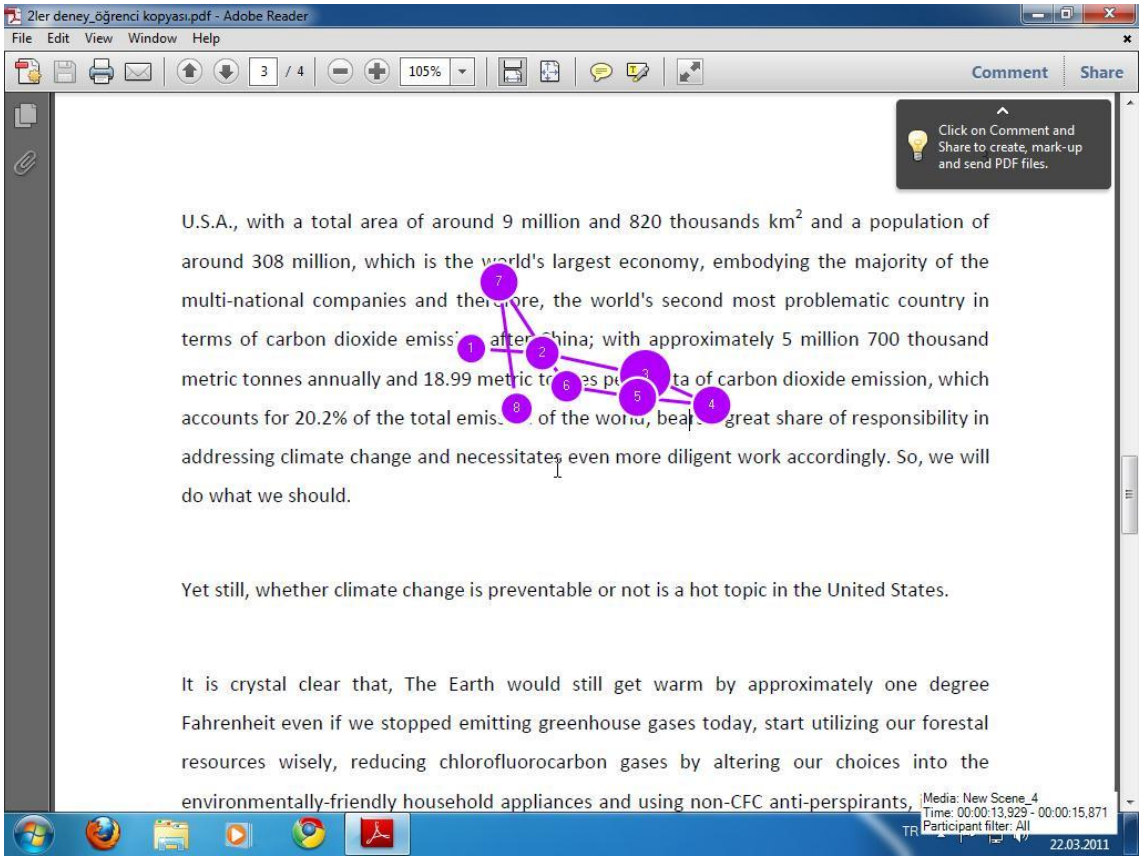


Figure 20

It is feasible to observe another type of devious eye movements in Figure 21. The subject started reading the sentence with a straightforward pattern (1, 2 and 3); however, when she came across with the following subordinate clause, her eyes immediately moved to the other clauses at the end of the sentence (4) and then subsequent erratic fixations on possibly unintended sites occurred (6, 7 and 8). A possible explanation for the abnormal sites of fixations and direction of saccades may be the syntactic structure of the sentence. The subject may have felt the necessity to move quickly to the end of the sentence to comprehend the overall context, as the sentence is excessively branched with numerous subordinate clauses attached to one another.

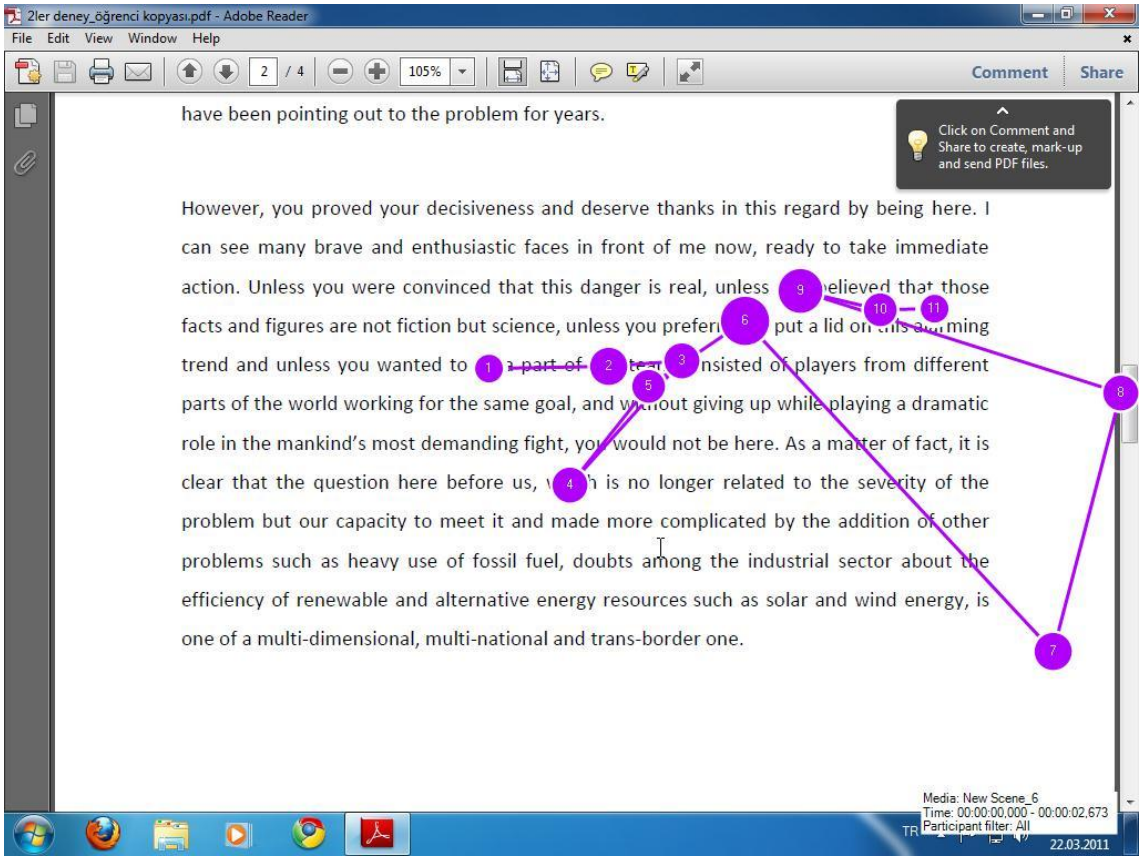


Figure 21

It is observed that subjects who performed reading for SI carried out a distinctive type of reading during the overall performance, which may be called as **second reading**. Subjects, who have finished reading the text for once in the allocated time, frequently began reading the text again. There are apparent differences between the first and second readings in terms of eye movements. As illustrated in the figures above, first reading patterns are similar to those of standard silent reading behaviour with certain exceptions. In this regard, eye movements during the first reading in reading for SI can be characterized with stable saccades following the text in a horizontal path with fixations on certain words. However, reading patterns during the second reading resemble patterns in scanning (see Holmqvist and Wartenberg, 2005, p. 4), in which the reader (or the interpreter in our case) quickly moves around certain parts of the text to extract as much information as possible to memorize specific linguistic segments such as numbers or proper nouns and to specify terms or detailed information to contextualize the text. Unlike Subject 1, Subject 2 had time for

such a second reading, in which she re-read certain paragraphs (usually the complicated ones).

Figure 22 shows eye movements of the subject while she was processing paragraph 8 for the first time. It is possible to notice standard reading patterns with only small corrective regressions.

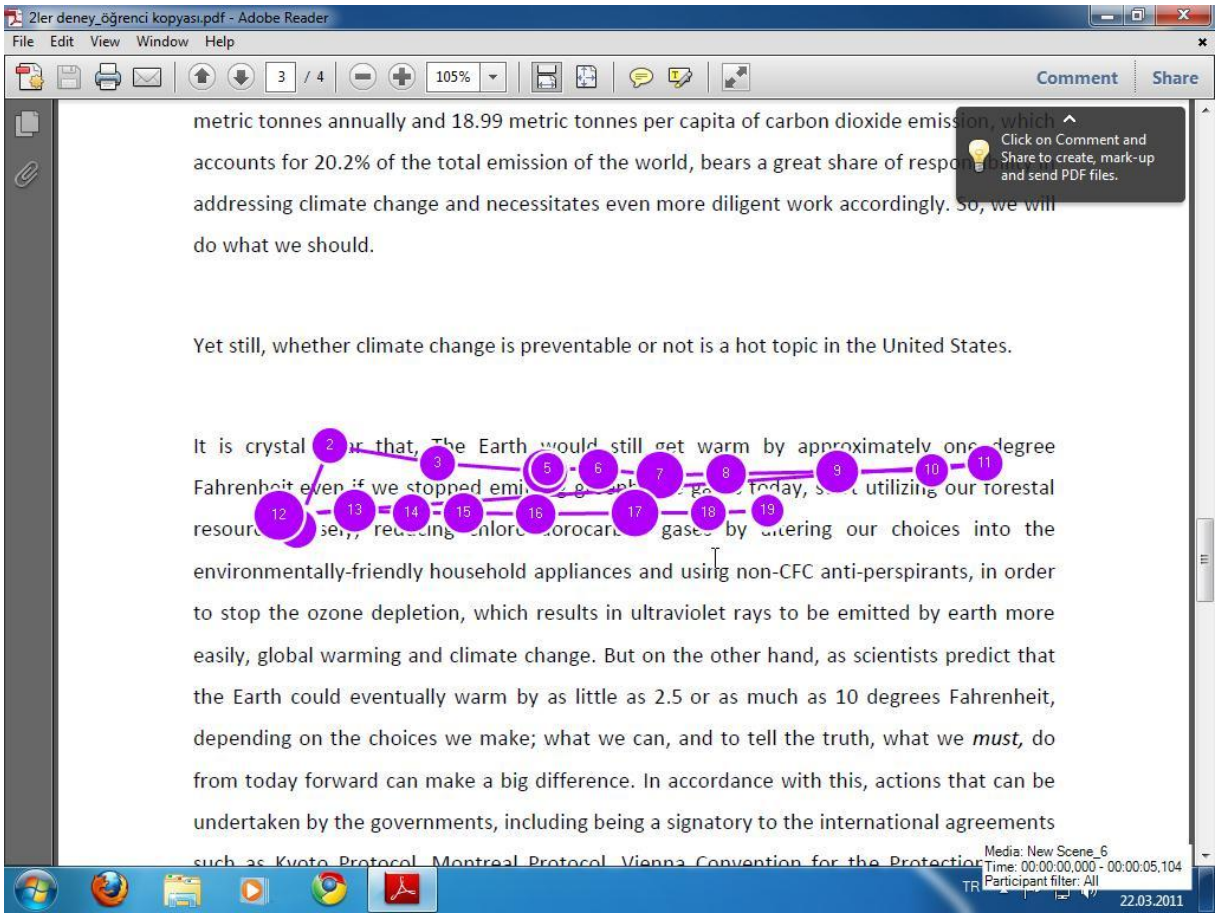


Figure 22

In contrast, Figure 23 demonstrates the eye movements of the subject when she was processing the same paragraph for the second time. It is clearly observed that she tried to grasp the overall meaning by fixating on various loci on the text. Within this segment, eye movements were highly fast and remarkably long saccades, which did not follow a linear path, can be observed. It is also noteworthy that the subject chose particularly paragraph 8 for the starting point of second reading. The paragraph in question contains difficult

linguistic items for interpreting such as numbers (e.g. *2.5, 10 degrees Fahrenheit*) and the names of agreements and protocols (e.g. *Kyoto Protocol, Montreal Protocol* etc.). However, it is observed that the subject did not specifically fixate on these linguistic items or key terms during second reading with few exceptions (e.g. *environmentally-friendly*, *CFC antiperspirants* etc.). When the eye movements in Figure 23 are considered, it can be concluded that the second reading of Subject 2 was not virtually deliberate. The subject endeavoured for contextualizing the information in the paragraph; however, she was not quite sure about which section to re-read. One of the evidences of such disorganized second reading is the erratic fixations on non-textual elements on the page (such as the black box at the top right – 14) and blank areas outside the textual area (15 and 16). On the other hand, we cannot see the fixations on the names of agreements and organizations. It seems that as soon as the subject finished processing the paragraph, she moved on second reading with the previous paragraph.

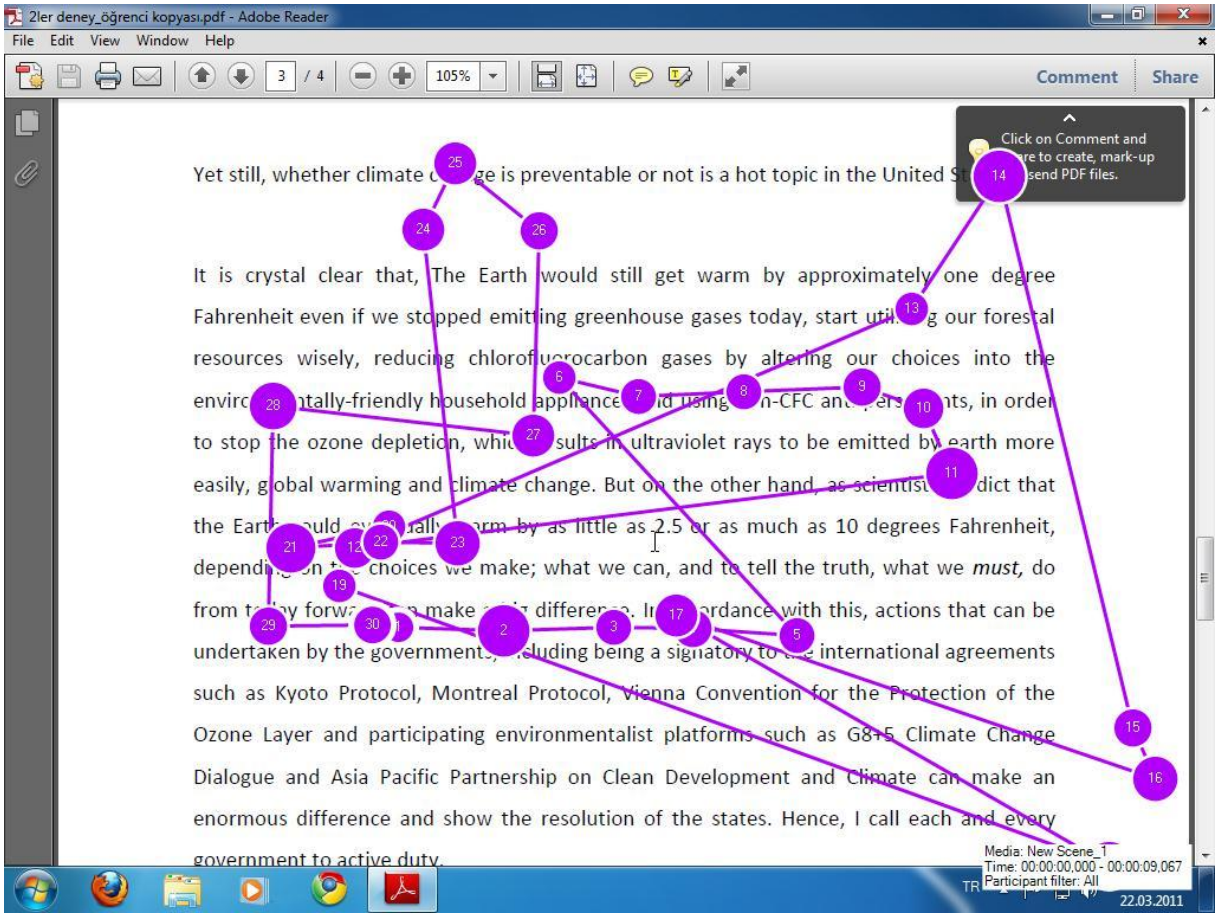


Figure 23

Cognitive Load

Subject 2 fixated on words or other linguistic segments within the text for 1032 times during the reading task, which lasted for 5 minutes and 1.475 seconds. The total duration she spent on all these fixations was approximately 269278 ms and the average duration she spent on one fixation was approximately 260.9282946 ms.

Table 6

Cognitive Load Based on Gaze Data of Subject 2

Indicator	**Value**
Number of Fixations	1032
Total Fixation Duration*	269278
Average Fixation Duration*	260.9282946
Task Length	00:05:01.475

* Values given as milliseconds.

SI Performance

Subject 2's total point from SI task is **66.5 out of 150**. It is observed that Subject 2 used interpreting strategies as Subject 1 such as filling sentences with the utterances that were not made in the original speech to refrain from long pauses. Moreover, at times, she used generic expressions for specific linguistic items and interpreted *Travis Blornick* as *a representative*, for instance. As a result, over-generalization errors were detected as well such as interpreting *10.000 years* as *in the last years* etc. She made the same lexical error with Subject 1 and interpreted *emission* as *absorption*. Furthermore, she skipped certain sentence connectors and misinterpreted numbers and interpreted *9 million and 820 thousands* km^2 as *9 million 827* km^2. The subject also used the English word *greenhouse* instead of its Turkish equivalent, *sera.* The most critical error she made was stating that CO_2 *emissions have increased with the Copenhagen Agreement*, which totally contradicts with the main idea of the text. In paragraph 6, the subject may have though that the figures following the word *China* belong to that country and interpreted so, yet they were about *the U.S.A*.

Retention Test

Subject 2 scored **37.5 out of 100** in the retention test.

SUBJECT 3

Reading Patterns

Frequent regressions were observed in reading patterns of Subject 3. Regressive eye movements; *i.e.*, movements going backwards instead of forward, as seen in Figure 24 (from 9 to 10), cause interruptions in reading and generally believed to increase when difficulties in text appear (Bayle, 1942, p. 16). In this regard, it can be stated that regressive movements may play a role in comprehension and Subject 3 had difficulty in processing the first right branching sentence of paragraph 2. It is noticeable that the sentence in question is relatively easy in terms of propositions. Considering that other subjects did not present a regressive reading pattern in this segment, it may be a reading preference of the subject or rather, an individual difference in cognitive skills. However, within the scope of text linguistics in reading for SI, it is important to note that the subject processed a long, right branching sentence, which may force the reader to fixate for longer durations and move beyond the borders of standard reading patterns.

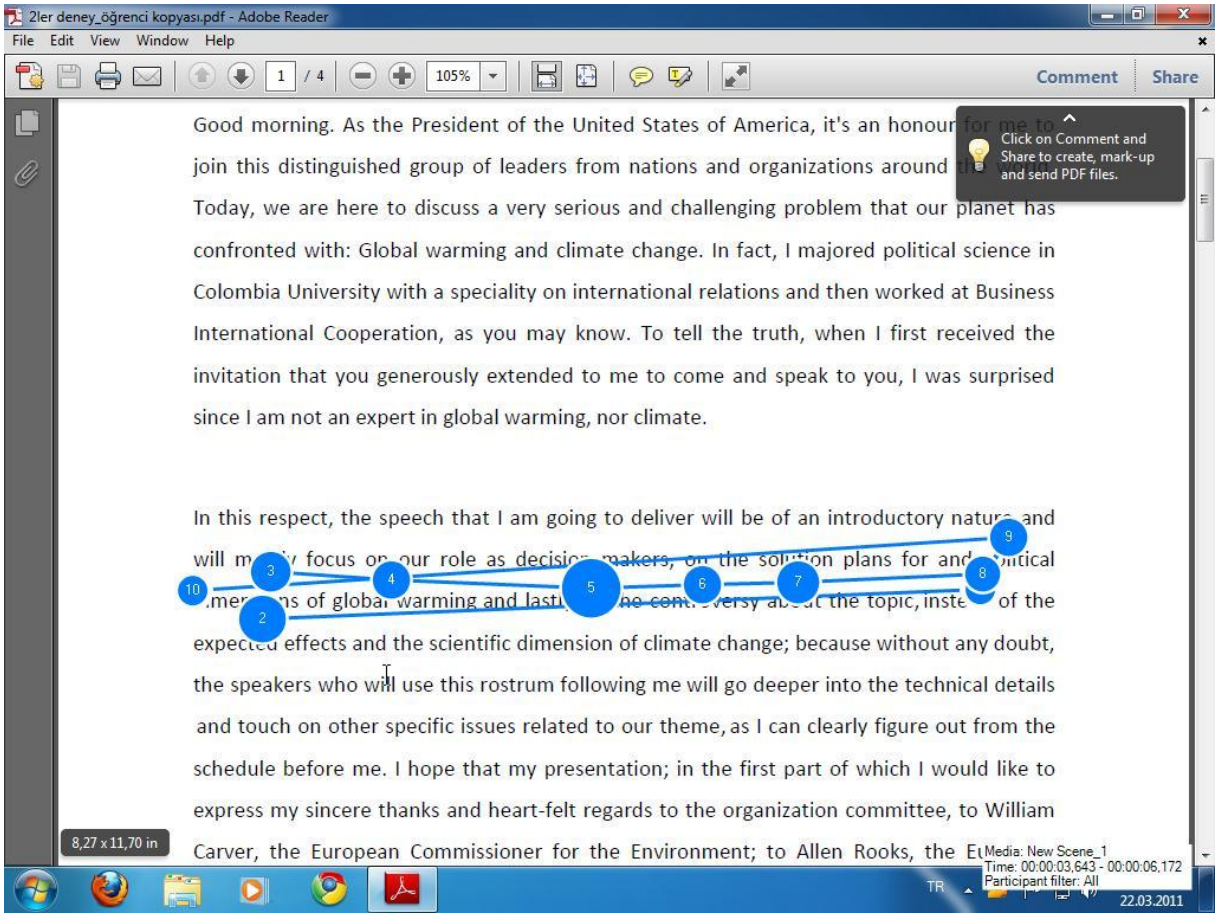


Figure 24

As seen from Figure 25, the subject fixated for long durations on the numbers in paragraph 6, especially on *308 million*, as expected. Furthermore, clicking on and selecting important segments (*9 million and 820 thousands km*^{2} and *5 million 700 thousand*) during reading was found as significant. Here, it can be stated that the subject endeavoured to direct her attention on specific units by using mouse movements and thereby, benefiting from the ICTs. These kinds of mouse movements were frequently observed during the reading behaviour of Subject 3 (see Figure 26, for instance). The subject reported to be unsure about her preference as to reading the text from a paper or a screen. However, eye and mouse movements evidence that the subject complied well with the hypothetical screen in the 'booth'. However, as her SI performance is the lowest among the group (49), it is difficult to state that there is a correlation between ICT management in the booth and SI performance. On the other hand, it is also

difficult to state that mouse movements alone are indicators of a good command of ICTs.

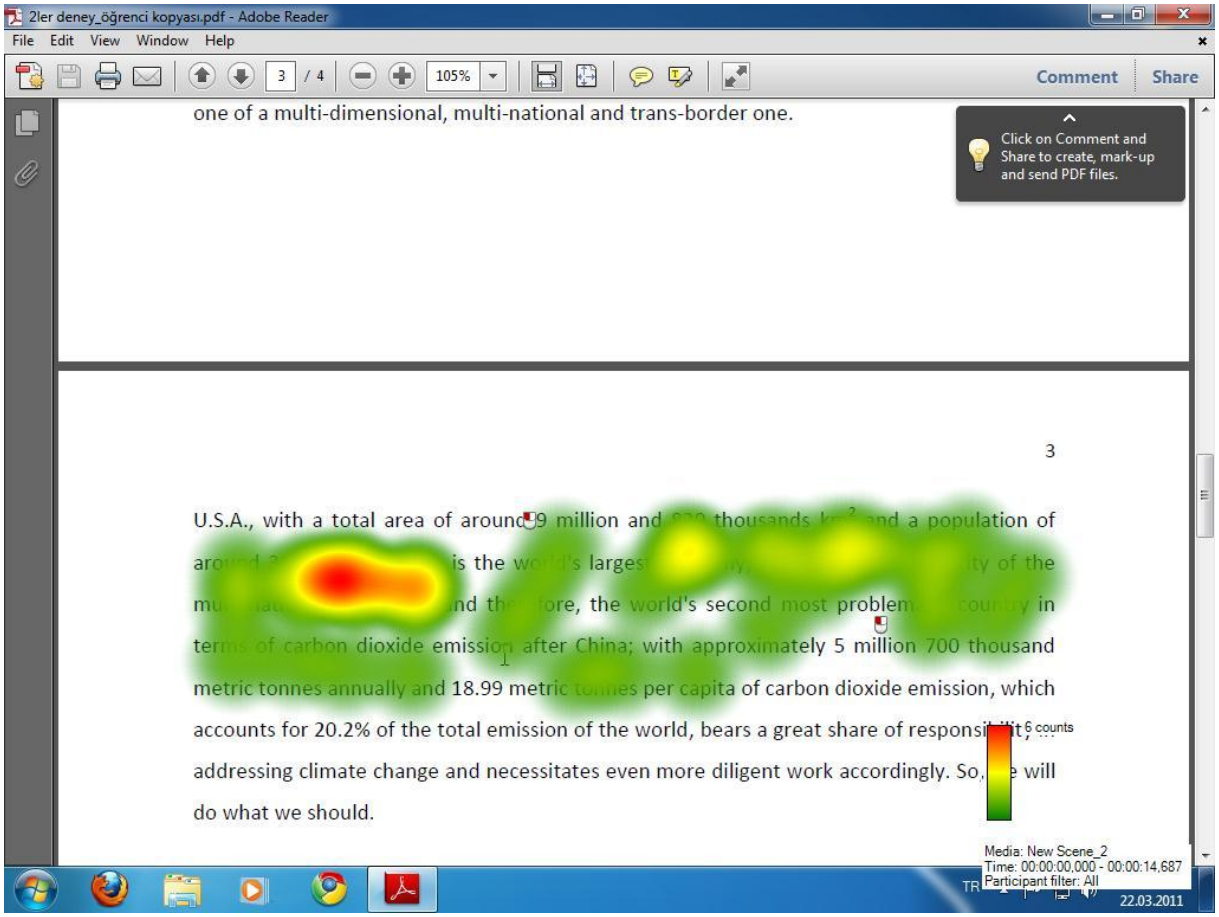


Figure 25

Figure 26 is a salient example to illustrate the mostly used reading patterns for SI and the prevailing reading behaviours of Subject 3, in particular. It is possible to observe clear regressive movements and longer fixations on these important segments. The subject selected important segments with mouse as seen in the figure. Although similar patterns can be seen in other subjects as well, selecting certain parts of the text by using a mouse is specific to Subject 3. If we consider that the subject intensified her comprehension process in this manner, this may be meaningful in terms of SI performance as comprehension is thought to be associated with SI. However, when compared to others, it is seen that the subject has a relatively low performance in SI. Yet, it is worth studying whether such mouse movements have any effect on reading for/during SI. In this

respect, further studies on the relation between scrolling behaviour (or mouse movements) and SI performance may be illuminating.

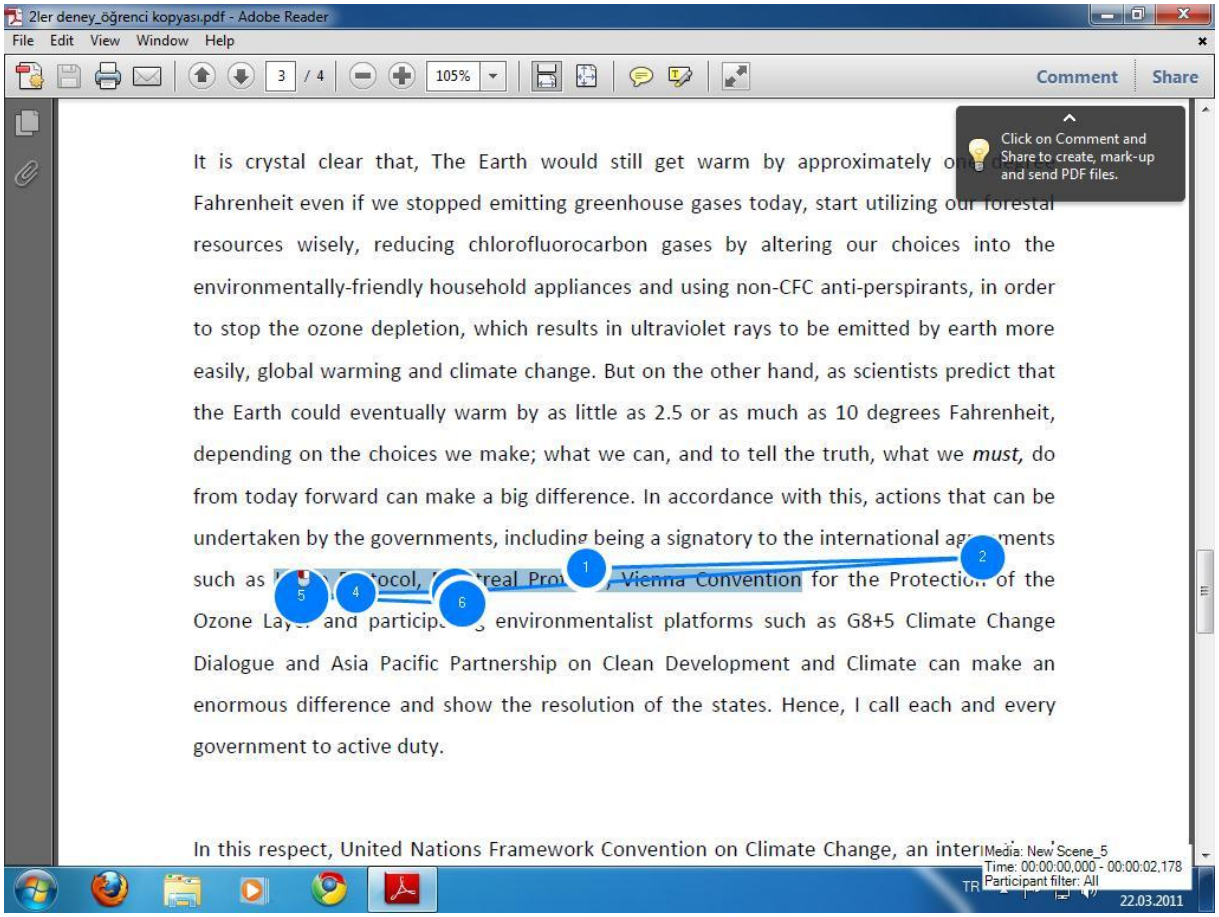


Figure 26

Figure 27 shows a second reading pattern, in which Subject 3 re-read paragraph 8 by scanning through the text. It is remarkable that Subject 3 also preferred to scroll up and begin re-reading from paragraph 8, exactly as Subject 2 did. The difference is that Subject 3 limited her focal loci with important segments as to SI such as figures etc. In this respect, this kind of second reading can be said to be much more focused and deliberate. Another important difference is that rather than moving up gradually, Subject 3 preferred to move down to the last paragraph and spend the rest of the allocated time for reading at that part. It may be misleading to set norms or pedagogical recommendations about the ideal content of second reading in reading for SI, since there exist numerous parameters such as individual differences, time left and linguistic

features of the text. Along with that, selecting parts to re-read is obviously an important constituent of reading for SI in order to use the time efficiently and considering the stress factor stemming from time constraint.

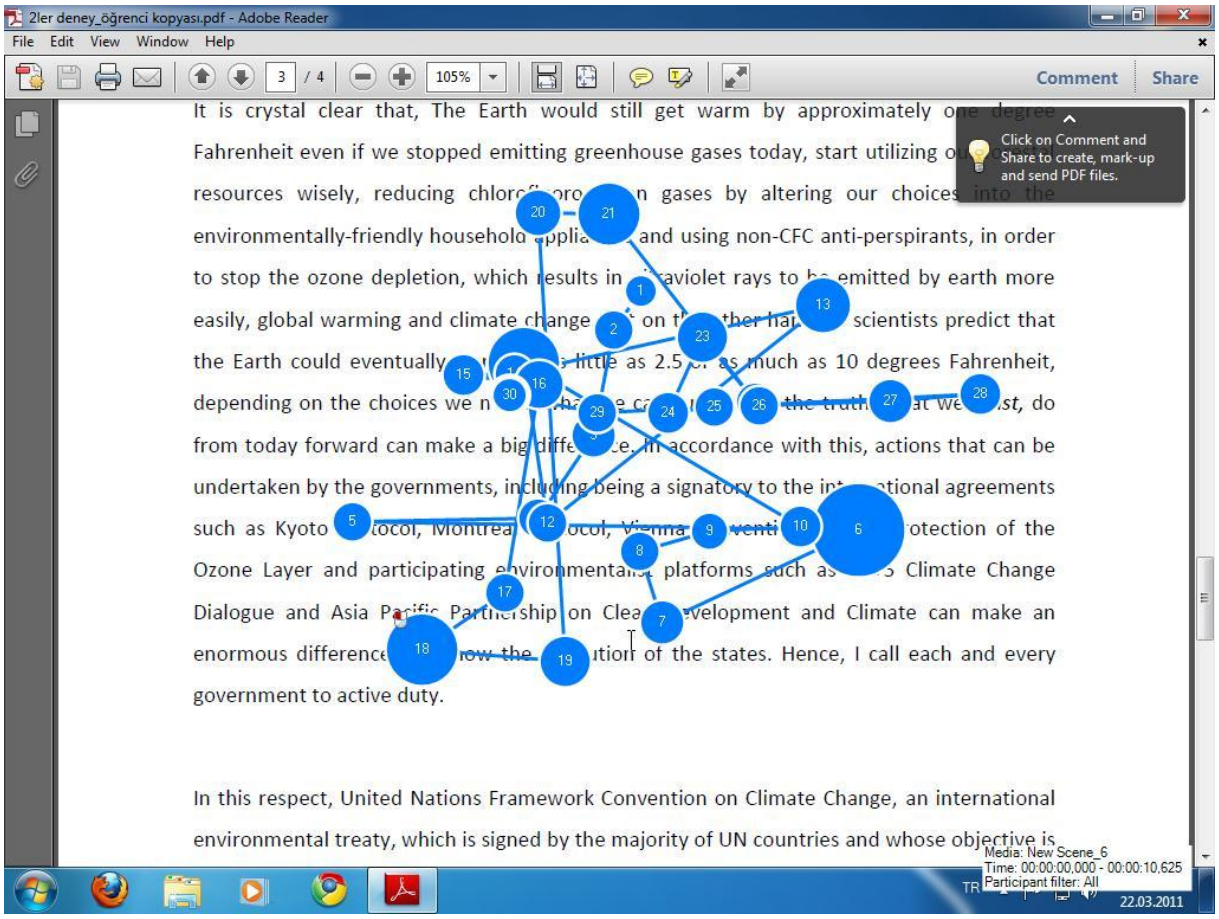


Figure 27

Cognitive Load

Subject 3 fixated on words or other linguistic segments within the text for 830 times during the reading task, which lasted for 4 minutes and 16.930 seconds. The total duration she spent on all these fixations was approximately 252432 ms and the average duration she spent on one fixation was approximately 304.1349398 ms.

Table 7

Cognitive Load Based on Gaze Data of Subject 3

Indicator	**Value**
Number of Fixations	830
Total Fixation Duration*	252432
Average Fixation Duration*	304.1349398
Task Length	00:04:16.930

* Values given as milliseconds.

SI Performance

Subject 3 skipped the majority of the sentences in the speech although she grasped and reflected the general idea. Since the grading is based on propositions, she scored **49 out of 150**, which is below average. The subject preferred to say, "*You may also see the names on the documents you have*" instead of stating every name in the organization committee and used general remarks instead of specific numbers and utilized approximation. However, she understood the second sentence of paragraph 6 in a right way, although she missed many bits of information. One of the reasons of the relatively low score is that she was too slow to catch up with the source speech. The score is also of particular interest considering that the Subject 3 used time for preparation more efficiently compared to other subjects in the same group and read the text in a relatively more detailed manner.

Retention Test

Subject 3 scored **32.5 out of 100** in the retention test.

SUBJECT 4

Reading Patterns

Subject 4 started reading with faster eye movements compared to other subjects in G1. It is observed that the subject skipped some phrases although not in the first sentence as other subjects but rather between sentences and later throughout the text. However, it is safe to assert that the initial reading of the subject has a dioristic pattern, which can be characterized by sharped-edged zigzag formations, long saccades and more frequent fixations on the right side of the screen. This pattern may be explained with the tendency of general word skipping behaviour that we frequently notice in other subjects in G1, which may be stemmed from associating reading task with the SI test. In other words, subjects formulated their reading for SI strategy by taking SI task into consideration and hence, skipped certain phrases which they though as easy to interpret. As for the zigzag path, the subject is thought to have utilized the speed-reading technique whether consciously or not or forced herself to increase her reading pace. In this context, studies support the hypothesis that in speed-reading the pattern of eye movements follows a zigzag path while that of the normal reader or skimmer follows the printed line (see McLaughlin, 1969).

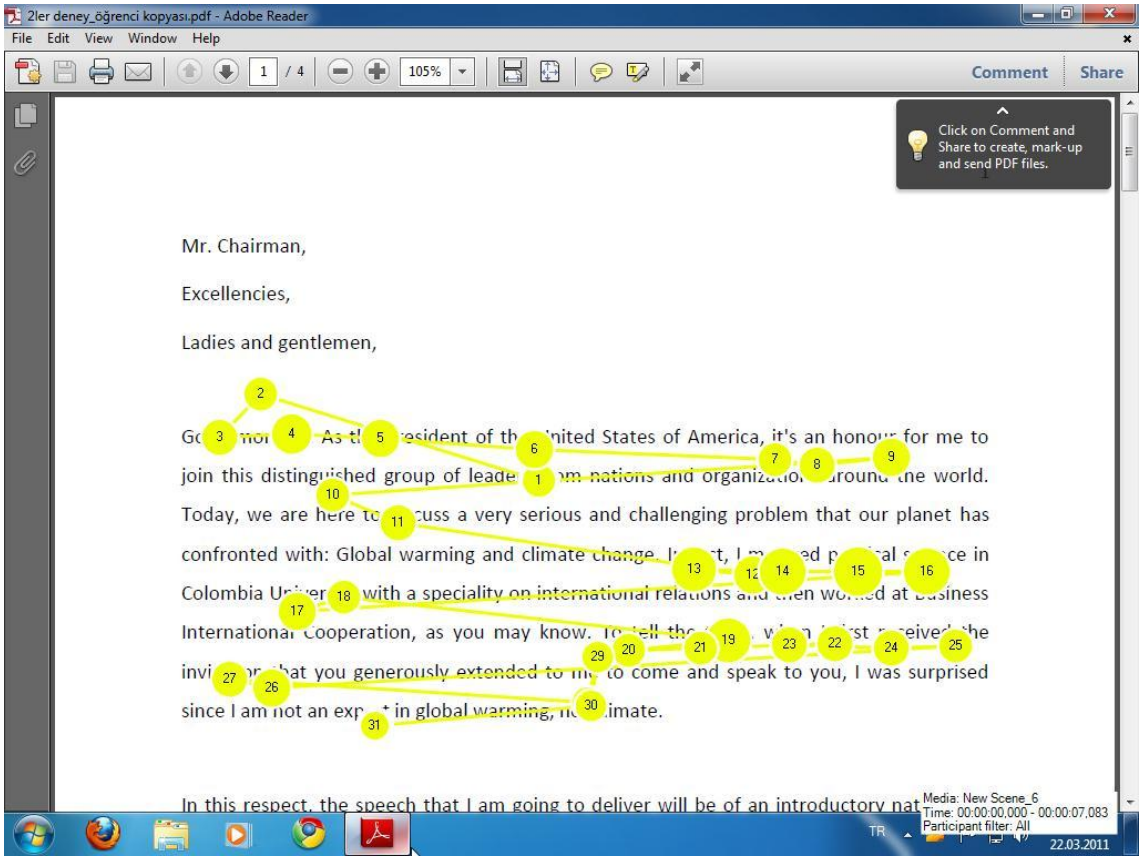


Figure 28

Analysis of eye movement video of Subject 4 also demonstrates that the subject processed the text relatively faster than all the other subjects in G1 with incessant scrolling down behaviour, which supports the speed-reading explanation. With this reading strategy, the subject managed to save time for the second reading. Along with that, the subject slowed down and focused on information-dense segments of the written text as seen in Figure 29. Frequent fixations on the proper names, regressions and non-linear paths (fourth, fifth and sixth fixations) are remarkable. Since the subject immediately recognized that names of persons and institutions would be challenging for interpreting and hence, preferred focusing on them for longer duration as understood from the frequency of the fixations. This pattern suggests the existence of a reading strategy that the subjects in G2 pursued, as we previously observed by skipping behaviour. Similarly, regressions and non-linear paths are assumed to be related with the higher information volume of the sentence in question.

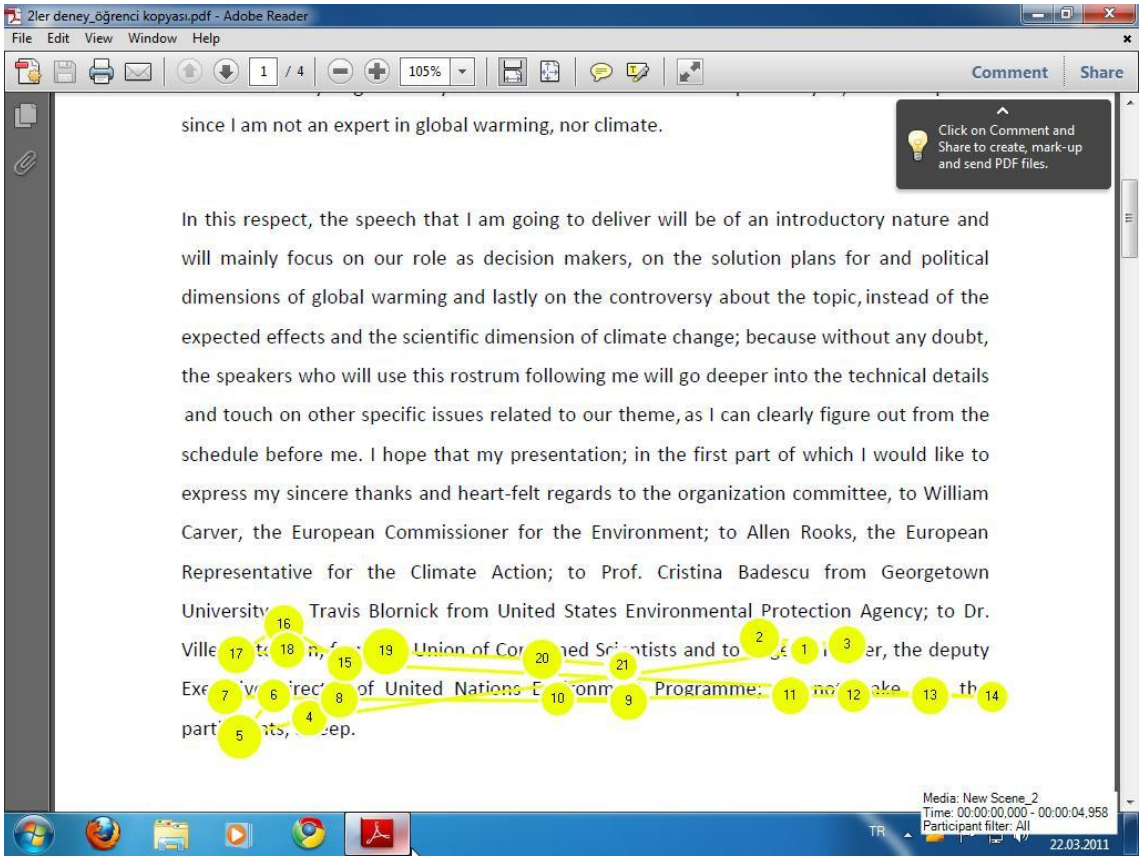


Figure 29

Although speed-reading has obvious advantages with regard to efficient time management in reading for SI, very fast scrolling down during reading results in mislocated fixations beginning in the middle of the paragraph and then moving to the top (see Figure 30). If this kind of reading and scrolling behaviour is repeated during page and paragraph shifts, the interpreter is likely to lose valuable time by reading the same segments repeatedly, which was the case for Subject 4. Figure 24 also shows that the subject was unable to control her reading pace at times and fixates on the margins of the paragraph, when 13th and 14th fixations are concerned.

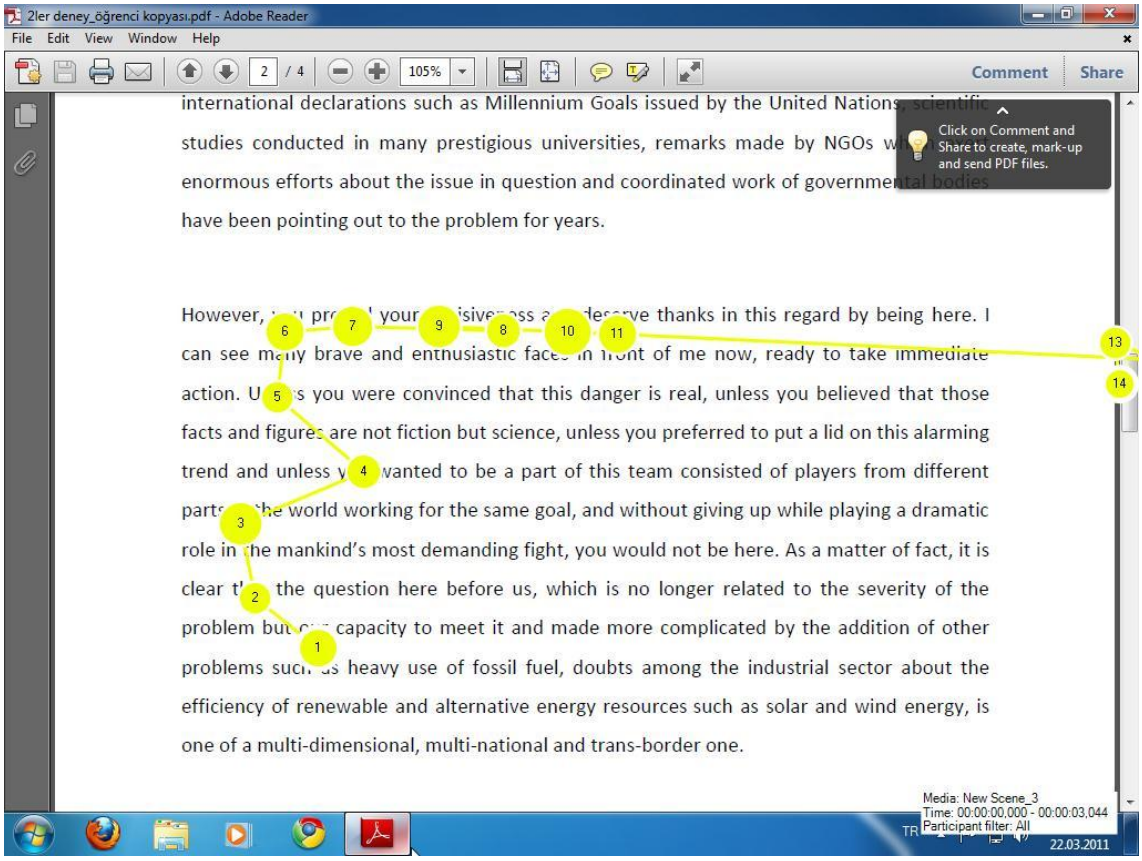


Figure 30

Figure 31 is an appropriate example for analysing the text processing of a paragraph for longer duration since the subject did not scroll down while she was processing paragraph 10 from the very beginning to the end. The subject followed a stable pattern with fixations of standard durations (approx. 250 ms) only with the exception of fixation on *foodstuff* (40, 47) and *hybrid* (71), which lasted longer than the others did. Longer fixations are generally associated with words with a low frequency in the language or a low level of predictability from the sentence context (De Graef, 2007 p. 177). In this regard, it is probable that the subject had difficulty in establishing these words in the context. Within the scope of SI, it can also be thought that the subject may have exerted mental effort to find Turkish equivalents for these words while reading them since subjects had SI task on their minds during reading for SI. When SI performance of Subject 4 is analysed, it is noticed that she managed to interpret both *foodstuff* and *hybrid* with appropriate equivalents. However, it is not sufficient to assert that there is direct relation between the fixation duration in reading for SI

and SI performance as specified below. Last point about Figure 31 would be about the gap in the middle of the paragraph. Although skipped sentence is an important one in terms of interpreting, unlike warming up sentences, Subject 4 did not allocate her attention to this part. Studies suggest that there is a greater probability of skipping words that are short, frequent or predictable compared to words that are long, infrequent or unpredictable (White, 2007, p. 411). In this respect, the subject may have found the concerned segment predictable, considering the SI task.

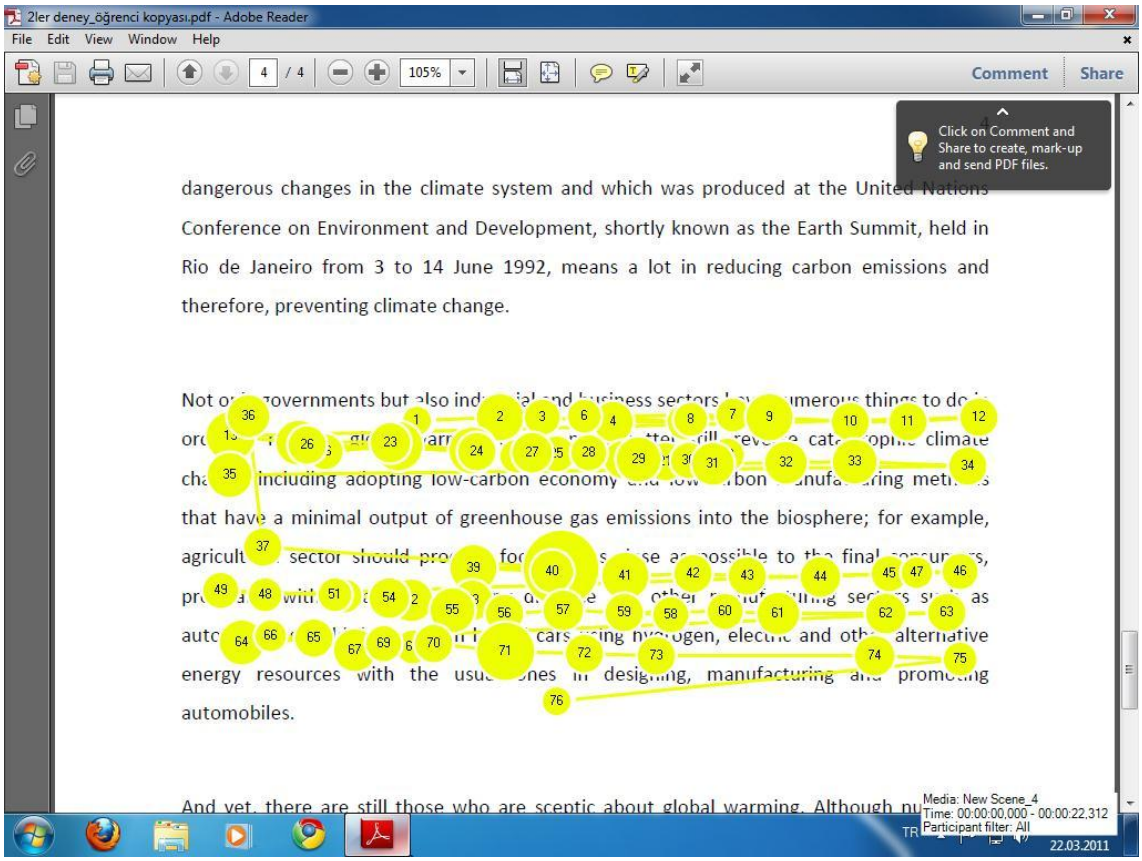


Figure 31

Cognitive Load

Subject 4 fixated on words or other linguistic segments within the text for 948 times during the reading task, which lasted for 4 minutes and 53.049 seconds. The total duration she spent on all these fixations was approximately 281220

ms and the average duration she spent on one fixation was approximately 296.6455696 ms**.**

Table 8

Cognitive Load Based on Gaze Data of Subject 4

Indicator	**Value**
Number of Fixations	948
Total Fixation Duration*	281220
Average Fixation Duration*	296.6455696
Task Length	00:04:53.049

* Values given as milliseconds.

SI Performance

Subject 4's performance was rather different from previous subjects. First, she caught more details compared to other subjects. However, although she interpreted more propositions compared to other subjects in the same group, she frequently missed the general meaning of the sentence. For instance, she said, *the dynamism of our markets harms our people* despite the fact that the speaker stated that *increase in temperature affects the dynamism of our markets and therefore, the living of our people*. As for the second sentence of paragraph 5, she fell into the linguistic trap structured by second condition and unless and interpreted the past sentence with present structure. Although the subject was rather successful in interpreting proper names, she considerably failed in interpreting numbers. For instance she interpreted *1895* as *1896*, *9 million and 820 thousands km^2* as *9 million and 896 kilometres*, *308 million* as *3 million*, *5 million 700 thousands metric tonnes* as *5 million 790 metric tonnes*, *18.99 metric tonnes* as *in the size of 8 million 66* and *20.2%* as *24%*. Apart from the numbers, there were also other linguistic errors such as interpreting *despite the fact that* as *according to*, *to deserve* as *to present*, *to stabilize* as *to increase*

first and then *to decrease* and missing the subject of the first sentence of paragraph 6 (*the USA*), which caused a serious ambiguity in the sentence. Despite all these errors, she scored relatively high and got **73 out of 150**, the second highest score of the test.

Retention Test

Subject 4 scored **25 out of 100** in the retention test.

SUBJECT 5

Reading Patterns

Reading patterns of Subject 5 can best be characterized by long fixations and stable movements with major deviations at times. It can also be stated that Subject 1's text processing speed is relatively fast. Gaze path of initial text processing shows parallelism with initial reading pattern of Subject 1 (cf. Figure 12). Rather than skipping, the subject started reading with a vertical path and then the pattern returns to standard movements (7, 8, 9 and 10). The main difference; however, is that Subject 5 spent a longer time during fixations (see Table 6), which means that the subject exerted much more cognitive effort during reading for SI with approximately 306 ms of average fixation duration. However, heavier cognitive load and/or effort does not guarantee a better SI performance as the subject ranked 5th in SI performance with a score of 52.5 (see Chart 7 for further information). In this case, longer fixations can be thought of indicators of processing difficulties starting from the first paragraph. In this regard, Staub and Rayner (2007) states that decisions about how long to remain focused on a given point in text before moving on are strongly affected by the cognitive factors related to text comprehension (p. 329).

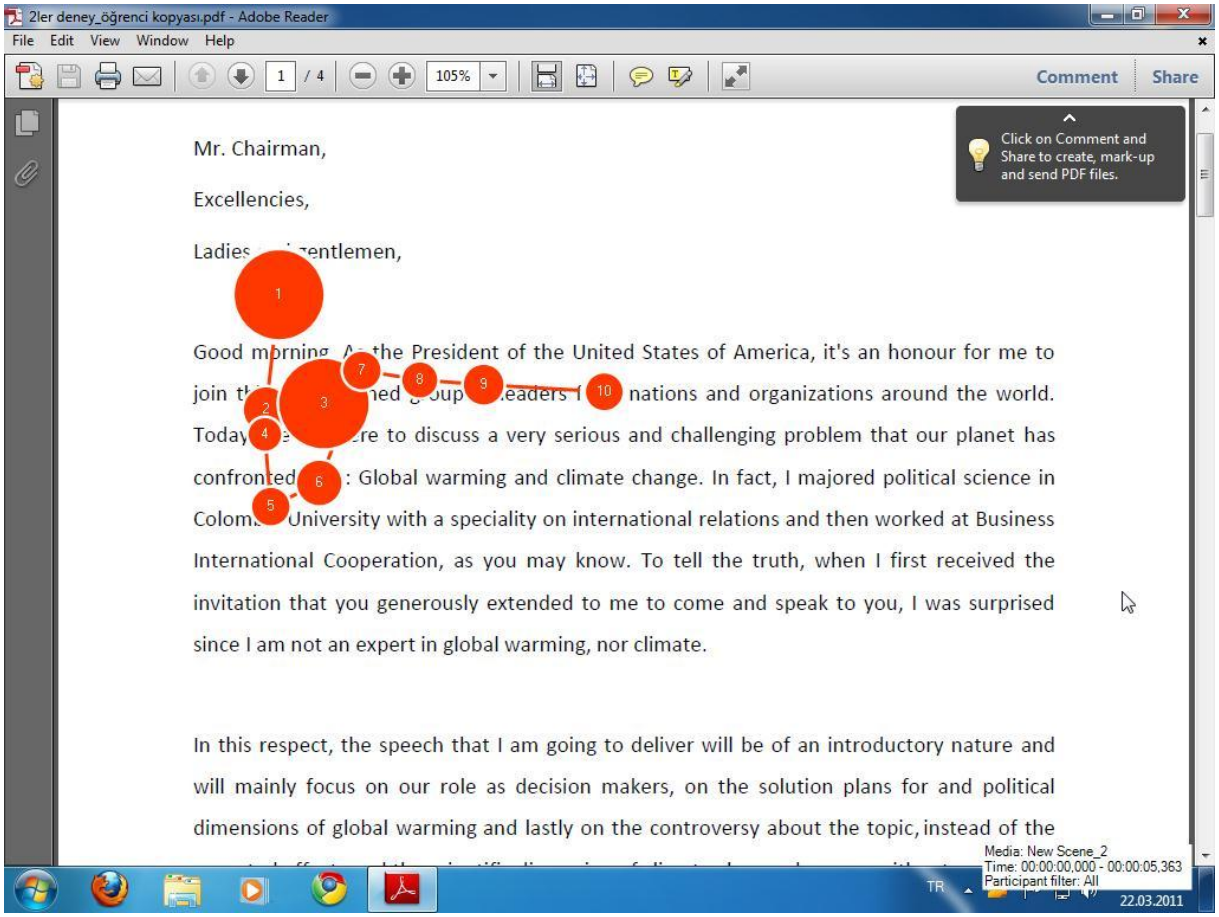


Figure 32

In Figure 33, it is possible to observe a similar pattern with Subject 5 (see Figure 30), in which the subject started reading from the middle of the paragraph due to fast scrolling down. Although eye movements became stable again following the third fixation, it could again be stated that the subject lost time, considering that this kind of reading pattern was repeated at every paragraph as in the case of Subject 5. This figure also demonstrates that false starts with the pace of scrolling down can be put forward as a characteristic of reading for SI. Similar patterns were also observed in other subjects as well, however, they were not included in the analysis to avoid repetition.

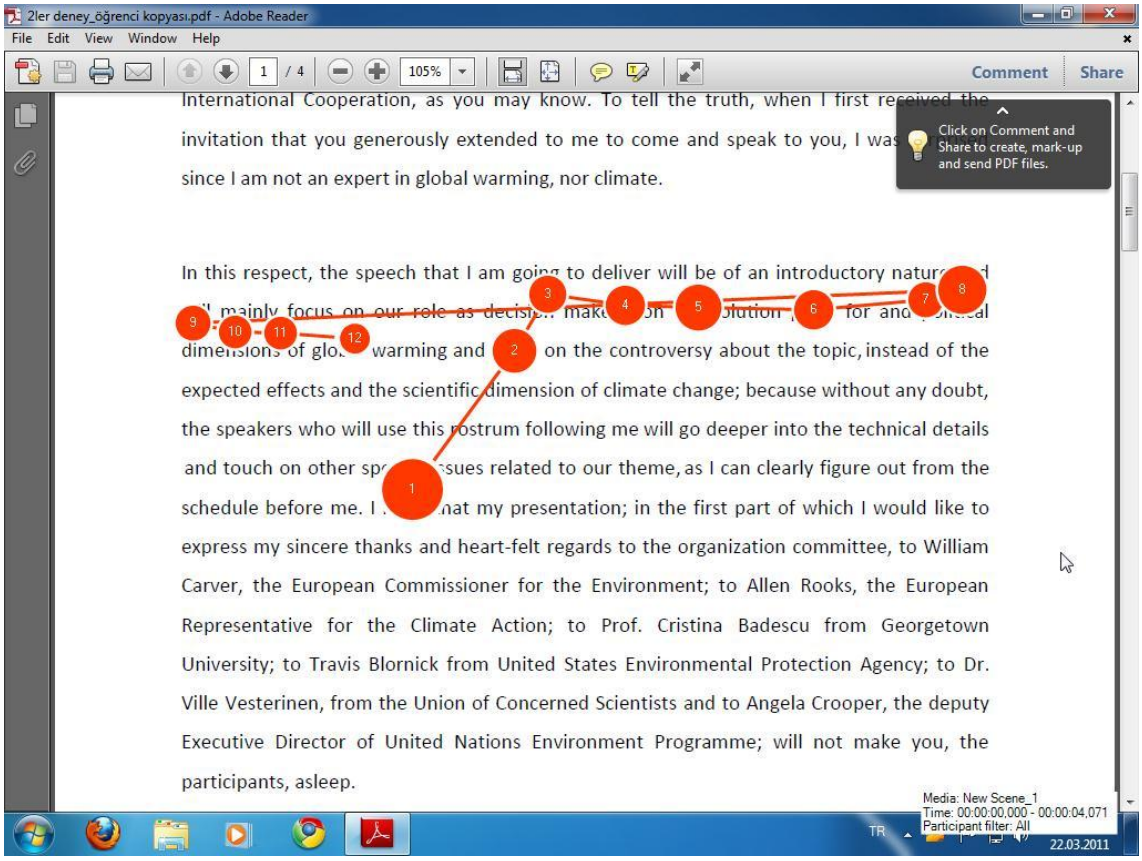


Figure 33

One of the most important points about reading patterns of Subject 5 is that the subject did not manage to use the allocated time efficiently and had to scan the last paragraphs, rather than reading. Figure 34 illustrates the reading patterns of the subject when time got limited yet he had still sections to read. By analysing even only eye movements with sharp saccades and excursive fixations, it is presumably suggested that the subject was in stress stemming from the time constraint. In this regard, the relation between stress and eye movements was discussed in numerous studies, which suggest that eye movements can be used to ameliorate post-traumatic stress disorder (see Andrade, Kavanagh and Baddeley, 1997). It is worth noting that such pattern resembles scanning in reading during SI to be specified below. It also presents a tangible proof that reading for SI is a matter of time management. The relation between cognitive load and SI performance was found as weak as discussed above. However, there are number of reasons to assert that time-management during reading for SI has an effect on SI performance, considering the poor SI

performance of Subject 5 and better SI performances of subjects, who managed the time efficiently enabling them to read the text for a second time (Subject 2, for instance).

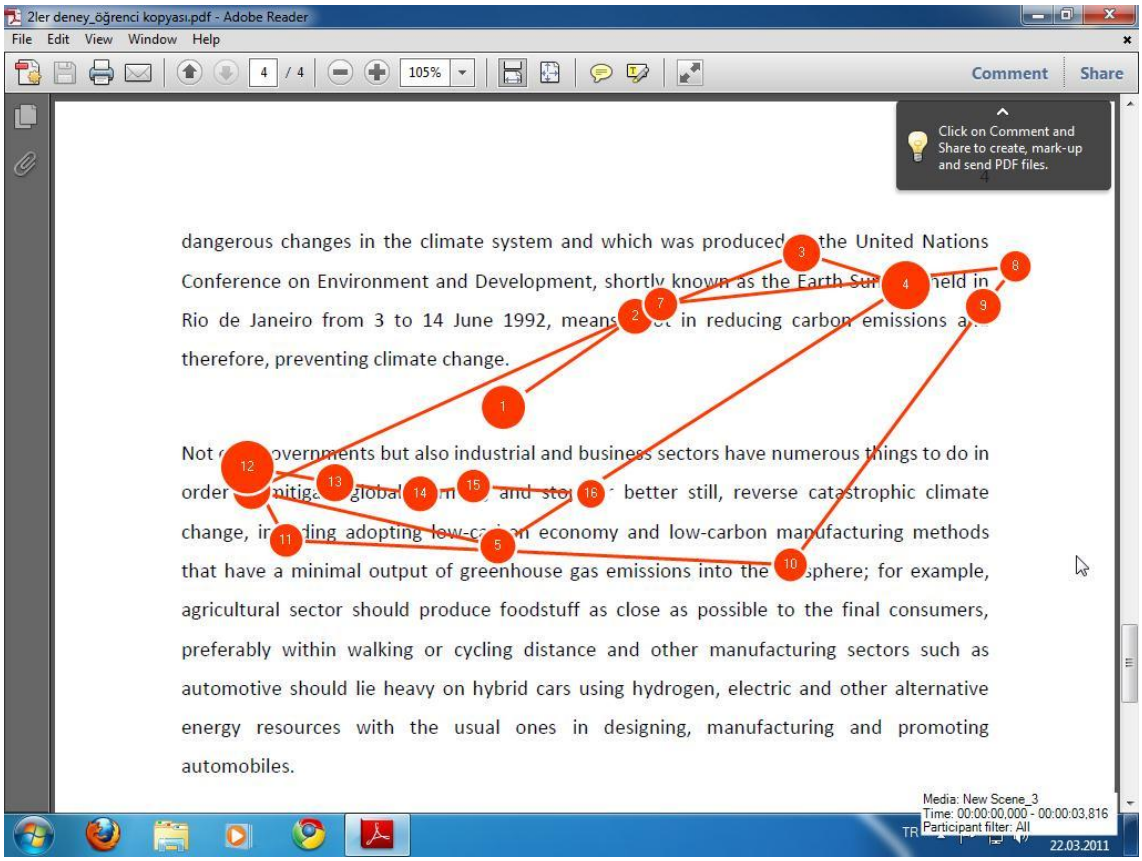


Figure 34

Cognitive Load

Subject 5 fixated on words or other linguistic segments within the text for 932 times during the reading task, which lasted for 4 minutes and 50.416 seconds. The total duration he spent on all these fixations was approximately 285303 ms and the average duration he spent on one fixation was approximately 306.1190987 ms.

Table 9

Cognitive Load Based on Gaze Data of Subject 5

Indicator	**Value**
Number of Fixations	932
Total Fixation Duration*	285303
Average Fixation Duration*	306.1190987
Task Length	00:04:50.416

* Values given as milliseconds.

SI Performance

Subject 5 scored **52.5 out of 150** in the SI test. The subject constructed full and meaningful sentences more than the other subjects in the same group and with relatively limited number of pauses. There were numerous misunderstandings in his performance, though. At certain moments, the subject preferred to benefit from his own world knowledge and used contextual and relevant expressions, which were not articulated by the speaker. For instance, in paragraph 5, he added a remark stating that *data taken from various parts of the world support the idea*, although the speaker mentions about *a team consisted of different players from the world*. Apart from the errors in proper names and numbers, one of the most glaring errors in terms of this study was that in paragraph 8 the subject interpreted *one degree Fahrenheit* as *2.5 to 10 Fahrenheit*. The speaker would mention about *2.5 to 10 Fahrenheit* in the following sentence. When the eye tracking video is analysed, it is observed that the subject highlighted the sentence with *2.5 to 10 Fahrenheit* and fixated on it for a long time. Therefore, most probably he memorized the specific numbers and said them during interpreting instead of what the speaker said. This is a salient example regarding the excessive effect of text on the interpreter and interpreting within the scope of reading for SI.

Retention Test

Subject 5 scored **35 out of 100** in the retention test.

SUBJECT 6

Reading Patterns

Subject 6 was the only subject who started reading the text without skipping words or phrases and followed the text with a relatively stable pattern as seen in Figure 35. There is a necessity to underline that Subject 6 had the highest score in the SI test (77.5) and the highest score in the retention test (60) with Subject 9 and Subject 12 among all other subjects in the main test. This result may suggest a hypothetical positive correlation between the stable patterns, or to be more specific, fewer skipping during the processing of the written text for SI and comprehension. Hence, it can be assumed that stable patterns during reading and few skipping may lead to deeper comprehension. It seems that comprehension level of the subject improved his SI performance and retention level accordingly. A vast volume of literature on eye movements suggest that lexical, syntactic and discourse-level variables have clear effects on eye movements control and therefore, word skipping as mentioned previously (see Staub and Rayner, 2007). Whether there exists a relation between word skipping and sentence comprehension has been the subject of various studies as well and authors imply the possibility of such a relation (see Underwood, 2005).

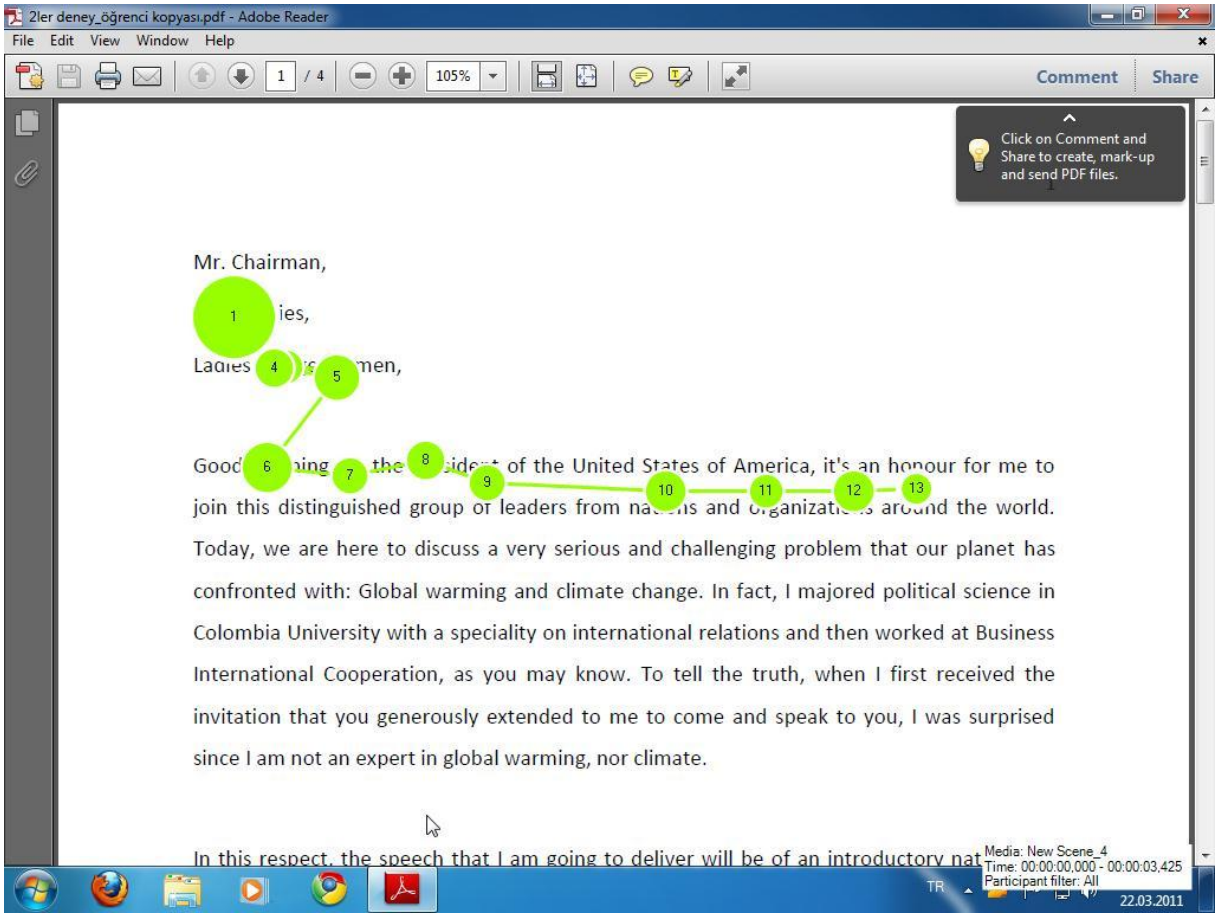


Figure 35

Subject 6 not only showed regular reading patterns but also re-read certain segments. As demonstrated in the Figure 36, this is not a typical second reading that is frequently seen following the completion of the whole text, instead, an **interim second reading** that the subject performed after he finished reading paragraph 1. In other words, the subject did not begin a second reading after he has completed reading the whole text; however, he re-read certain paragraphs as paragraph 1 after he completed reading them only. Considering the subject's score in SI and the retention test, it may not be wrong to assert that these kind of second readings also enhance comprehension. However, interim second readings take up much time and may not allow interpreters to re-read the whole text again. In this respect, going for a typical second reading or interim second reading seems to be a personal choice.

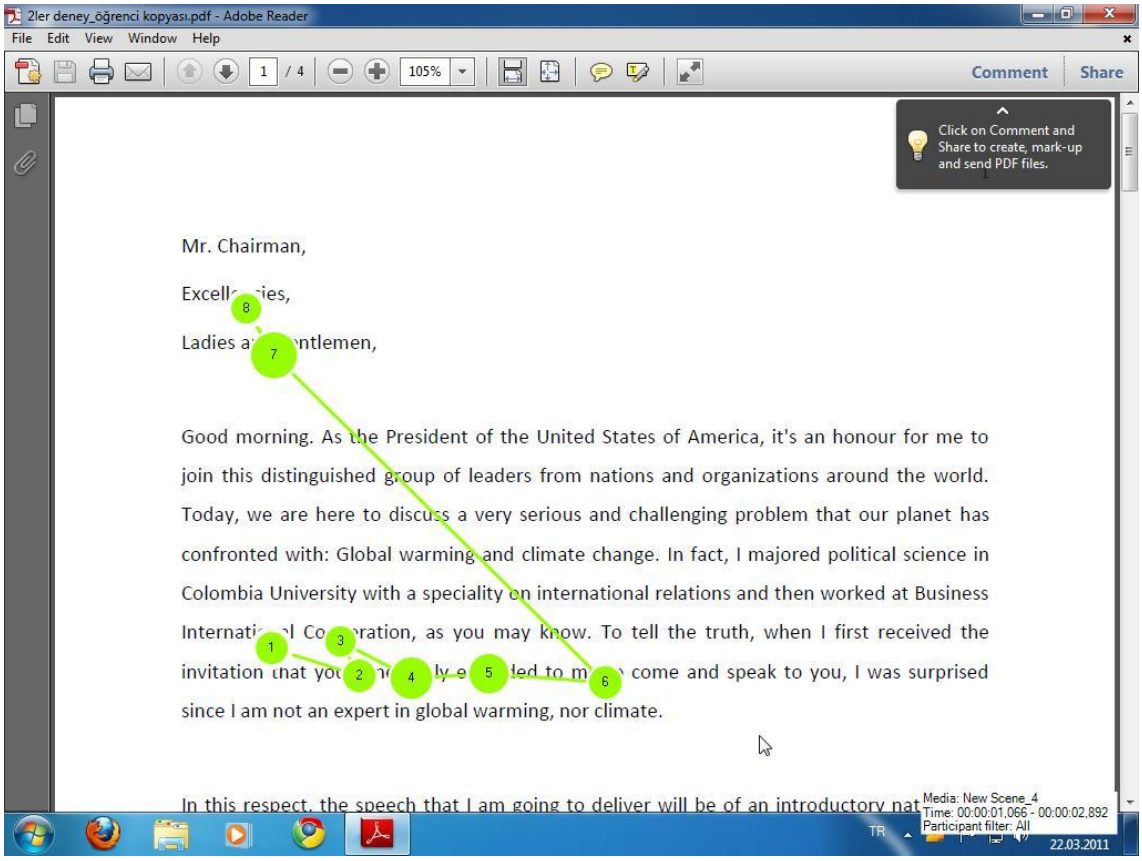


Figure 36

We observe a typical information processing behaviour with frequent regressions in Figure 37. Here, the sixth fixation can be regarded as a deviation from the regular pattern. Throughout the reading for SI process, interpreters may lose their attention, which can also be detected with eye movements. At times, it is observed that the subjects in G1 focused on non-textual areas on the screen, such as blank areas around the text, boxes in the Adobe Reader™ page or symbols on the task bar, tool bar and system tray. However, what is observed in fixation 6 may simply be a mislocated fixation. Whether such fixation can be controlled by the reader or not save time is a matter of discussion (*ibid.*, 2005).

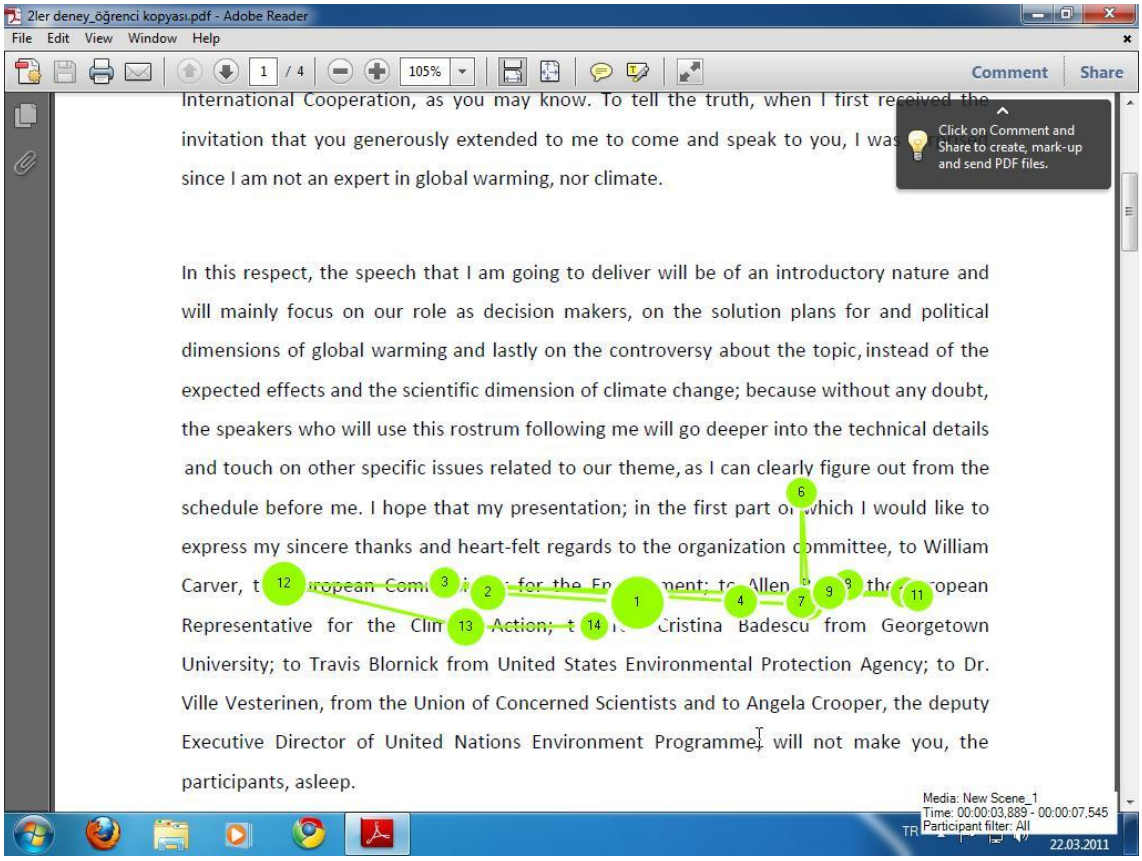


Figure 37

Cognitive Load

Subject 6 fixated on words or other linguistic segments within the text for 1049 times during the reading task, which lasted for 4 minutes and 45.816 seconds. The total duration he spent on all these fixations was approximately 234231 ms and the average duration he spent on one fixation was approximately 223.2897998 ms.

Table 10

Cognitive Load Based on Gaze Data of Subject 6

Indicator	**Value**
Number of Fixations	1049
Total Fixation Duration*	234231
Average Fixation Duration*	223.2897998
Task Length	00:04:45.816

* Values given as milliseconds.

SI Performance

Subject 6 managed to reflect the main idea of the speech in addition to interpreting minor details with relatively fewer errors. This performance brought him **77.5 out of 150**, which is the highest score of both G1 and G2. The errors he made were similar with other subjects in the group: He missed certain conjunctions (e.g. *despite the fact that*), misinterpreted figures (e.g. *380* instead of *308*) and interpreted *emission* as *emilim*. The most critical error in his performance was misinterpreting a segment saying that *the aim is to emit more* CO_2 *to biosphere*, which contradicts with the main idea of the text.

Retention Test

Subject 6 scored **60 out of 100** in the retention test.

GROUP 2

The subjects of Group 2 (G2) read the written text of the speech during SI performance and thus, along with the auditory record. Reading patterns and the gaze data, which will be specified below, belong to the eye tracking record taken during this SI performance. Subjects in G2 performed SI with text and subsequently, they answered questions in the questionnaire and the retention test. Reading patterns and SI performance will be presented and discussed for each subject below in addition to the general analysis. Individual findings about cognitive load and retention test will be presented for each subject as well, yet they will be discussed in 4.2 in a comparative manner. Findings about questionnaire will only be presented and discussed in 4.2.

SUBJECT 7

Reading Patterns

Reading patterns of G2 make sense when analysed in synchronization with the SI performance of the subjects since they processed the text along with the auditory input. In general, considerable difference between G1 and G2 was observed in terms of reading patterns; even analysis of Subject 1's on-line reading process during SI would be sufficient to present the difference. However, there are differences between the subjects in G2 as well in terms of text processing. The main reason of the difference was the ability of subjects in synchronizing the text with the auditory input. In this regard, two main kinds of reading patterns come to the fore under the title of reading during SI: (1) Following the text in synchronization with SI and, (2) Scanning through the text in order to find the text segment that is being uttered by the speaker at any given moment. The latter reading (or scanning) style was generally observed following the deviations since the subjects are observed to lost track of the text easily, when visual and auditory input did not match.

In this respect, Figure 38 below shows a typical reading process during SI, in which the reader is following the text with the auditory input (the second case). This kind of reading pattern can be characterized by numerous, frequent and long fixations, multiple fixations on the same spot and excessive number of regressions. This may be the empirical evidence that the subject exerted considerable cognitive effort while performing multiple sub-tasks; *i.e.*, listening, speaking, reading and interpreting as mentioned in the previous chapter. It would be applicable to state that Subject 7 was performing all these tasks at that very moment considering the fact that she was following the text in synchronization with the speech.

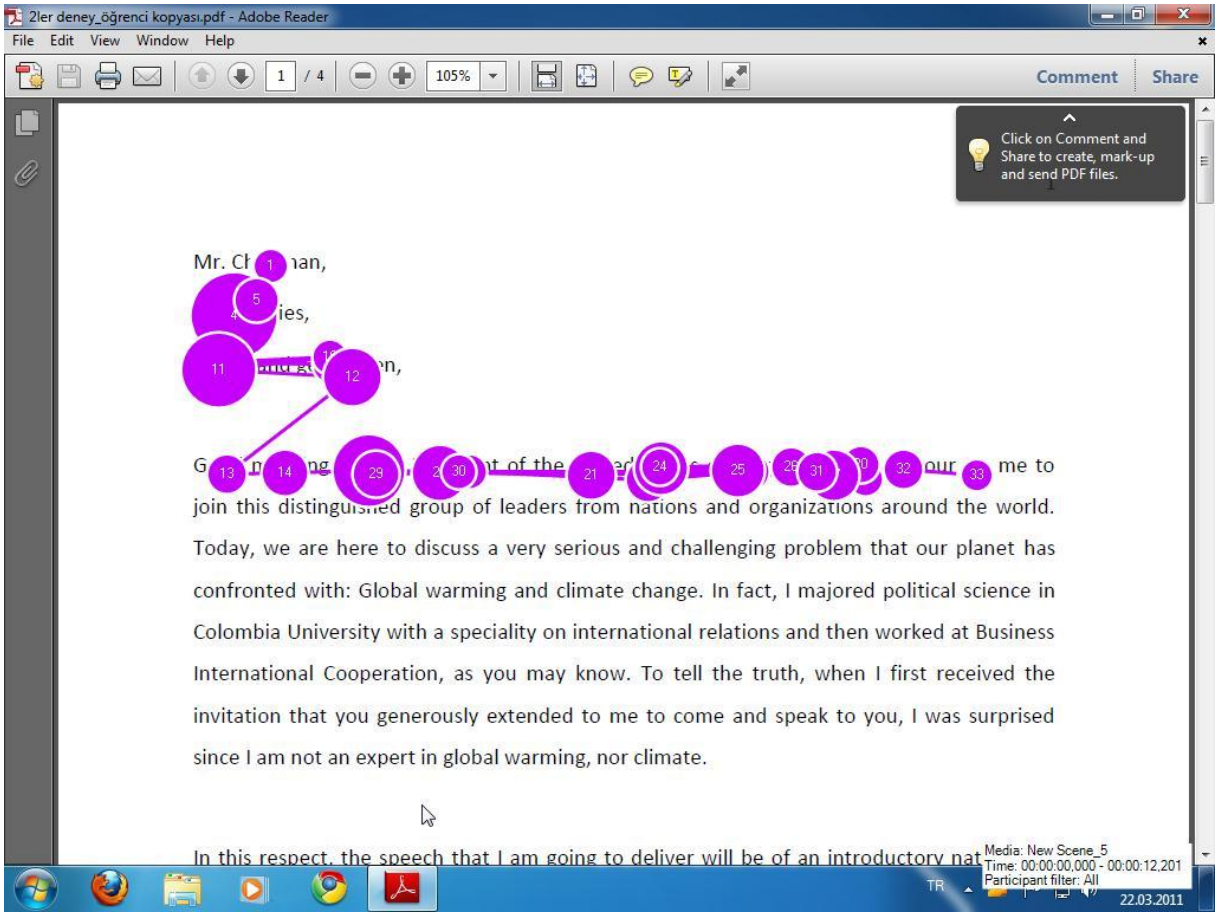


Figure 38

Figure 39 is the heat map of the same interval. By using heat map, it is much easier to detect and define characteristics of reading during SI. When the figure is compared with the heat map of Subject 1, the difference between reading for

SI and reading during SI can be scrutinized in detail (cf. Figure 14). As clearly seen from the figure, visual focal loci of the subject cover nearly every area of the paragraph with dense fixations. It is also remarkable that longer fixations begin where deviation begins in the paragraph. In this regard, longer fixations may be regarded as a reaction against deviations.

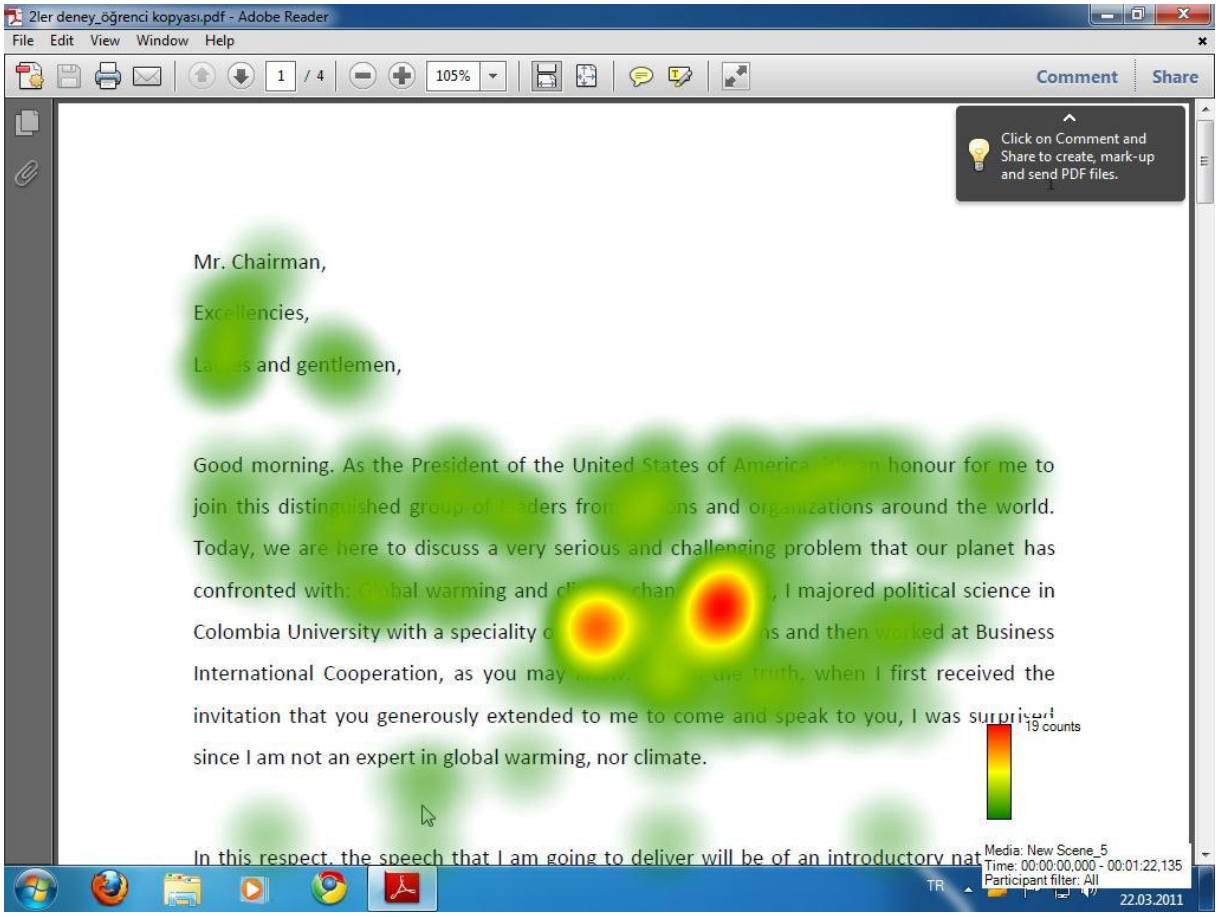


Figure 39

Figure 40 shows reading behaviour in case of deviation in a more explicit manner. The site of multiple fixations under the 15th fixation is the exact point where deviations begin. It is noticeable that the subject fixates on one specific spot for a very long duration and without any saccadic movement. In this regard, it can be asserted that the subject stopped reading for a certain duration, which resulted in a very dense fixation yet a sharp decrease in SI performance during this period. Even only with this reading behaviour, it would be reasonable to assert that availability of texts during SI may not be

necessarily advantageous for interpreters and effective management of texts during SI became critical at such braking points.

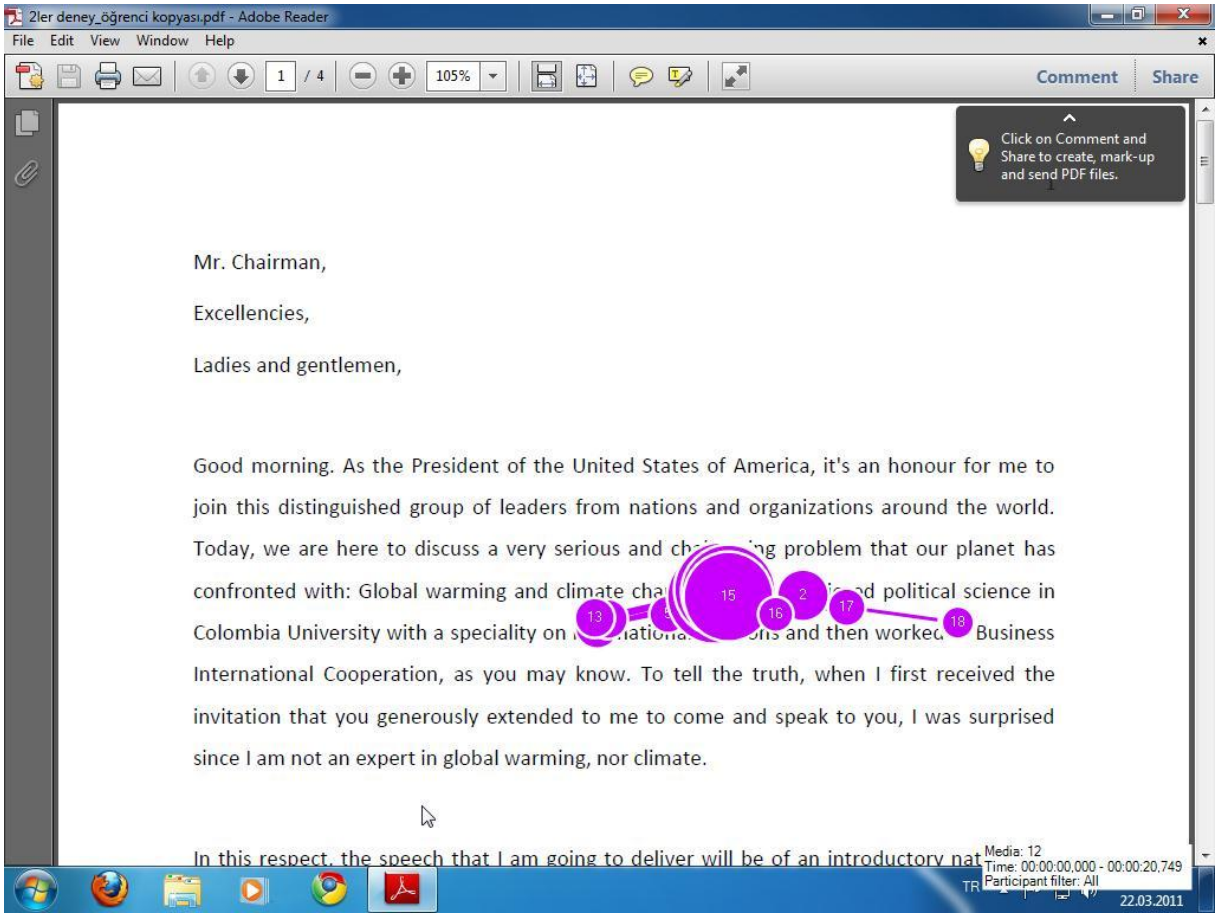


Figure 40

Figure 41 illustrates the second general reading pattern; *i.e.*, scanning through the text in order to find the segment that is being uttered by the speaker at any given moment. During the time interval selected to visualize the following pattern, Subject 7 was not following the text in synchronization with the speech. However, she tried to find and extract information by scanning through the text, characterized with erratic eye movements. The segment used in the figure is an information-dense sentence with numerous proper names. In this regard, it would not be wrong to assert that the requirement to find and process the information arises when the subject comes across with the specific linguistic segments.

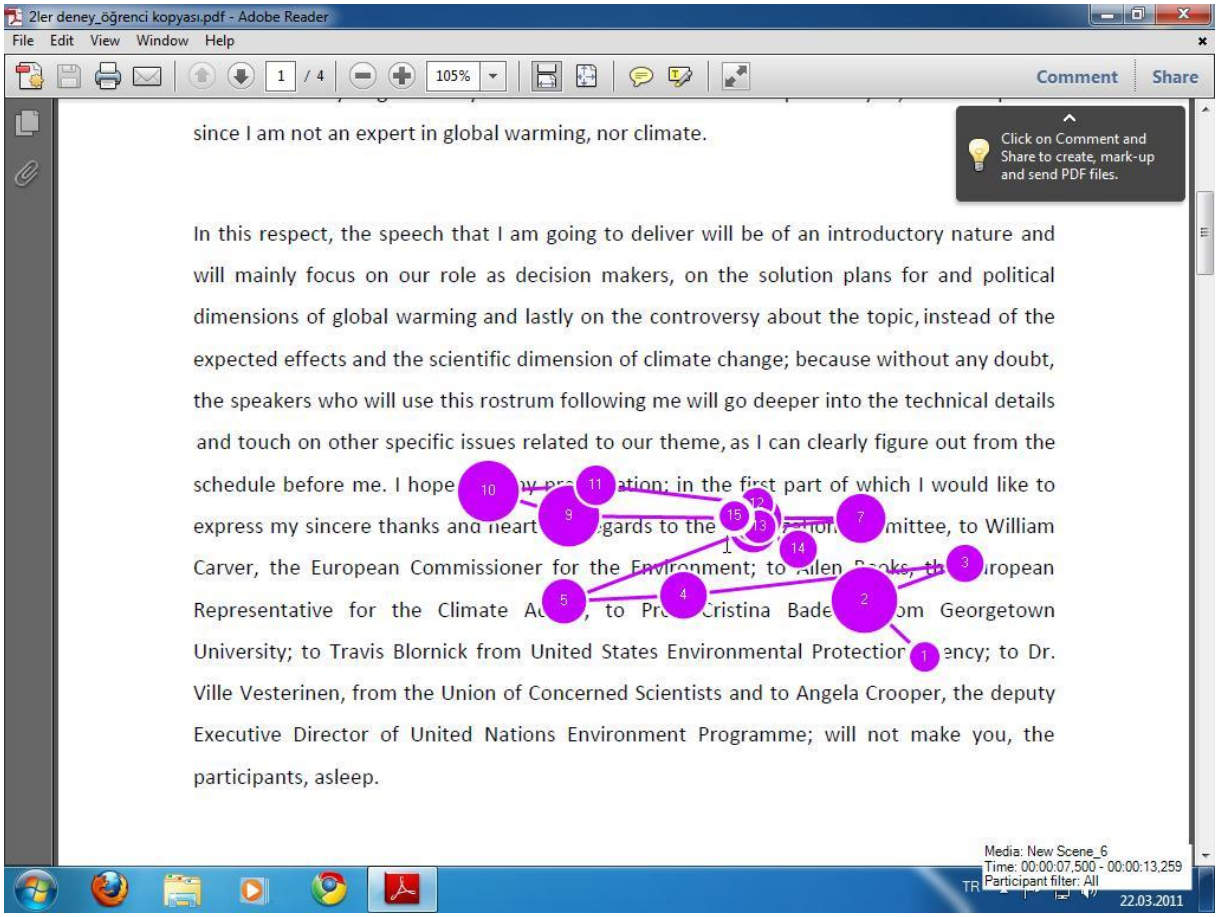


Figure 41

Scanning through the text with rapid and anomalous eye movements, illustrated in Figure 40, was beneficial for the subject and she aligned with the text again with the help of the auditory input. When she found the correct segment of the speech on the text, she produced an exclamation sound, suggesting the psychological influence of re-synchronization. However, there were multiple deviations in the speech and not so long before, she lost the track of the speech again in the second deviation, where the order of sentences was switched. In this respect, Figure 42 depicts the eye movements of the subject following this deviation. As seen clearly from the figure, the subject's eye movements became even more unstable than last time. Long and multiple fixations, long saccades between sentences and even pages, fixations on irrelevant sites, transitions between segments are frequently seen during the selected interval. Scrolling behaviour of subjects following a deviation is also worth mentioning. Subject 7, for instance, scrolled down until the end of the text on tenterhooks in order to

find the relevant sentence, when she came across with the deviation of switched sentences although the speaker was reading the segment that was only a sentence below. This kind of scrolling management was costly to the interpreter. With the continuously flowing auditory data, she could not manage to synchronize the text with the speech again until the end of SI/reading task. Therefore, the text began to be a distractor, instead of an aid from that moment on.

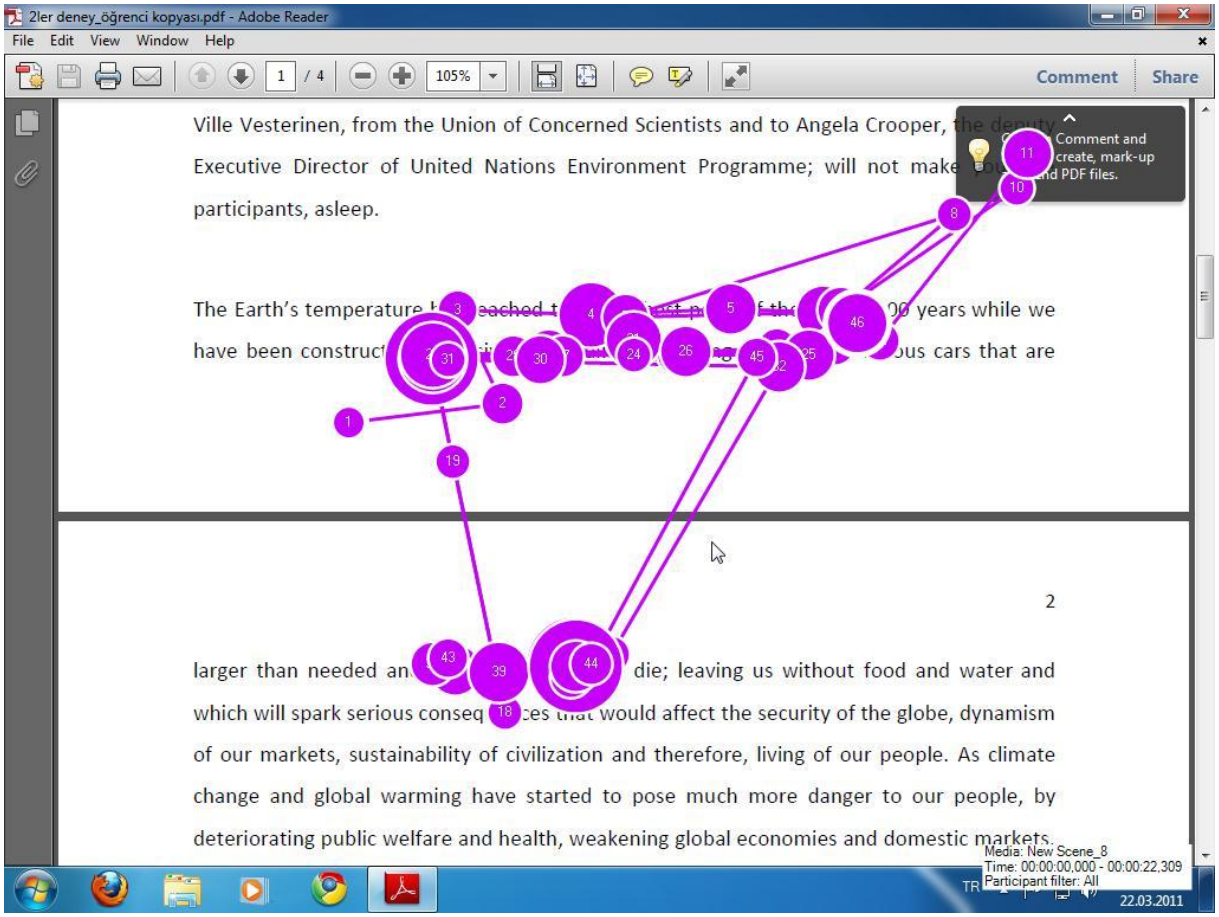


Figure 42

In Figure 43, we could see a circular reading pattern, which was frequently observed especially when the subjects in G2 quickly scanned the text to find the relevant segment during SI. Counter-clockwise pattern suggests a backwards scrolling in case of deviation. Such a reading pattern supports the view that non-synchronized reading during SI bears a resemblance to eye movements

during active tasks such as scene perception and (free) visual search of real-world objects (see Land, 2007).

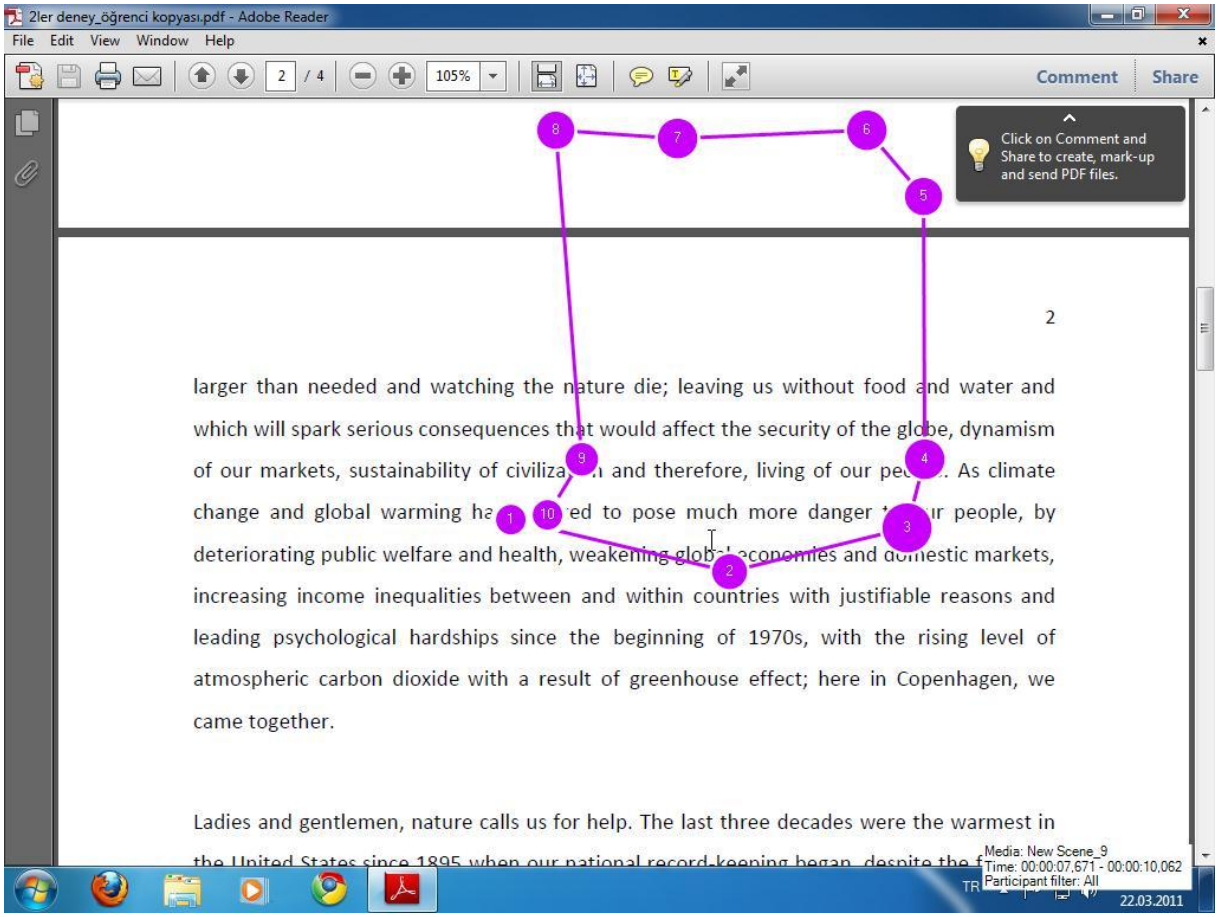


Figure 43

Cognitive Load

Subject 7 fixated on words or other linguistic segments within the text for 1886 times during the reading task, which lasted for 12 minutes and 13.925 seconds. The total duration she spent on all these fixations was approximately 625201 ms and the average duration she spent on one fixation was approximately 331.4957582 ms.

Table 11

Cognitive Load Based on Gaze Data of Subject 7

Indicator	**Value**
Number of Fixations	1886
Total Fixation Duration*	625201
Average Fixation Duration*	331.4957582
Task Length	00:12:13.925

* Values given as milliseconds.

SI Performance

Subject 7's SI performance is important to give an idea about interpreting with text and the results were expected and illuminating. The most crucial indicator is her low score, **33 out of 150**, which also the lowest of the test. There were numerous notable errors, resulting in this poor performance. For instance, she generally could not articulate proper names and she rounded the numbers, gave long pauses in paragraph 3 and 4, made critical errors in interpreting conjunctions, made semantic mistakes stemming from poor comprehension, such as interpreting *emission* as *emilim* etc. Along with that, she managed to benefit from the visual input very limitedly and interpreted three protocol names while following them through the text. In general, she had severe difficulty in interpreting the essence of the speech.

Retention Test

Subject 7 scored **25 out of 100** in the retention test.

SUBJECT 8

Reading Patterns

Figure 44 depicts Subject 8's pre-reading eye movements, with which the subject quickly scanned the paragraph with very long saccades and without scrolling down. Fixations on distracting objects such as the symbol on the task bar or the small information window on the top right were also conspicuous. This kind of reading pattern resembles the second reading behaviour in G2. In this regard, it could be stated that long saccades covering the whole paragraph may refer to the effort of comprehending the paragraph at once.

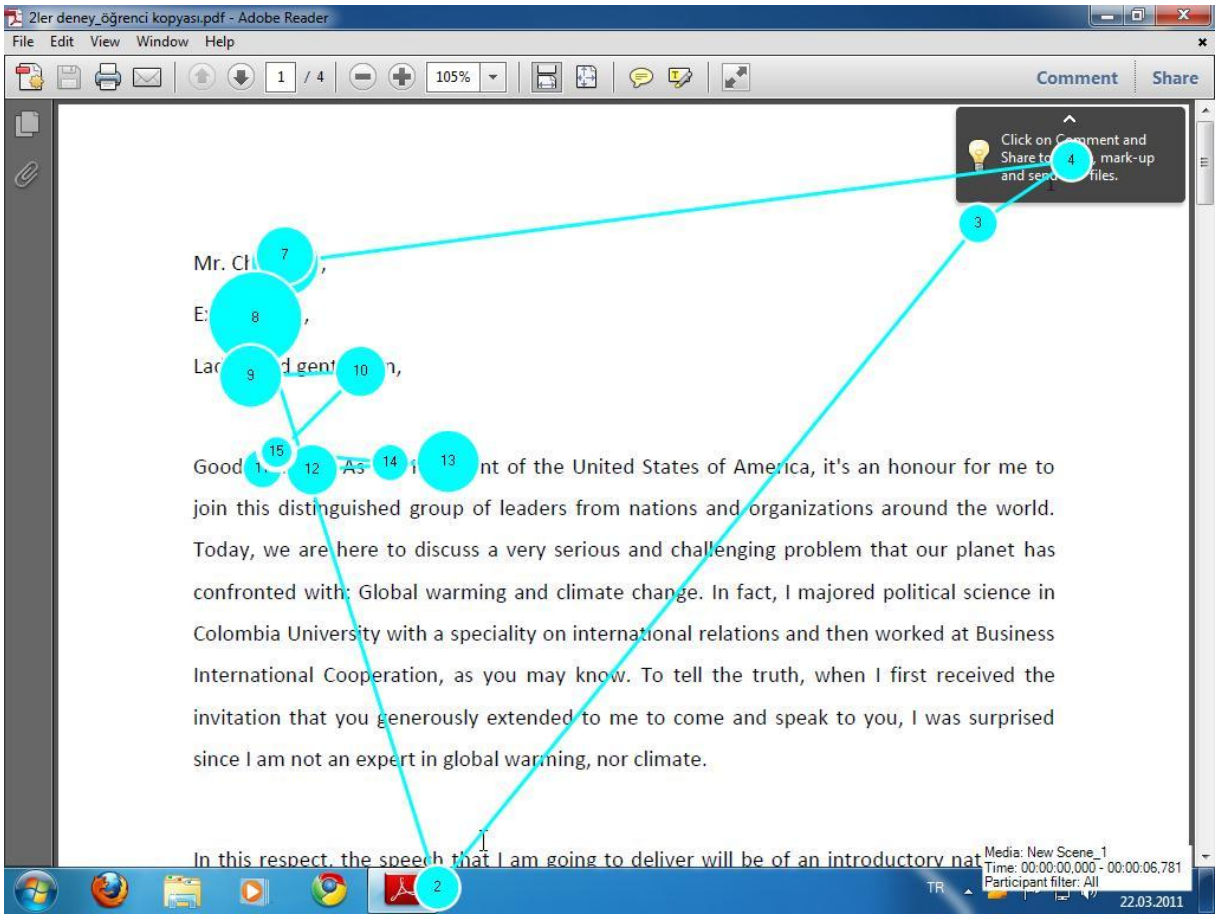


Figure 44

When the subject finished scanning the paragraph, she began reading and interpreting. Within this segment, reading patterns demonstrated the

characteristics of synchronized reading, since she followed the text with the auditory input. Along with that, it is notable that the eye movements of the subject got faster when she proceeded to the fourth sentence of paragraph 1, where the first deviation began (cf. Figure 37). The sixth fixation is another example of dispersing saccades following a stable pattern.

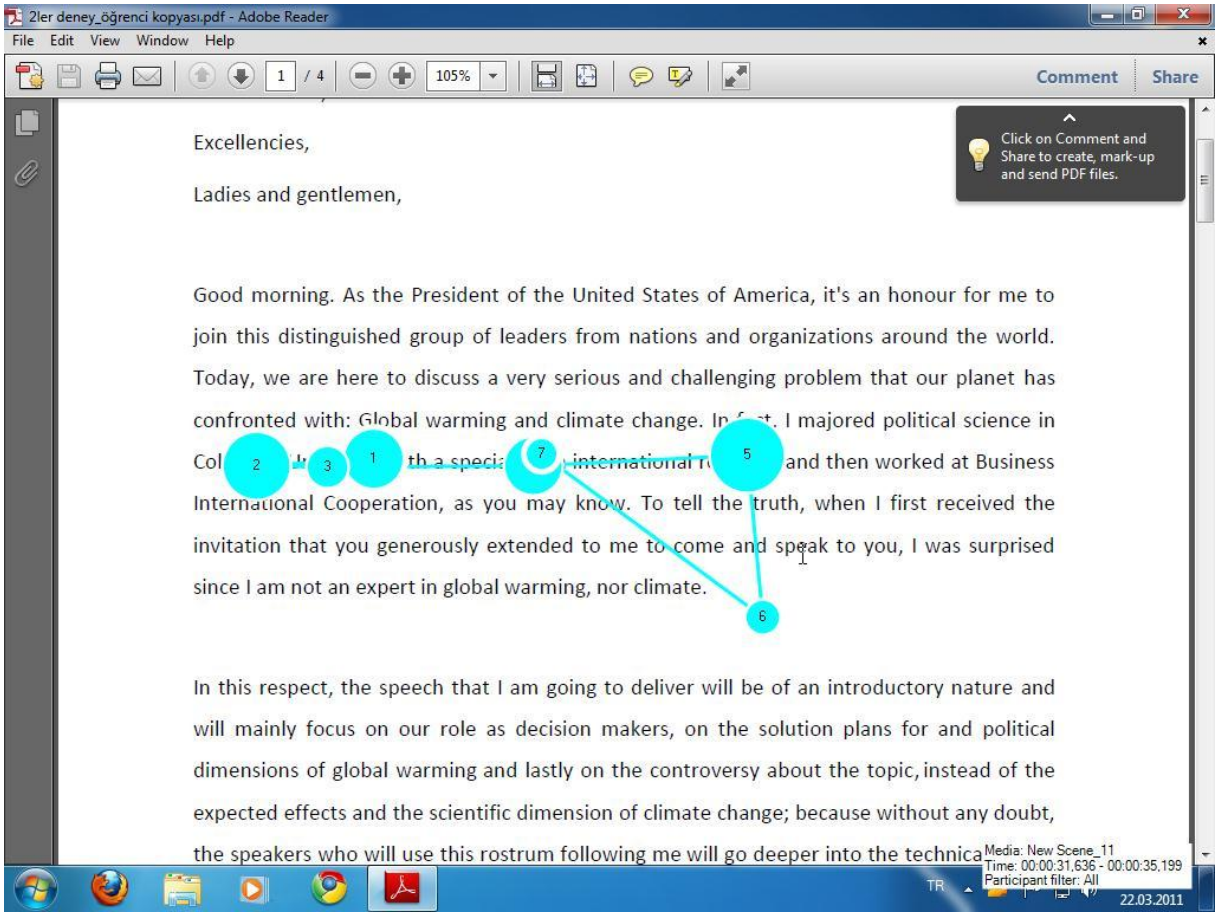


Figure 45

Figure 46 is a demonstration of excessive erratic movements during non-synchronized reading, through which the subject was searching for the related auditory information. When compared with the previous figure, it is noticeable that anomalous eye movements got intensified gradually. In this respect, the following figure depicts one of the most intensified points of deviated gaze path.

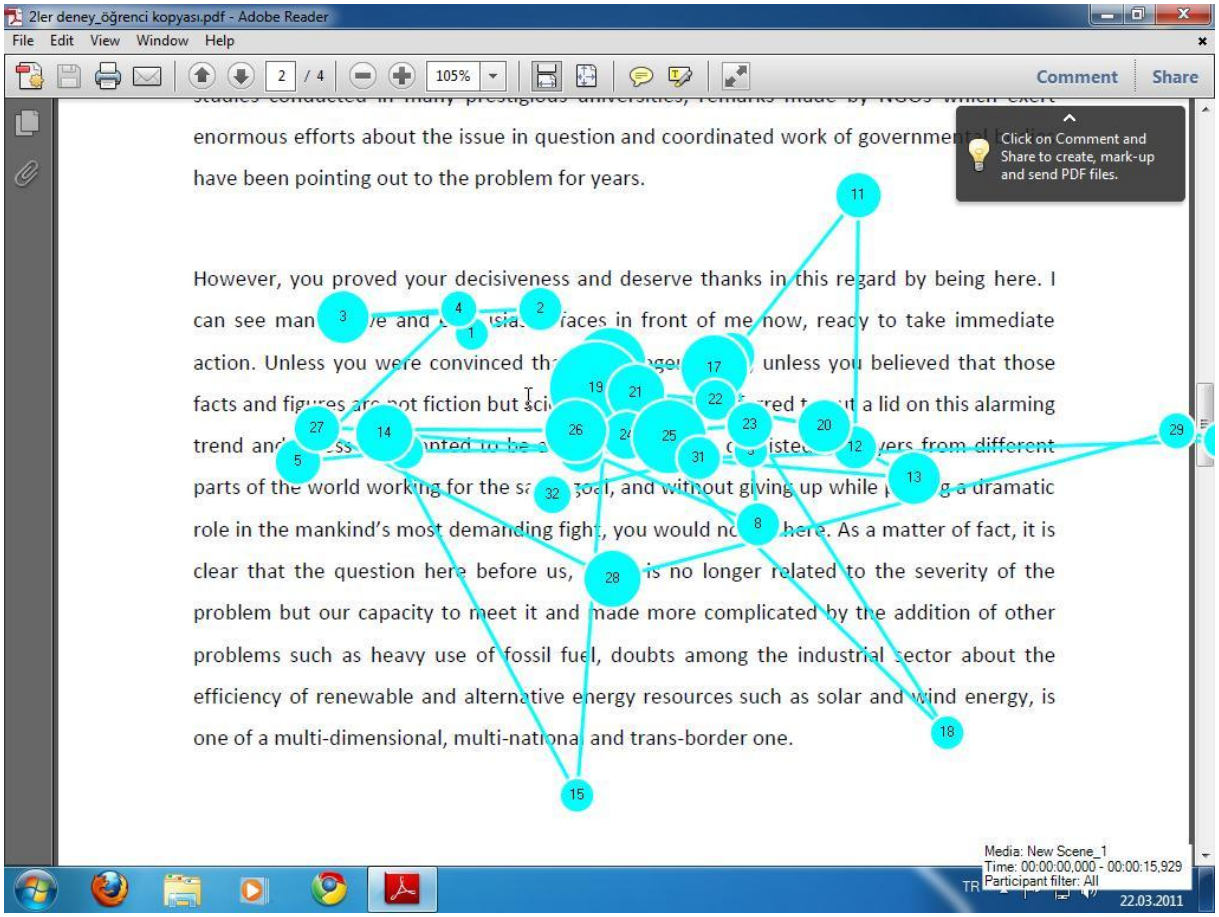


Figure 46

The subject found the correct segment of the text again after certain duration of non-synchronized reading as shown in Figure 47. It is highly intriguing that the moment of synchronization began with longer fixations as in the first and the second fixations in the figure. Furthermore, the subject clicked on the text for a couple of times at that moment probably in order to manage the text physically. Although the following fixations slightly differ from other synchronized reading behaviours, it is still a protruding example of synchronized reading during SI.

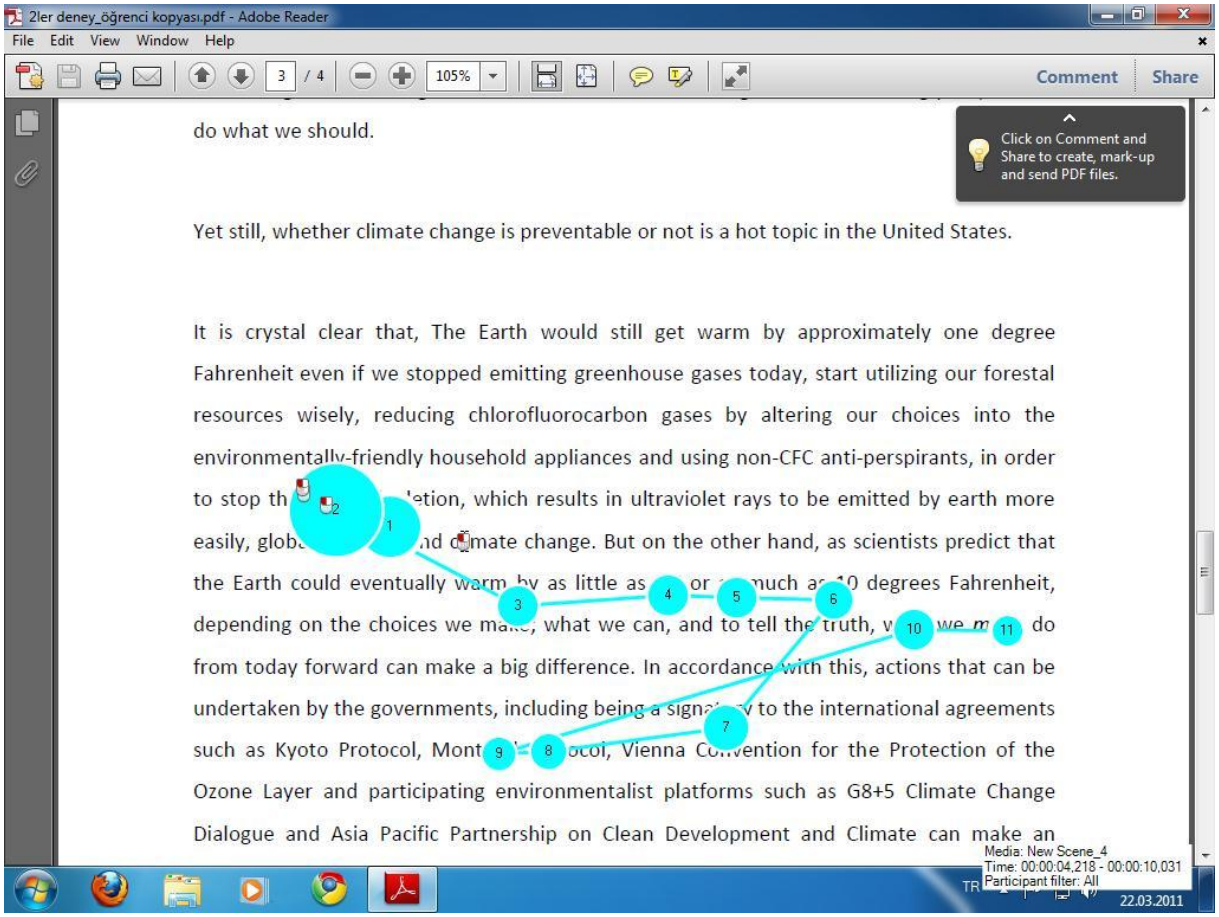


Figure 47

Cognitive Load

Subject 8 fixated on words or other linguistic segments within the text for 1523 times during the reading task, which lasted for 12 minutes and 5.822 seconds. The total duration she spent on all these fixations was approximately 547613 ms and the average duration she spent on one fixation was approximately 359.5620486 ms.

Table 12

Cognitive Load Based on Gaze Data of Subject 8

Indicator	**Value**
Number of Fixations	1523
Total Fixation Duration*	547613
Average Fixation Duration*	359.5620486
Task Length	00:12:05.822

* Values given as milliseconds.

SI Performance

Subject 8 scored **63.5 out of 150** in the SI test. This score can be regarded as above average considering the mean score of the test, which is **57.7**. The subject made a promising start while she was interpreting the warming up paragraph. In general, she performed SI with a controlled and reassuring tone and style. However, awkward or informal sentences such as *petrol-driven cars emit very bad things* etc. were frequent in the record, although she formed more completed sentences when compared to other subjects in G2. Furthermore, she made numerous lexical errors such as interpreting *factories* as *firmalar (firms)*, to *stabilize* as *to decrease*, *concentrations* as *emissions*, *electric* as *electronic*, *sceptic* as *anxious* etc. There were errors in figures as well. Nonetheless, she gave nearly no pauses during the performance. On the whole, there seems a switch between lexical and syntactic efforts in SI performance of the subject. In other words, the subject performed SI on the syntactic level rather than lexical, which is evident from the errors in specific words yet well-constructed sentences in the target language. It is highly difficult to label one of the two as 'better' since syntactic errors lead to critical disfigurement in the output as lexical errors do. Furthermore, the target audience may infer the context of the speech despite lexical errors; however, this may not be likely in the event of syntactic errors in the interpreting. Nonetheless, the type of lexical error is

highly significative here as some words in the text, such as terms and key words, may change the overall meaning dramatically. As a result, the severity of the errors in SI performance may be related with the register of the text.

Retention Test

Subject 8 scored **45 out of 100** in the retention test.

SUBJECT 9

Reading Patterns

The figure below illustrates Subject 9's reading behaviour from the point when the first deviation occurs. As seen from the figure, the subject lost her reading control as soon as she became aware of the difference between the auditory and visual inputs. This pattern is rather divergent even when compared to non-synchronized reading during SI. Since the subject did not scan the text for information consciously, yet only try to concentrate on auditory input and meanwhile, fixate on the text haphazardly. Thus, it would be more convenient to distinguish this reading pattern from others, although it was still performed in the event of non-synchronized reading during SI.

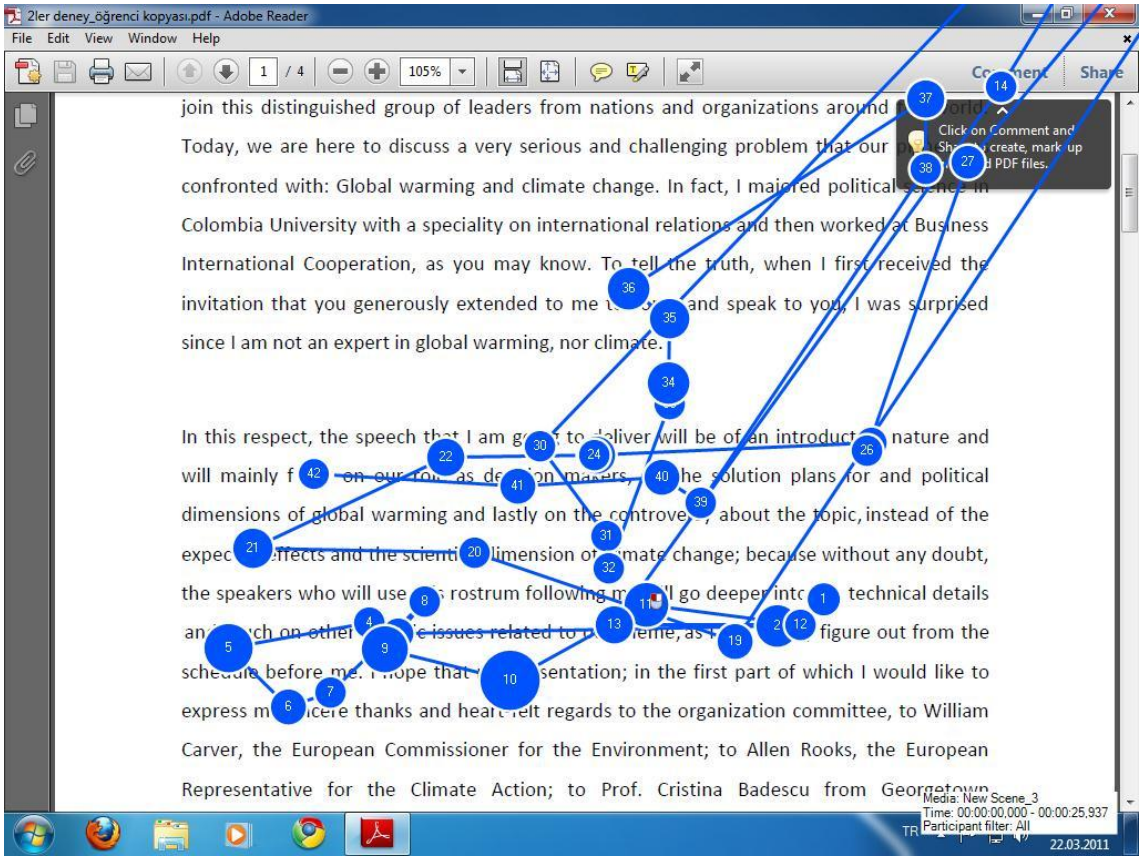


Figure 48

The subject found the related segment again as shown in the figure below. This figure is illuminating in comparing reading for SI and synchronized reading during SI. Although two reading behaviours seem similar to each other, eye movements can be regarded as fuzzier compared to those of subjects in G1. Multiple and frequent fixations and frequent regressive movements seem to be distinguishing features of synchronized reading during SI. Increased number of fixations can be regarded as the manifestation of heavier cognitive load (see Sharmin, Špakov, Räihä and Jakobsen, 2008).

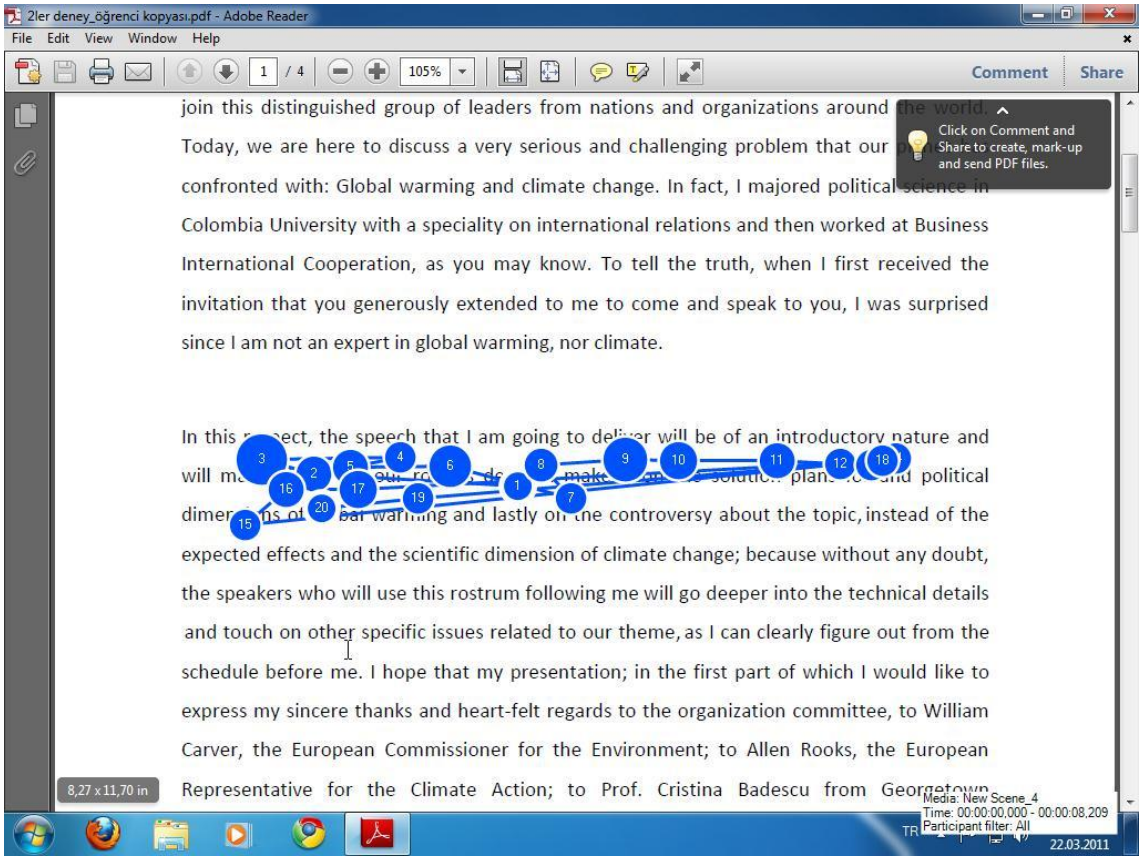


Figure 49

Following the text even with the auditory input cannot sometimes be as stable as the previous reading pattern. In Figure 50, the subject exerted an effort to focus primarily on names of persons and institutions. However, auditory input was faster than the subject's reading pace in any case, considering interpreting and reading L2 tasks, which also required additional time. As a result, fast regressions to process the text were detected. Another reason for this slightly erratic pattern may be the syntactic differences between English and Turkish languages. Under these circumstances, the subject missed some specific linguistic segments in the section in question although she managed to follow the text.

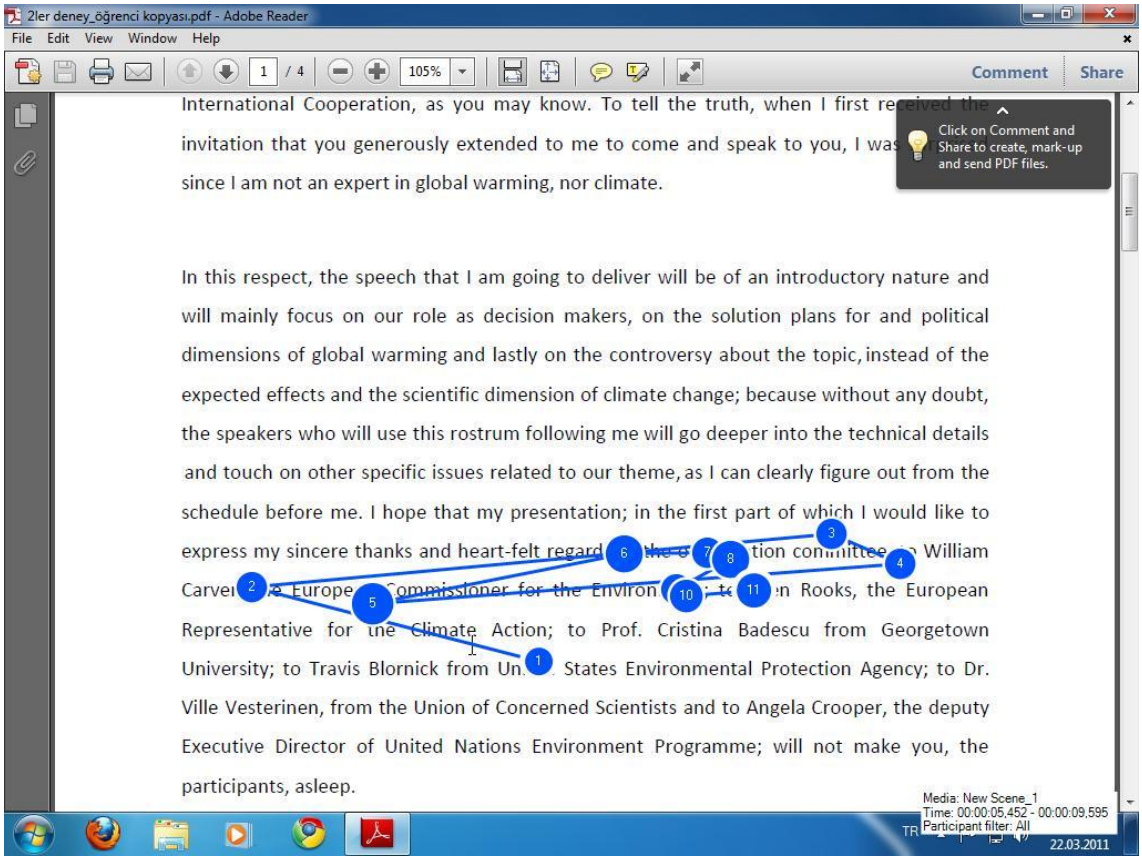


Figure 50

Cognitive Load

Subject 9 fixated on words or other linguistic segments within the text for 1882 times during the reading task, which lasted for 12 minutes and 20.130 seconds. The total duration she spent on all these fixations was approximately 508485 ms and the average duration she spent on one fixation was approximately 270.1833156 ms. Subject 9's fixation measures were relatively lower when compared to other subjects in G2. However, it does not manifest an exceptional case within the general pattern since the subject lost contact with the eye tracker for numerous times by moving her head, which resulted in lost segments in recording.

Table 13

Cognitive Load Based on Gaze Data of Subject 9

Indicator	**Value**
Number of Fixations	1882
Total Fixation Duration*	508485
Average Fixation Duration*	270.1833156
Task Length	00:12:20.130

* Values given as milliseconds.

SI Performance

Subject 9 scored **65 out of 150**. There is a strong connection between eye movements of the subject and her SI performance. It is strikingly important that she exerted considerably successful performance in paragraph 6 and partly in paragraph 8 and 9, which are information-dense paragraphs and contain numerous figures. It is observed that the subject followed the text during interpreting paragraph 6, 8 and 9; fixated on important segments for a long duration and thus, did nearly no mistakes in interpreting figures, unlike other subjects especially those in G1. It is also intriguing that the subject lost contact with the text while she was processing paragraph 2 and as a result, she had errors in interpreting titles, names of persons and organizations. This kind of fluctuation in performance proves that management of text in SI with text is directly related with the overall performance. However, she also had difficulty in noticing conjunctions such as *instead of* and *even if*, which changed the overall meaning of the output accordingly. It is also noteworthy that the subject could not complete sentences in the target language and got lost with the context of the text although she interpreted even minor details at a lexical level. This is thought to be related to over depending on the text during SI and bears importance when compared with other subjects' SI performances (cf. Subject 8).

Retention Test

Subject 9 scored **60 out of 100** in the retention test.

SUBJECT 10

Reading Patterns

Subject 10 started SI and reading with fairly stable patterns when compared to other subjects in G2. When Figure 51 is analysed, relatively steady saccades with frequent regressions and fixations can be seen. However, the duration of these fixations were shorter, at least for the initial segments of the text in comparison with the other subjects in the same group. This manifests a relatively lower cognitive load, which may be explained with textual ease for the subject. However, it may not be related with the other indicators in the test (see 4.2.6 for further details on the relation between indicators).

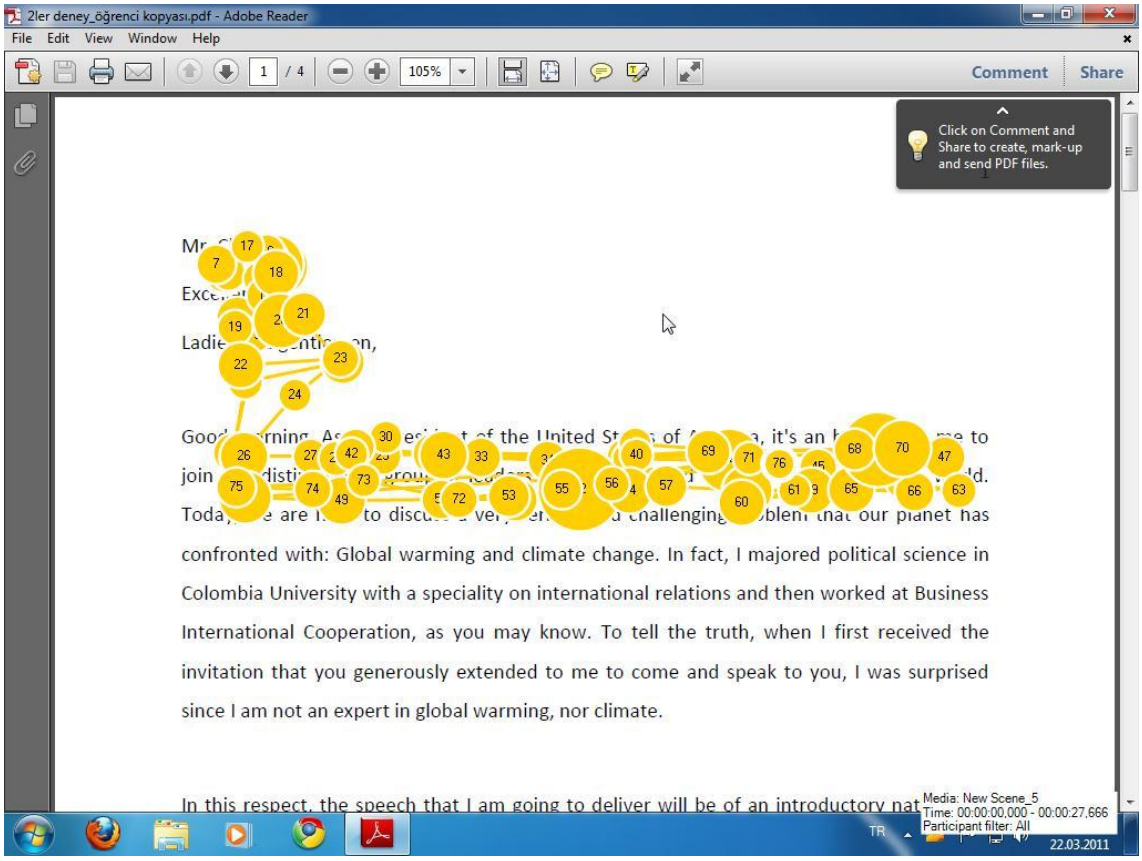


Figure 51

Figure 52 shows the eye movements of the subject at the segment, where the first deviation begins. It was mentioned above that (see Figure 40 and 45) synchronization moment of the text could be characterized with longer and dense fixations. Here, we observe that desynchronization can also be characterized with longer fixations (see the seventh fixation). It is also worth mentioning that the eye movements following the deviation followed an upwards direction first instead of scrolling down and searching for information. However, it does not seem to be a deliberate choice yet rather a haphazard and erratic behaviour.

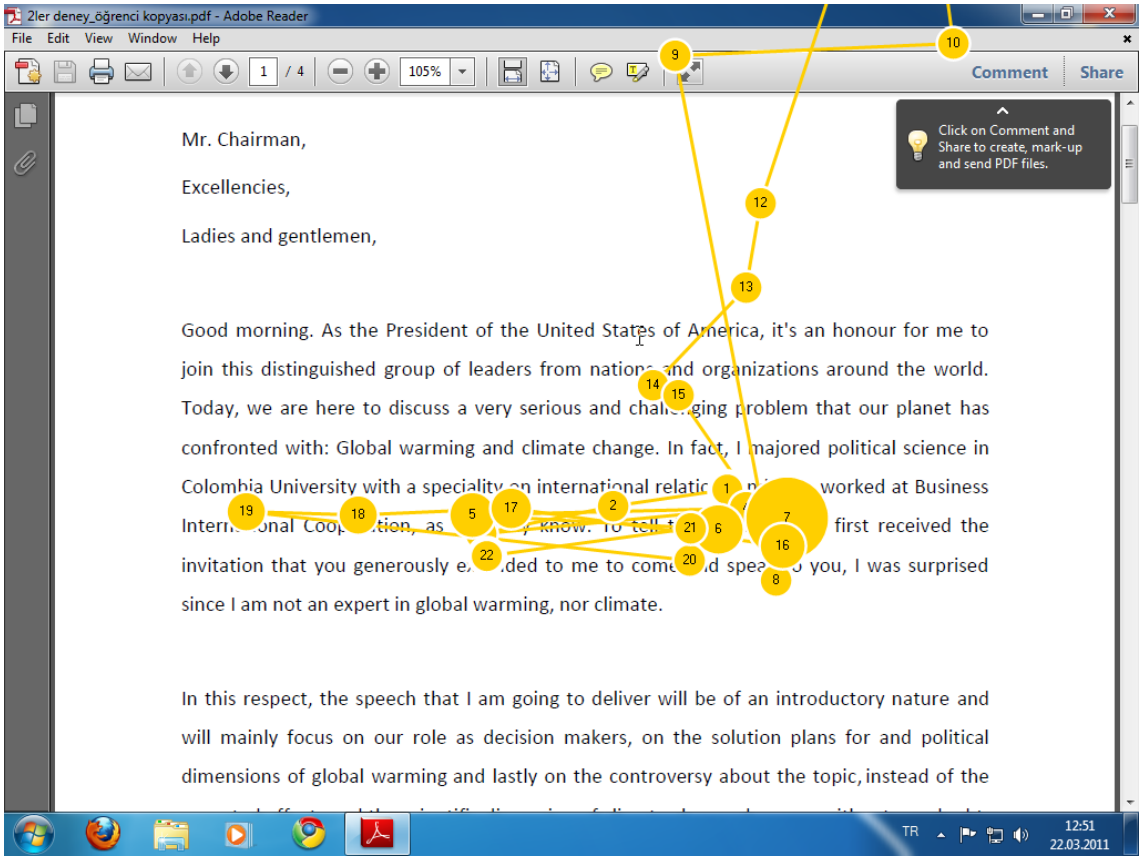


Figure 52

In Figure 53, it is possible to observe a **fast scanning** behaviour, in which the subject quickly scanned the paragraph with the eye movement in triangular shape (1, 2, 3, 4 and 5). Since other subjects set similar patterns in fast scanning (cf. Figure 43), it could be stated that triangular patterns may be defined as a characteristic of scanning in text processing. A similar triangular pattern in web sites of search engines is named as **Google's golden triangle** or **F formation**, which is located on the top left of the screen (see Hotchkiss, Alston and Edwards, 2005).

Another important point about the segment in question is the subject's accomplishment in following the numbers with the auditory input. First, it resulted in a remarkably better performance in paragraph 6. The effect of textual presence during SI manifests itself mostly when numbers and proper nouns are concerned. In this respect, Mazza (2000) stated that no valid comprehensive strategy has been identified to deal with numbers apart from

note-taking and boothmate's aid in writing down names and figures. However, in SI with text, synchronized reading, if possible, seems to be a plausible and effective method in interpreting these extremely difficult linguistic items.

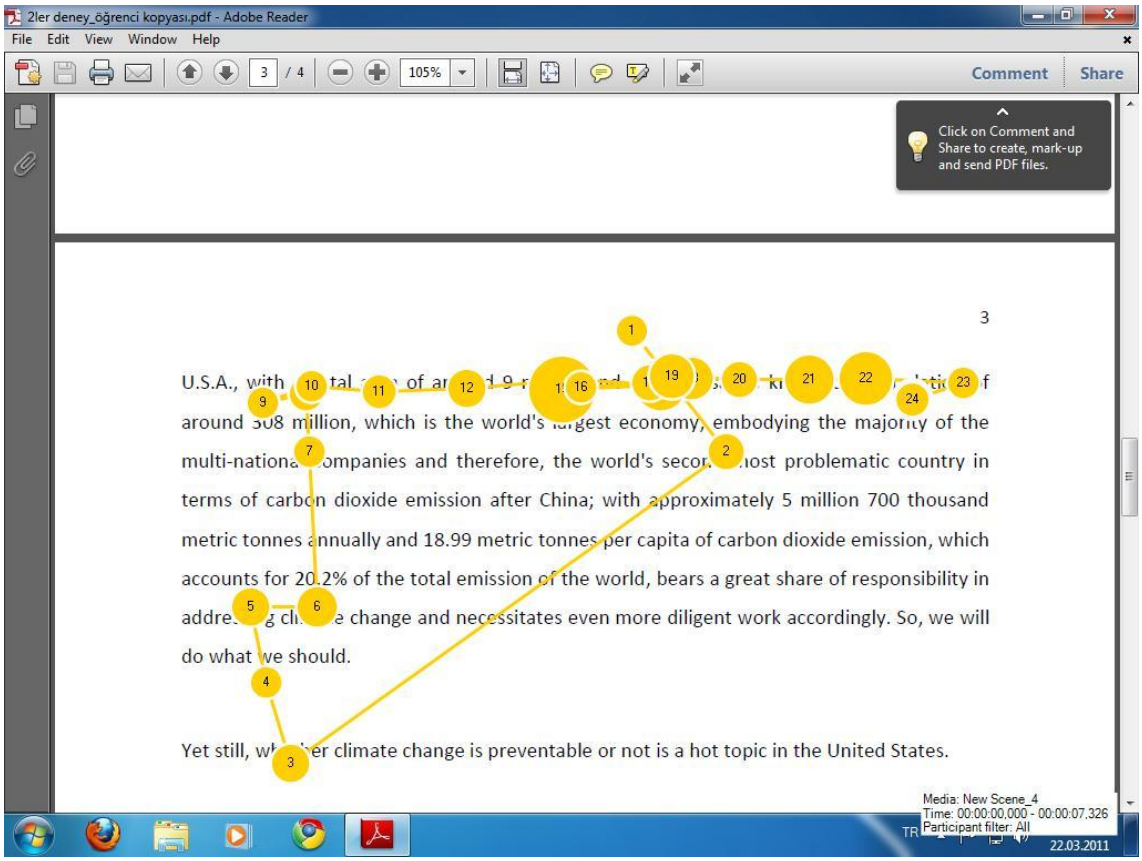


Figure 53

Cognitive Load

Subject 10 fixated on words or other linguistic segments within the text for 2097 times during the reading task, which lasted for 12 minutes and 6.127 seconds. The total duration she spent on all these fixations was approximately 624835 ms and the average duration she spent on one fixation was 297.9661421 ms**.**

Table 14

Cognitive Load Based on Gaze Data of Subject 10

Indicator	**Value**
Number of Fixations	2097
Total Fixation Duration*	624835
Average Fixation Duration*	297.9661421
Task Length	00:12:06.127

* Values given as milliseconds.

SI Performance

Subject 10 scored **54.5 out of 150** points in the SI test. As a characteristic of SI performances in G2, the subject had severe difficulty in forming full and meaningful sentences due to overdependence on the text when she was following the text and due to searching effort when she was performing non-synchronized reading. As for managing deviations, she delivered a relatively poor performance. For instance, she fell into the trap of deviations and interpreted *Dr. Christina Badescu* as *Prof. Christina Badescu.* Furthermore, the subject was inversely influenced by the text and interpreted *psychological* as *physiological* (*fizyolojik* in Turkish), which also proves the adverse effect of written text in SI with text. It is assumed that if she had focused on auditory channel instead of visual one, she would have interpreted it correctly, as there is not a phonetic resemblance between *psychological* and *physiological* yet a graphical one. This error is thought to be arisen from **lexical interference** between the source and target languages and lexical interference may clearly be associated with the over-dependence on the written text in SI with text.

Retention Test

Subject 10 scored **40 out of 100** in the retention test.

SUBJECT 11

Reading Patterns

Reading performance regarding Subject 11 during SI is a salient example of one of the common cases in SI with text: losing the track of text with deviations. The subject lost track with the text in the first deviation (see Figure 54) and not long after, found it again. However, the second deviation, which was nearly at the beginning of the speech and text, became the breakaway point for the subject since he could not synchronize the text with the speech until approximately 11th minute. Still, he managed to interpret proper nouns with the guidance of visual input. The subject's eye movements can be characterised with very rapid saccades, relatively shorter fixations and undirected gaze paths, which cover the majority of the eye tracking record.

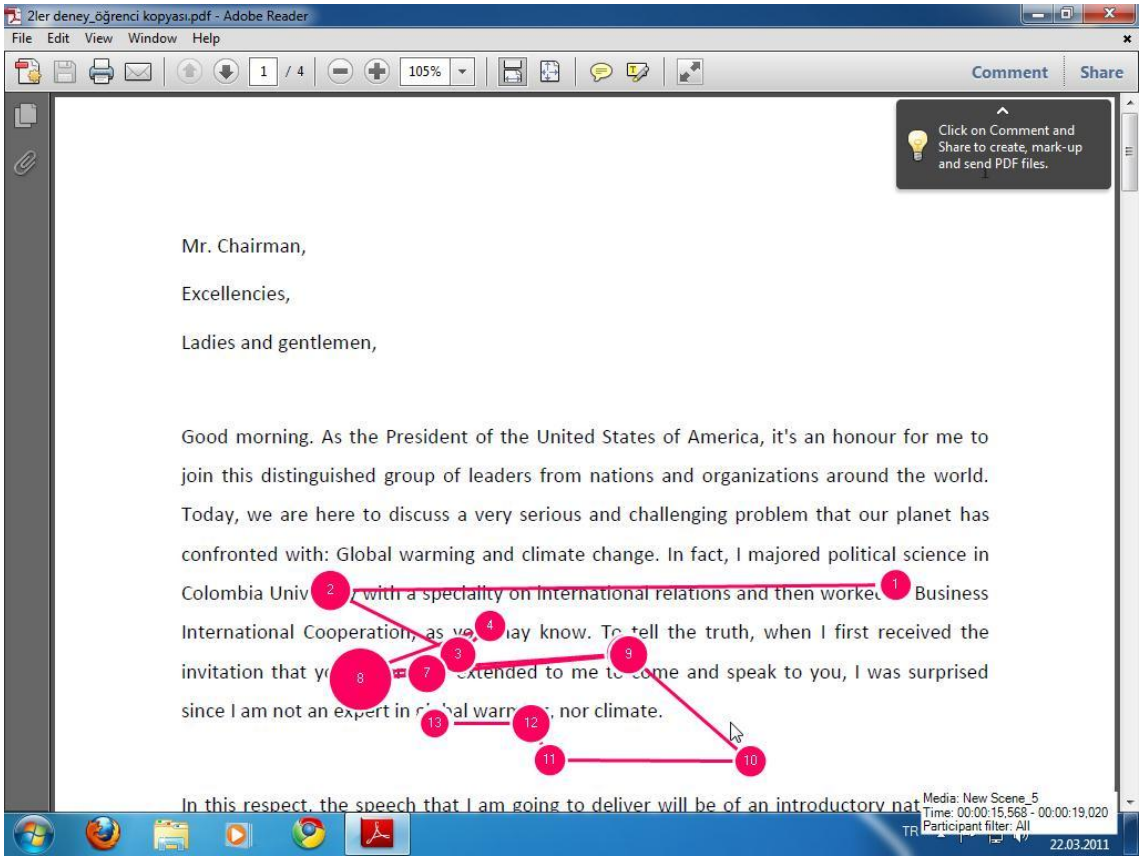


Figure 54

Figure 55 demonstrates the subject's processing performance of paragraph 6. When compared to the previous subject processing the same paragraph (see Figure 53), the nature of non-synchronized reading during SI can be better understood. The most distinct difference is sharp and indirect movements, which do not follow a strategic path but rather haphazardly move around the text to find a 'hook' in order to synchronize the text with the speech again (see Chapter 5 for detailed discussion about hooks). Nevertheless, the subject could not manage to perform synchronization until the very end as he rapidly scrolled down and skipped the majority of the text following the second deviation although the correct section was only a paragraph below.

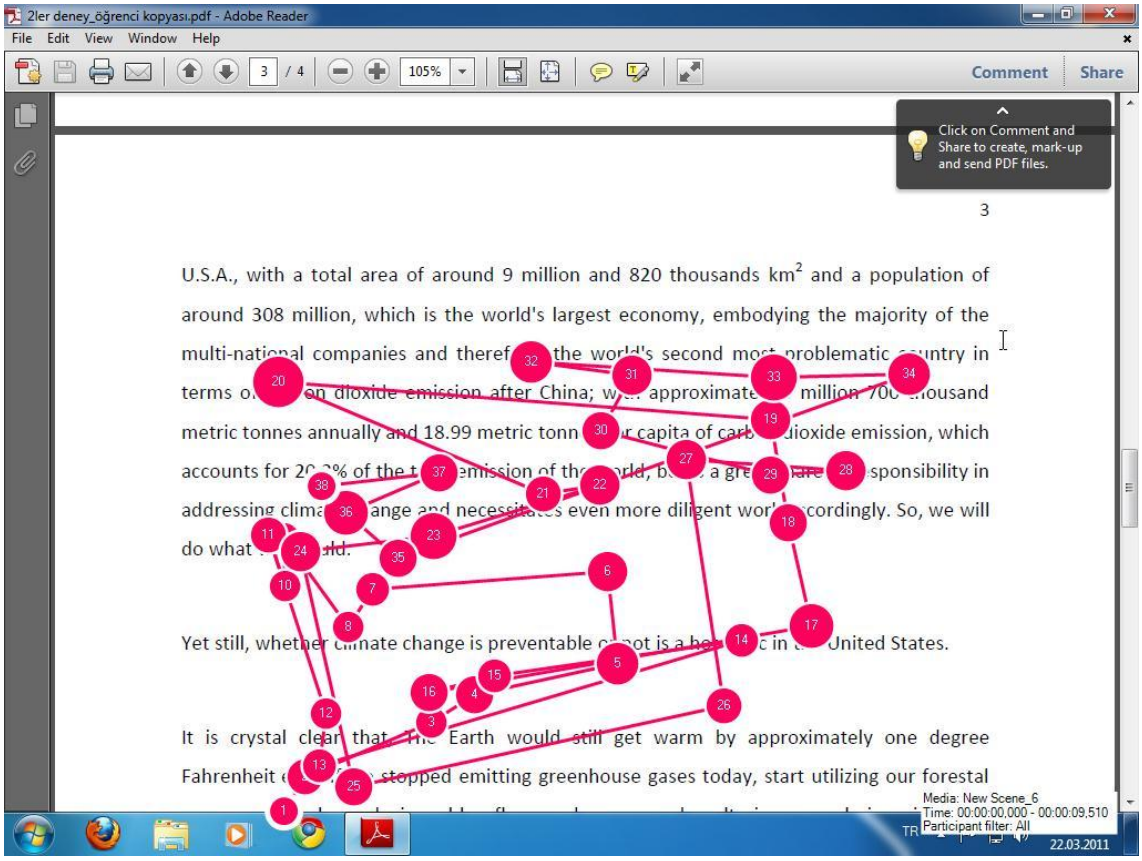


Figure 55

Figure 56 depicts a highly intriguing point in gaze patterns of subjects. When the figure is analysed in detail, we could see very erratic movements, which are familiar for G2. However, abnormally long and frequent fixations seem to be rather atypical even for reading during SI, and for Subject 11, in particular. At first, it could be though that the subject was searching for information while scanning the text. Nonetheless, when the gaze video was replayed along with the auditory record, it was observed that the subject was interpreting paragraph 6, 'infamous' for high load of information, while processing paragraph 10. Hence, it can be put forward that long fixations and heavy cognitive load accordingly, stemmed from SI performance, rather than text processing. Hence, the subject switched the channel from visual to auditory and focused solely on the speech by ignoring the visual input during the segment in question. In conclusion, it is better to distinguish this reading pattern from strategic information pursuit behaviour. It was highly important to analyse gaze pattern with auditory record for G2, for this reason.

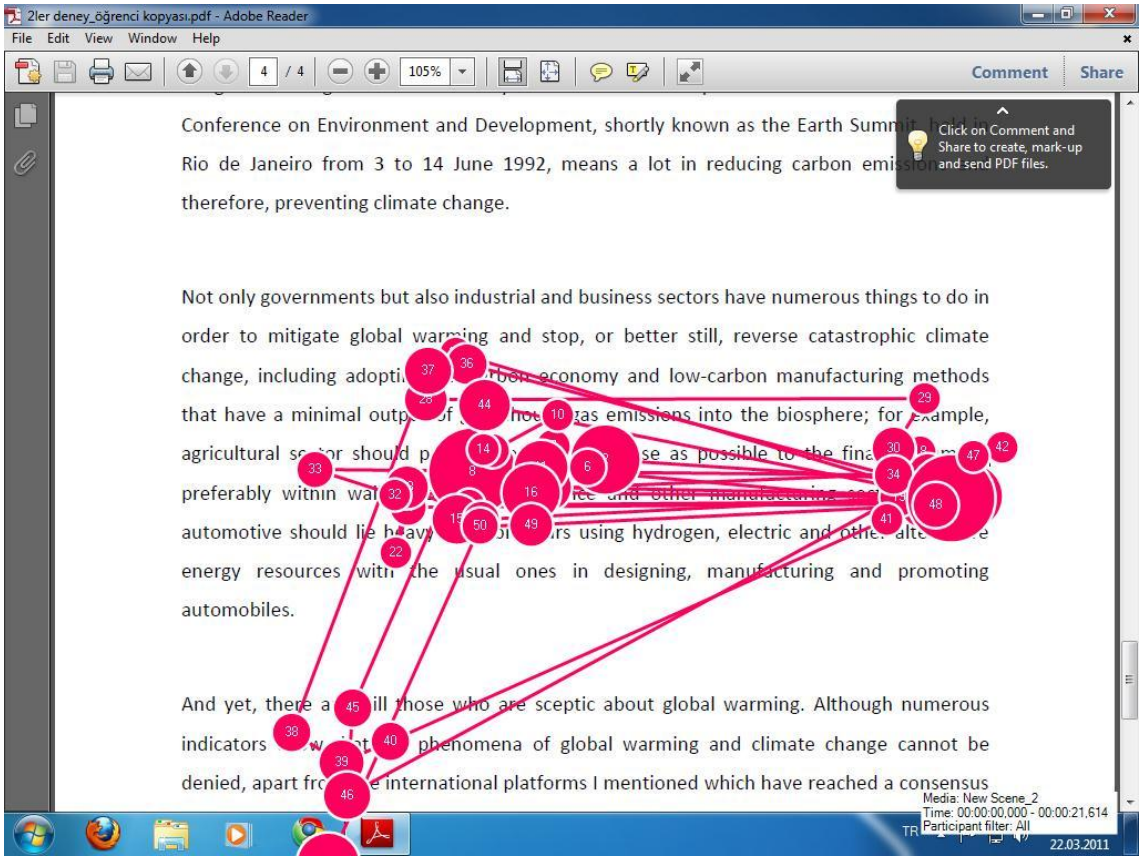


Figure 56

Following the non-synchronized reading, which covered the majority of the eye tracking record, the subject finally synchronized the text with the speech, as shown in Figure 57. Soon after, saccades became considerably stable, following a horizontal path and resembling reading patterns of G1. During this segment, there was a remarkable increase in the subject's SI performance as expected. However, since he spent a great amount of time due to desynchronization, a change in the pitch of voice, which was the case for other subjects in G2, was not observed in the SI record of Subject 11.

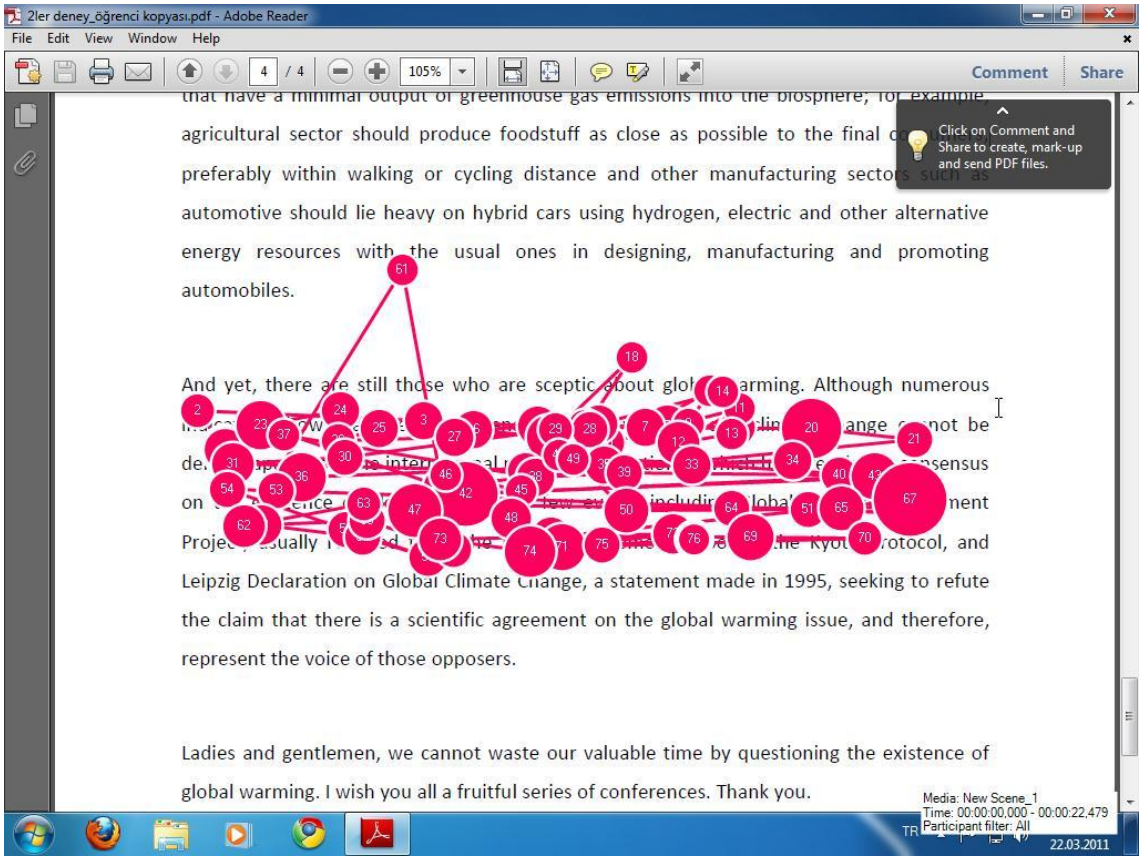


Figure 57

Cognitive Load

Subject 11 fixated on words or other linguistic segments within the text for 2285 times during the reading task, which lasted for 12 minutes and 12.587 seconds. The total duration he spent on all these fixations was approximately 678286 ms and the average duration he spent on one fixation was approximately 296.8428884 ms**.**

Table 15

Cognitive Load Based on Gaze Data of Subject 11

Indicator	**Value**
Number of Fixations	2285
Total Fixation Duration*	678286
Average Fixation Duration*	296.8428884
Task Length	00:12:12.587

* Values given as milliseconds.

SI Performance

Subject 11's SI performance and score, which is **51.5 out of 150**, is directly related with his reading performance. The subject put in an unsatisfactory performance as he had severe difficulty in synchronizing the text with the speech during the majority of the speech delivery. For instance, he could not pronounce names of the persons and he could not interpret names of the institutions in paragraph 2 when he lost the track of the text. Following deviations, he made considerably long and interruptive pauses. Similarly, his performance in paragraph 6, which is loaded with figures, was remarkably poor. On the other hand, no sooner than he found the correct segment of the text again, a dramatic increase in the performance was observed.

Retention Test

Subject 11 scored **35 out of 100** in the retention test.

SUBJECT 12

Reading Patterns

Subject 12's reading performance was alike to others in the same group, suggesting certain reading types. However, he employed a synchronization strategy, in which he waited for the correct segment to come after losing the track of the text, instead of actively searching for it with scrolling behaviour. In this respect, when compared to the other subjects in G2, and to Subject 11, in particular, he was better in following the text with the auditory input. Although he got lost within the text with the first deviation, he again found where he should read before long; however, he lost the text completely following the second deviation at about the fourth minute of the record until about the seventh minute. From then on, he caught the track of the speech thanks to the strategy he employed, which also alleviated his SI performance prominently.

Figure 58 demonstrates the synchronized reading pattern between two initial deviations. Similar movements with other subjects in the same groups strongly suggest a specific type of text processing.

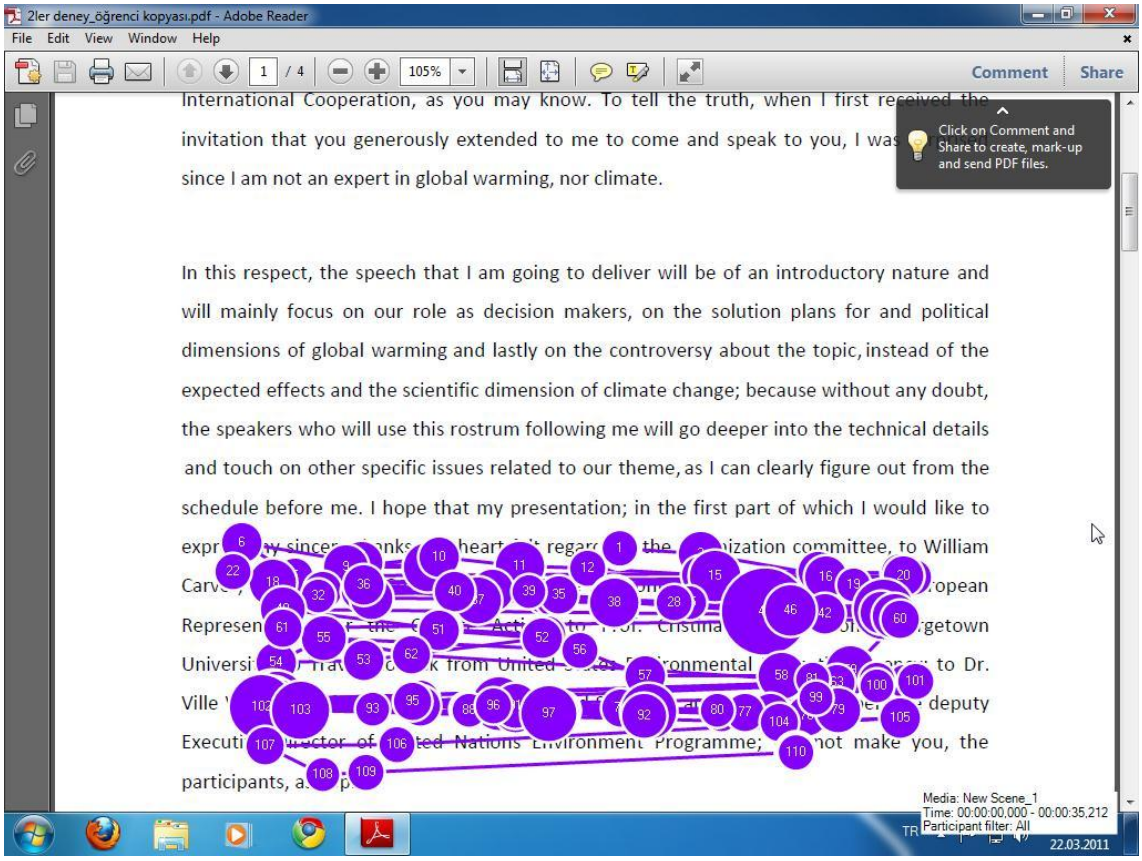


Figure 58

Figure 59 is the visual depiction of the abovementioned synchronization strategy that the subject followed. During this segment, the subject waited on the paragraph for the automatic synchronization without scrolling up or down. It is possible to notice central accumulation of fixations caused by waiting in the same segment. Nevertheless, there are also uncontrolled paths moving haphazard directions throughout the text.

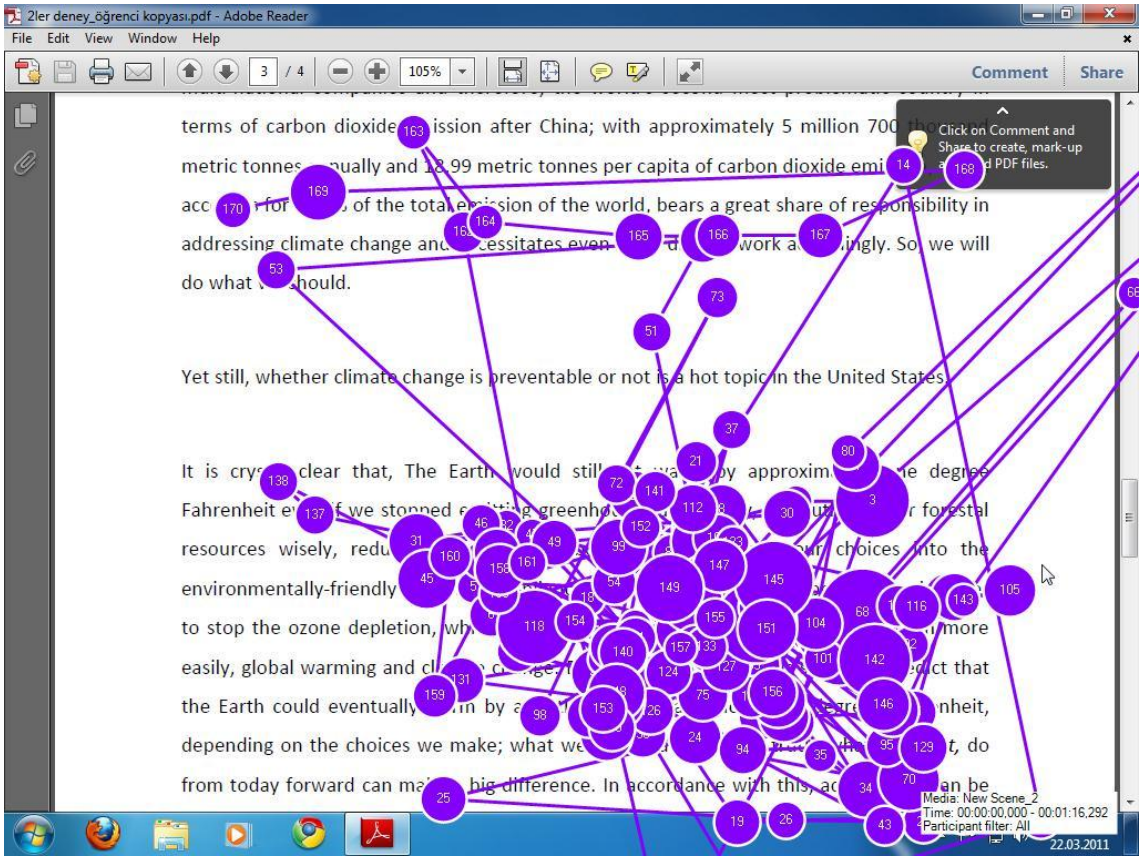


Figure 59

This strategy indeed helped the subject finding the track of the text without losing much time as in the case of Subject 11. In this regard, Figure 60 shows synchronized reading patterns with still notable regressions, presumptively caused by the unconventional sentence structure and figures.

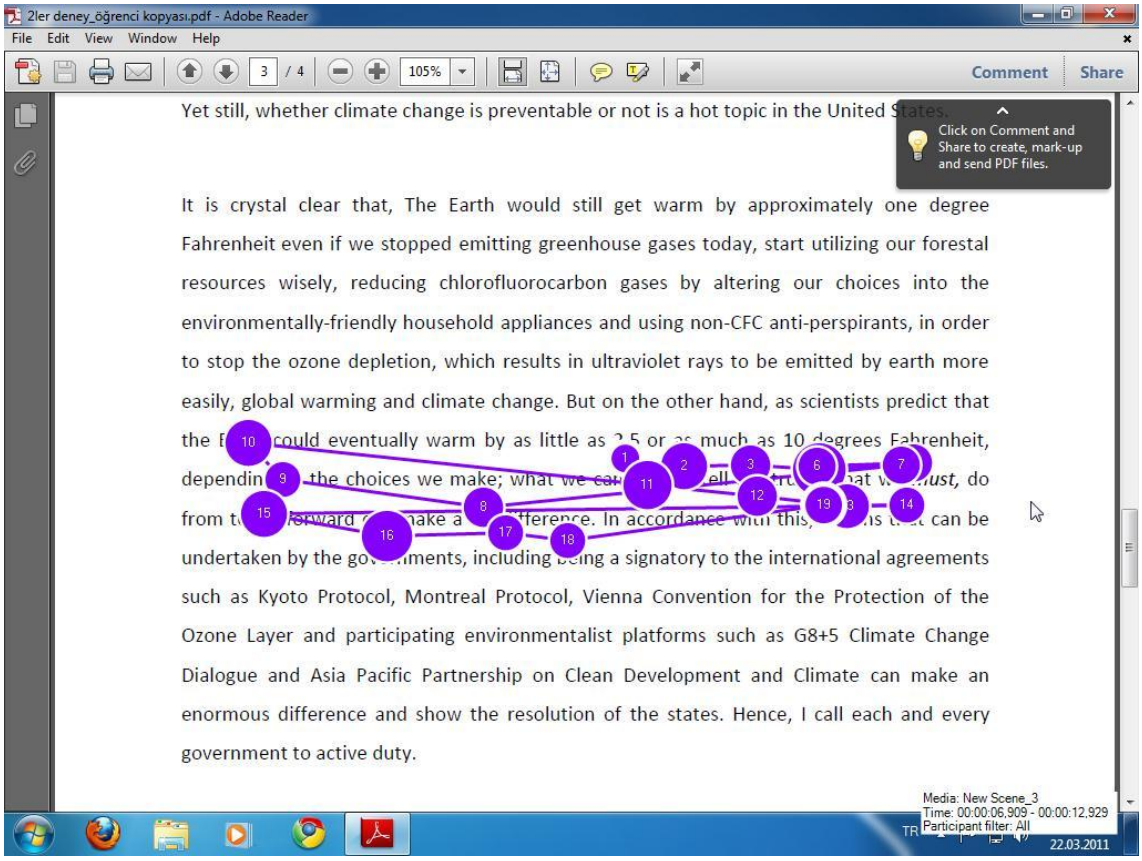


Figure 60

Cognitive Load

Subject 12 fixated on words or other linguistic segments within the text for 1916 times during the reading task, which lasted for 12 minutes and 4.716 seconds. The total duration he spent on all these fixations was approximately 667326 ms and the average duration he spent on one fixation was approximately 348.2912317 ms**.**

Table 16

Cognitive Load Based on Gaze Data of Subject 12

Indicator	**Value**
Number of Fixations	1916
Total Fixation Duration*	667326
Average Fixation Duration*	348.2912317
Task Length	00:12:04.716

* Values given as milliseconds.

SI Performance

Subject 12 scored **49.5 out of 150** in SI test. The subject made glaring syntactic interpreting errors as frequently seen in other subjects in G1. To be more specific, there were long pauses, unfinished sentences, unnecessary additions or sentences without subjects, especially when information-dense sentences are considered. However, the subject managed to interpret numbers in a correct way, as long as he followed the text along with the speech. Certain common lexical errors such as interpreting *United Nations* as *United States* or *vice versa* were detected in Subject 12's performance as well. On the other hand, one of the most critical errors he made was interpreting *yet still* as *therefore*, which changed the whole meaning of the sentence.

Retention Test

Subject 12 scored **60 out of 100** in the retention test.

4.2. GENERAL FINDINGS AND DISCUSSIONS

4.2.1. Reading Patterns

Subject-based analysis on reading patterns above suggests that there exists a prominent distinction between G1 and G2. The heat maps below (Figure 61 and 62), which were produced by collecting all eye movement data from the very beginning to the end of the reading tasks, demonstrate the divergence between the selected subjects to represent their groups (Subject 2 from G1 and Subject 7 from G2) in terms of visual focal loci. In general, reading patterns set by G1 can be considered as relatively regular, strategic, controlled thus, within the borders of the text. In contrast, subjects in G2 established considerably more erratic, undirected and disorganized gaze paths. When fixations are considered, we again notice various differences between the groups. Fixations of G1 were relatively steadier yet less frequent and denser. On the other hand, fixations of G2 were highly frequent and dense yet scattered in line with the general reading patterns of that group. It is assumed that the operational contrariety between groups with regard to the reading task may be one of the main reasons of the difference between reading patterns. This observation is of utmost importance as regards the performance and training within the scope of SI with text.

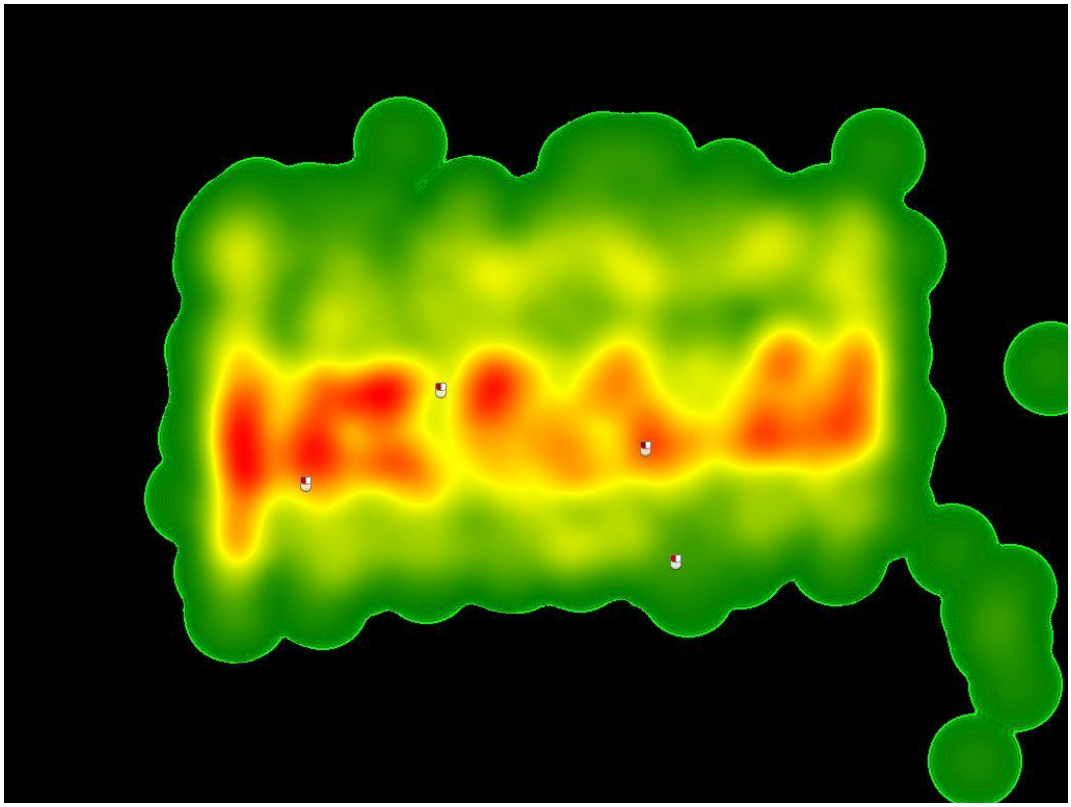


Figure 61: Heat map of visual focal loci of Subject 2 demonstrating reading for SI.

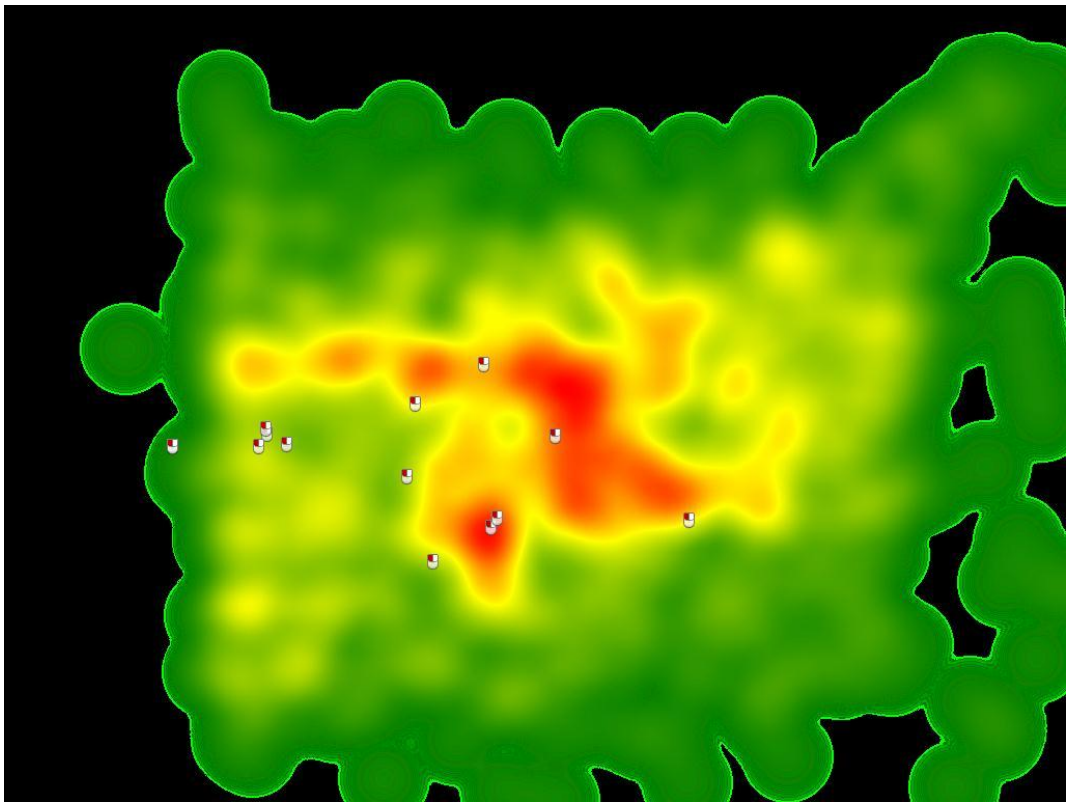


Figure 62: Heat map of visual focal loci in Subject 7 demonstrating reading during SI.

It is possible to define tentative reading types regarding SI with text (see Figure 63) thanks to the observation on subjects' reading patterns during the main task. In this respect, reading within SI can be classified mainly as (1) reading for SI, in which the interpreter prepares for SI by reading related visual material for varying durations and (2) reading during SI, in which the interpreter processes any kind of related visual material while performing SI. As for reading for SI, the study shows that there is a substantial difference between eye movements during the first reading and subsequent readings. On the other hand, reading during SI can further be grouped into two sub-types as synchronized reading, in which the interpreter follows the text along with the speech and non-synchronized reading, in which the interpreter cannot manage to follow the text with such synchronization due to numerous reasons such as deviations or losing concentration etc. According to our observation, it can occur by two means: The interpreter may search for the related segment in the text regarding the auditory input in order to synchronize the visual input with the auditory one, or alternatively, s/he may choose or may be forced to ignore the text and focus solely on auditory input. It can be stemmed from the interpreter's losing confidence and expectation about finding the correct segment of the text again. In this respect, training programmes for interpreting are recommended to focus on these particular reading skills within SI or favourably, launch specific reading courses (see 6.3). The detection of the reading types within SI may also be illuminating in understanding the nature of SI with text and may bridge over further cognitive studies on SI with text (see 6.4).

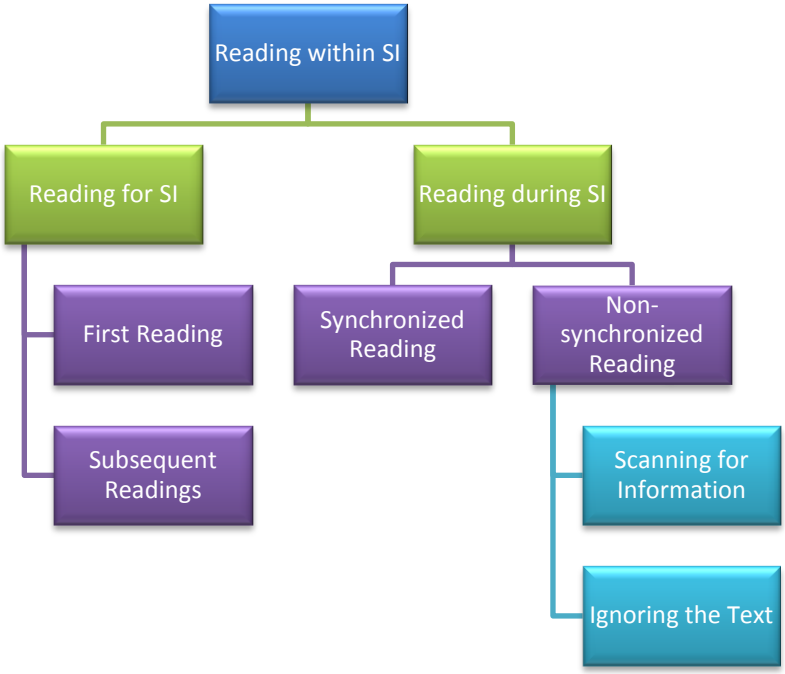


Figure 63: Reading types within SI.

4.2.2. Cognitive Load

There are three fundamental and suggestive measures of gaze data regarding cognitive load: number of fixations, total fixation duration and average fixation duration. The data were collected and calculated by using the eye tracker, and analysed in connection with the eye-mind hypothesis as specified in previous chapters. In this respect, higher values in these indicators imply heavier cognitive load. Gaze data collected from each subject from both groups based on these measures are presented in Table 17. Moreover, lengths of reading tasks for both groups are specified in the table as well, in order to make connections and to comment on the gaze data in a more intelligible way. In this context, although all measures are suggestive for the cognitive load, average fixation duration was selected as the main indicator to perform statistical analysis as task lengths vary according to the groups. It is important to remind that what is compared here is the cognitive effort required for reading for SI and reading during SI or from another viewpoint, reading for SI and SI with text.

The results based on all indicators manifest that G2 exerted relatively heavier cognitive load than G1 did although there does not exist a significant difference between groups in terms of average fixation duration in statistical terms. It is assumed that the results were expected and were due to multiplicity of cognitive tasks (reading, listening, interpreting and speaking) that G2 had to perform during main test in comparison with the tasks of G1. Cognitive load based on the gaze data may also be analysed individually for separate tasks of both groups in order to understand the cognitive mechanisms of reading for SI and reading during SI (SI with text). Findings regarding the indicators are presented in the tables and charts below and discussed respectively.

Table 17

Cognitive Load Based on Gaze Data

Subject (Group)	Number of Fixations	Total Fixation Duration*	Average Fixation Duration*	Task Length**
S1 (G1)	1011	265139	262.2542038	04:33.0
S2 (G1)	1032	269278	260.9282946	05:01.0
S3 (G1)	830	252432	304.1349398	04:16.9
S4 (G1)	948	281220	296.6455696	04:53.0
S5 (G1)	932	285303	306.1190987	04:50.4
S6 (G1)	1049	234231	223.2897998	04:45.8
MEAN	**967**	**264600.5**	**275.5619844**	
TOTAL	**5802**	**1587603**	**1653.371906**	
Subject (Group)	**Number of Fixations**	**Total Fixation Duration***	**Average Fixation Duration***	**Task Length****
S7 (G2)	1886	625201	331.4957582	12:13.9
S8 (G2)	1523	547613	359.5620486	12:05.8
S9 (G2)	1882	508485	270.1833156	12:20.1
S10 (G2)	2097	624835	297.9661421	12:06.1
S11 (G2)	2285	678286	296.8428884	12:12.6
S12 (G2)	1916	667326	348.2912317	12:04.7
MEAN	**1931.5**	**608624.3333**	**317.3902308**	
TOTAL	**11589**	**3651746**	**1904.341385**	

* Values given as milliseconds.

** Values are rounded.

4.2.2.1. Number of Fixations

Data regarding the total number of fixations during the eye tracking record for both groups are presented in Chart 1 and Chart 2, showing differences between subjects and between groups, respectively. Subjects in G1 fixated for 967 times and subjects in G2 fixated for 1931.5 times on average during their respective tasks. It means that there is a sharp difference between G1 and G2, which is

more than natural due to difference in total task length and number of cognitive tasks. However, what is significant here is that the results between subjects in the same group show similarity to each other (between 830-1049 for G1 and between 1523-2285 for G2), which adduces that both G1 and G2 performed well defined and distinctive cognitive tasks that vary minimally due to individual cognitive differences under predefined textual conditions. This may help us to understand and measure overall cognitive load required for SI with text and compare it with other SI modalities.

Chart 1

Subject-based Comparison between G1 and G2 for Number of Fixations

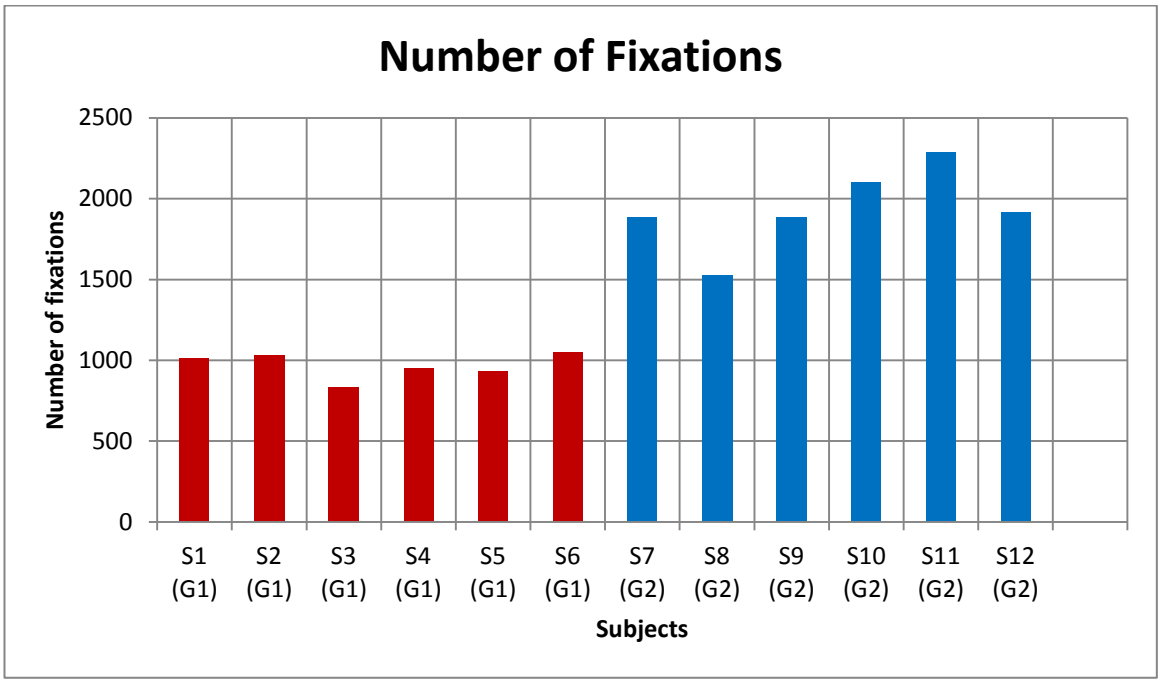
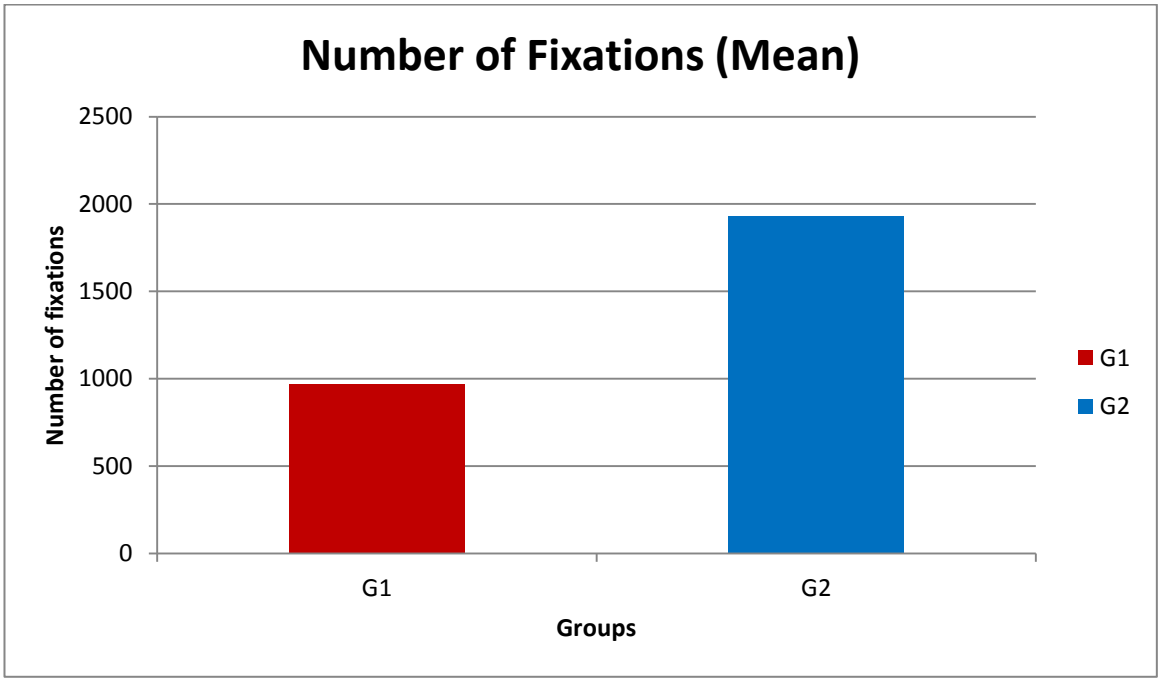


Chart 2

Comparison between G1 and G2 for Number of Fixations (Mean Value)



4.2.2.2. Total Fixation Duration

Chart 3 and Chart 4 demonstrate the data regarding total fixation duration; *i.e.*, the total time subjects spent on fixations in milliseconds, for subjects and groups respectively in a comparative fashion. Subjects in G1 fixated for 264600.5 ms and subjects in G2 fixated for 608624.3333 ms on average during their respective tasks. Similar with fixation count, a remarkable difference between groups can be observed in terms of total fixation duration as well. The reason of the difference can again be explained with total task length along with the multiplicity of cognitive tasks of G2. The similarity between subjects in the same groups (between 234231-285303 ms for G1 and between 508485-678286 ms for G2) is again noteworthy in terms of suggesting an incoincidental pattern.

Chart 3

Subject-based Comparison between G1 and G2 for Total Fixation Duration

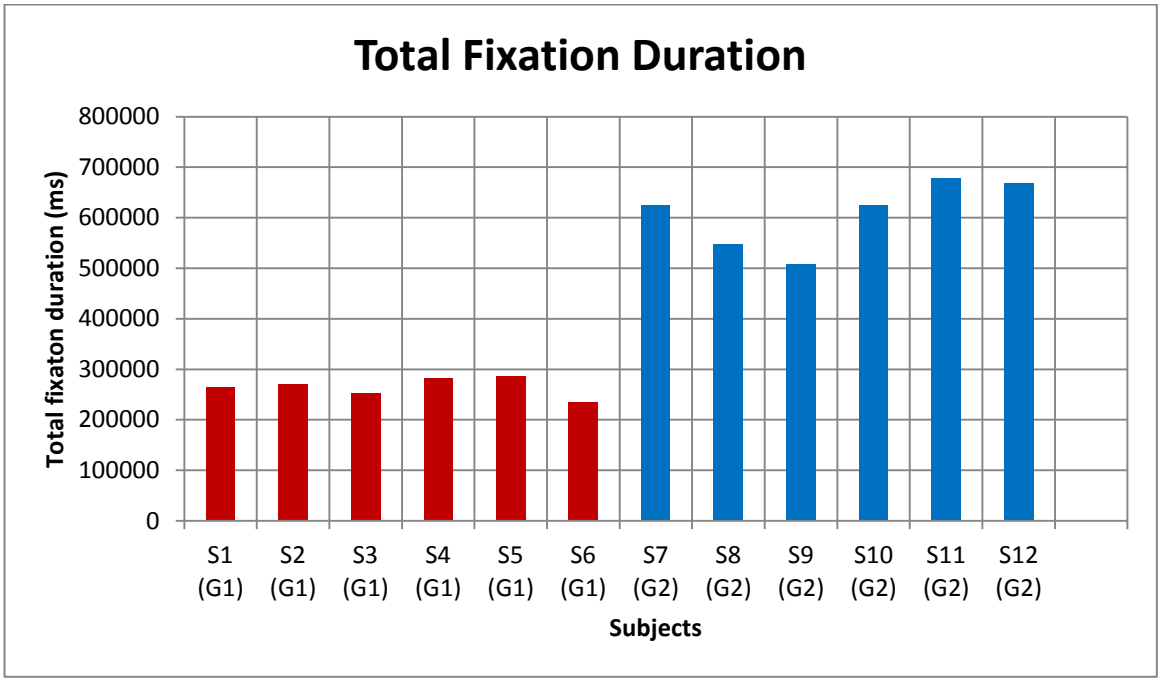
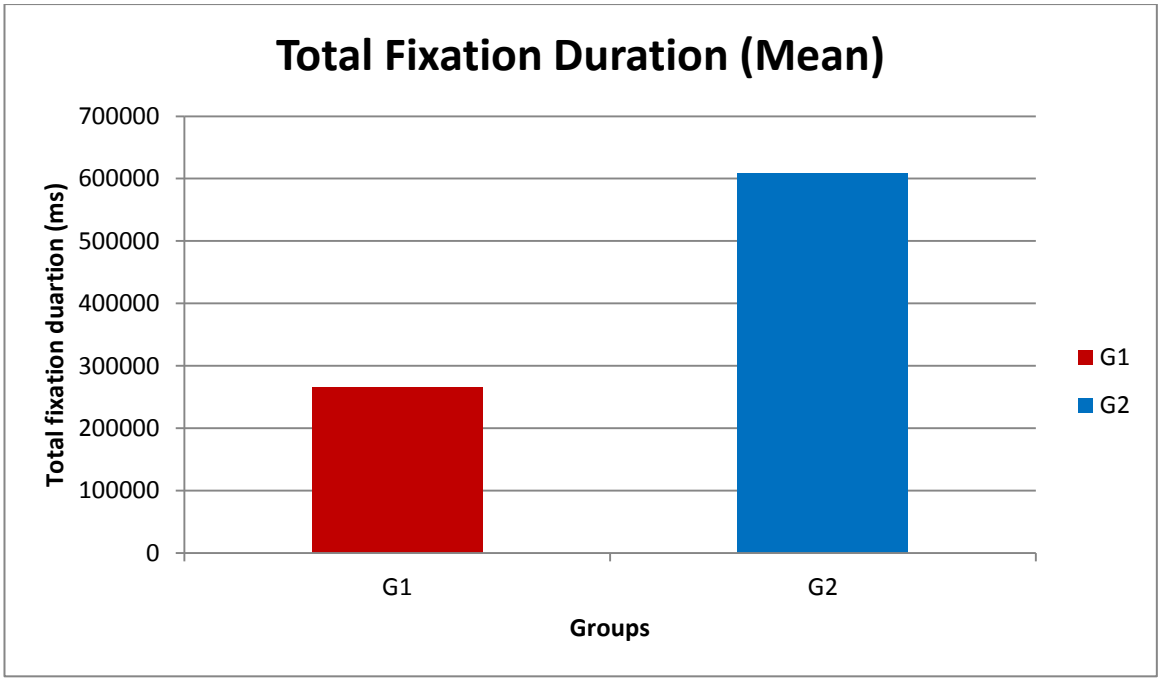


Chart 4

Comparison between G1 and G2 for Total Fixation Duration (Mean Value)



4.2.2.3. Average Fixation Duration

Average fixation duration is the most important eye tracking indicator in terms of cognitive load in our case, as specified above. Subjects in G1 spent 275.5619844 ms and subjects in G2 spent 317.3902308 ms for one fixation on average (see Chart 5 and Chart 6). The difference implies that there exists an observable difference between G1 and G2 in favour of G2 in terms of average fixation duration; although it is not significant in terms of statistical means (see Table 18 and 19). The difference between average fixation duration may be regarded as the evident proof that G2 exerted more cognitive effort than G1. Therefore, it would be safe to assert that SI with text requires more cognitive effort than silent reading for SI. This result is expected due to the difference in the number of tasks, which G1 and G2 performed during eye tracking record. Along with that, the results are of utmost significance as they put forward the **required cognitive effort** for reading for SI and SI with text respectively based on average fixation duration. In this respect, Rayner (1998) defined the required cognitive effort for certain tasks in terms of average fixation duration. For instance, approximate mean fixation duration is calculated as 225 ms for silent reading, 275 ms for visual search and 330 ms for scene perception (p. 373). In this regard, it can be stated that approximate mean fixation duration is **275 ms** for reading for SI and **317 ms** for SI with text (or reading during SI). When compared to previously defined and well-recognized tasks, it can be concluded that reading for SI is strikingly different from silent reading and requires much more cognitive effort (275>225 ms). On the other hand, SI with text requires nearly as much cognitive effort as visual search (317≈330 ms).

However, when it comes to comparing results using statistical means, the difference between the two samples was found as not significant ($p>0.05$, two-tailed test) (see Table 19). In this respect, it is important to state that we cannot conclude any difference between groups based on high p-value and the most probable reason for this statistical finding can be the sample size (see Vickers, 2009). If the test is repeated with a larger sample size, it is estimated that even

small statistical differences may increase and become significant consequently. Furthermore, when Chart 5 is analysed in detail, it can clearly be seen that the highest value in G1 (approx. 306 ms) is lower than even the average value of G2 (approx. 317 ms) and the three highest values belong to the subjects in G1, which suggests a notable difference despite the statistical results.

Chart 5

Subject-based Comparison between G1 and G2 for Average Fixation Duration

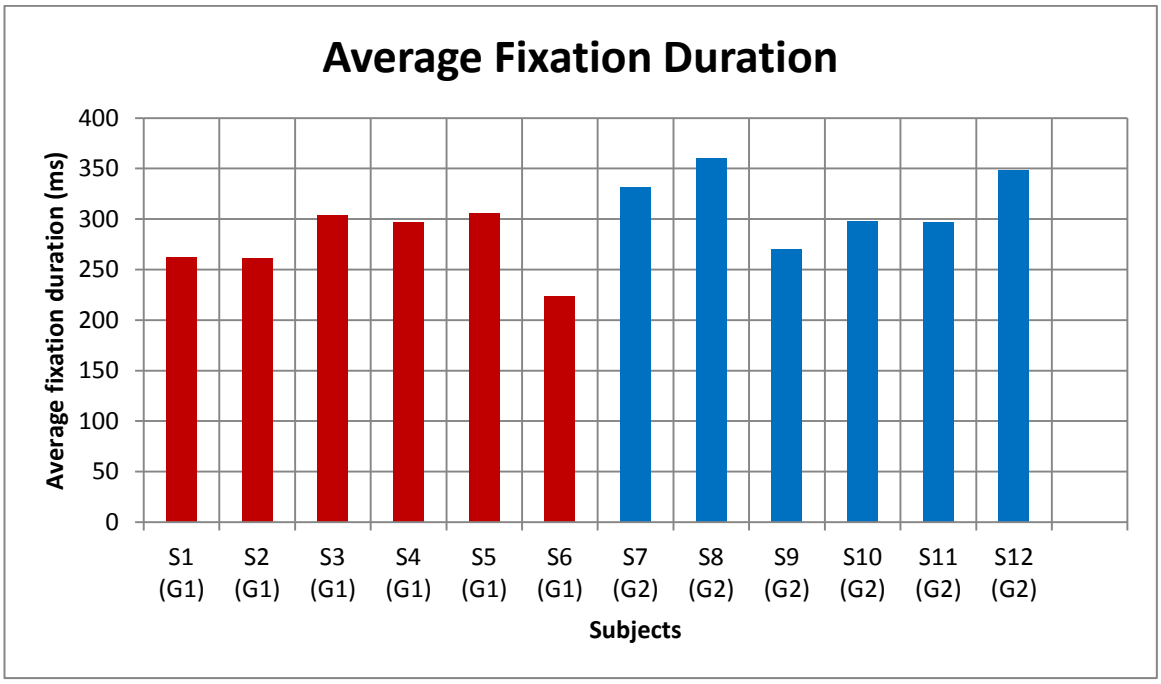


Chart 6

Comparison between G1 and G2 for Average Fixation Duration (Mean Value)

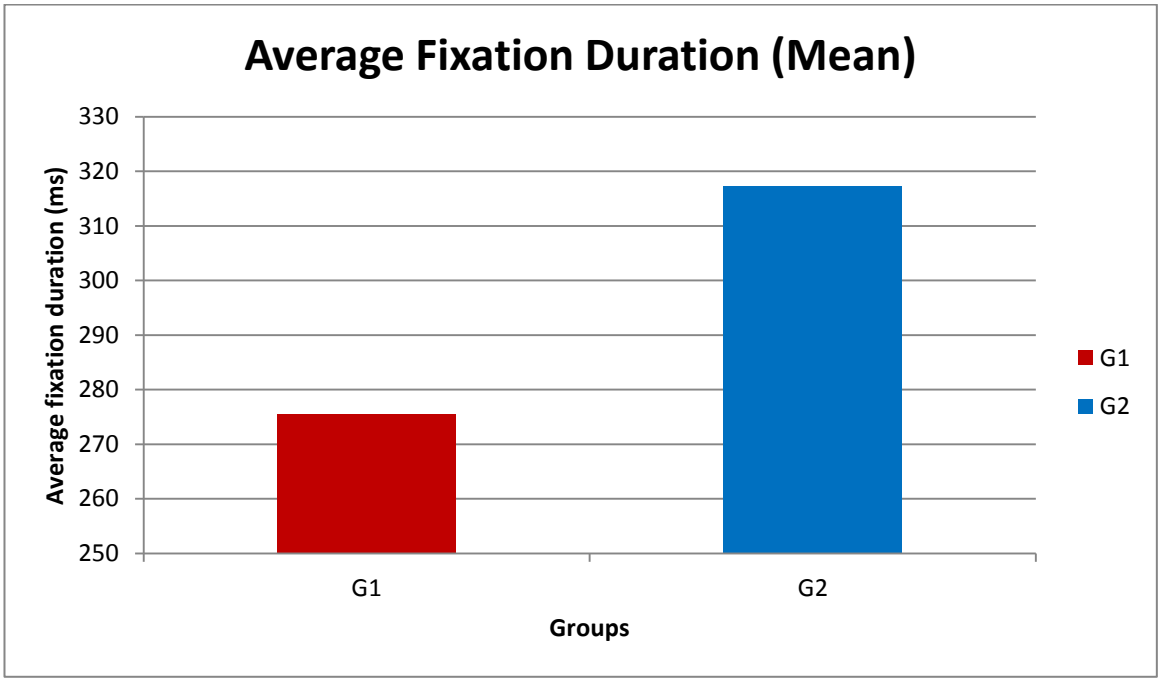


Table 18

Statistical Analysis of Average Fixation Duration for G1 and G2 – Ranks

	Group	N	Mean Rank	Sum of Ranks
Average Fixation Duration	G1	6	4.67	28.00
	G2	6	8.33	50.00
	Total	12		

Table 19

Statistical Analysis of Average Fixation Duration for G1 and G2 - Test Statistics

	Average Fixation Duration
Mann-Whitney U	7.000
Wilcoxon W	28.000
Z	-1.761
Asymp. Sig. (2-tailed)	**.078**
Exact Sig. [2*(1-tailed Sig.)]	.093[a]

4.2.3. SI Performance

The results of the SI performance show that both groups delivered unsatisfactory SI performances, presumably due to challenging interpreting conditions such as fast delivery rate, highly structured speech, laboratory settings etc. When the scores are compared between the groups, it is observed that G1 scored relatively higher than G2 (see Chart 18, 19 and Table 21). It may be considered as an unexpected result at first, considering the existence of text during SI for G2 and linguistic structure of the visual input used in the test including branched sentences, figures, proper nouns etc. However, it can be assumed that higher cognitive load of G2, which was put forward based on the average fixation duration, may have deteriorated the SI performance of G2. However, as in average fixation duration, statistical analysis did not reveal any significant difference ($p>0.05$, two-tailed test) (see Table 22). Here, similar explanations that are offered for the statistical analysis regarding the average fixation duration can be stated for the SI performance as well.

From the qualitative point of view, it is observed that there are also differences between interpreting styles and errors of both groups. One of the most important differences was that while subjects in G1 were better in

contextualizing information, subjects in G2 were superior in noticing and interpreting details and specific linguistic segments such as numbers and proper names. In this respect, it can be inferred that visual input, or the written text in our case, has indeed a considerable effect on SI performance. That being said, certain errors that were common for all subjects in both groups were descried. For instance, difficulties in interpreting conjunctions, which are of utmost importance considering their role in constructing the context, were recurrent in both groups (see Chapter 5 for further details).

Table 20

SI Performance

Subject (Group)	Score	Subject (Group)	Score
Subject 1 (G1)	57	Subject 7 (G2)	33
Subject 2 (G1)	66.5	Subject 8 (G2)	63.5
Subject 3 (G1)	49	Subject 9 (G2)	65
Subject 4 (G1)	73	Subject 10 (G2)	54.5
Subject 5 (G1)	52.5	Subject 11 (G2)	51.5
Subject 6 (G1)	77.5	Subject 12 (G2)	49.5
MEAN	**62.58333333**	**MEAN**	**52.83333333**
TOTAL	**375.5**	**TOTAL**	**317**

Chart 7

Subject-based Comparison between G1 and G2 for SI Performance

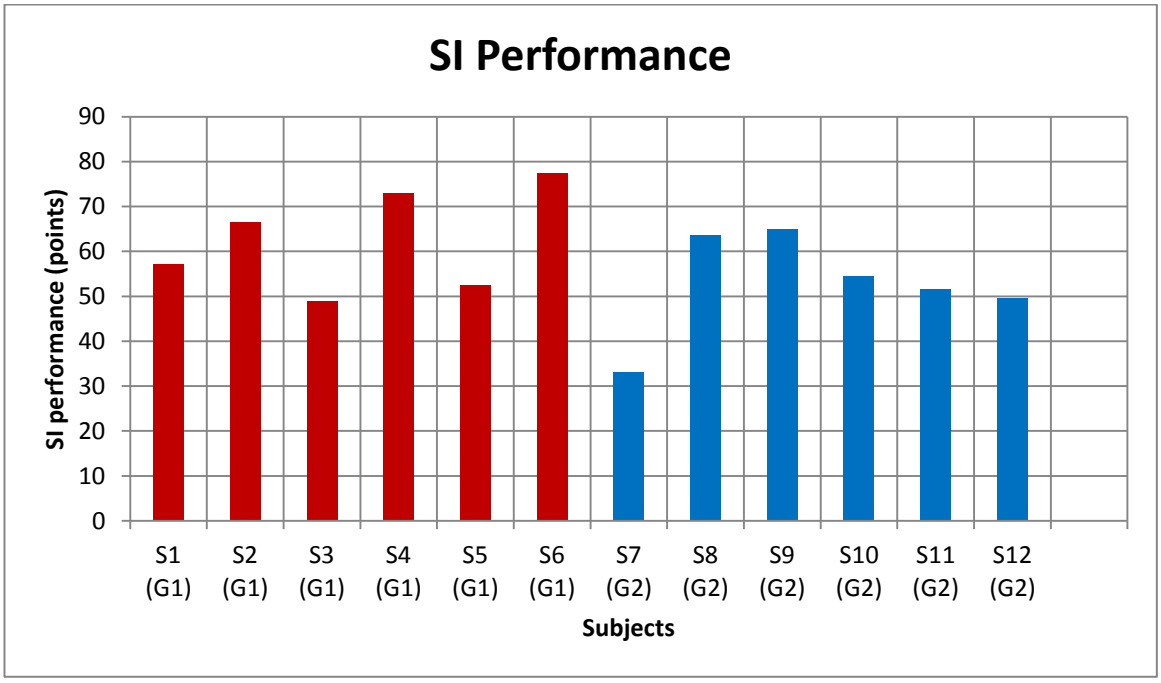


Chart 8

Comparison between G1 and G2 for SI Performance (Mean Value)

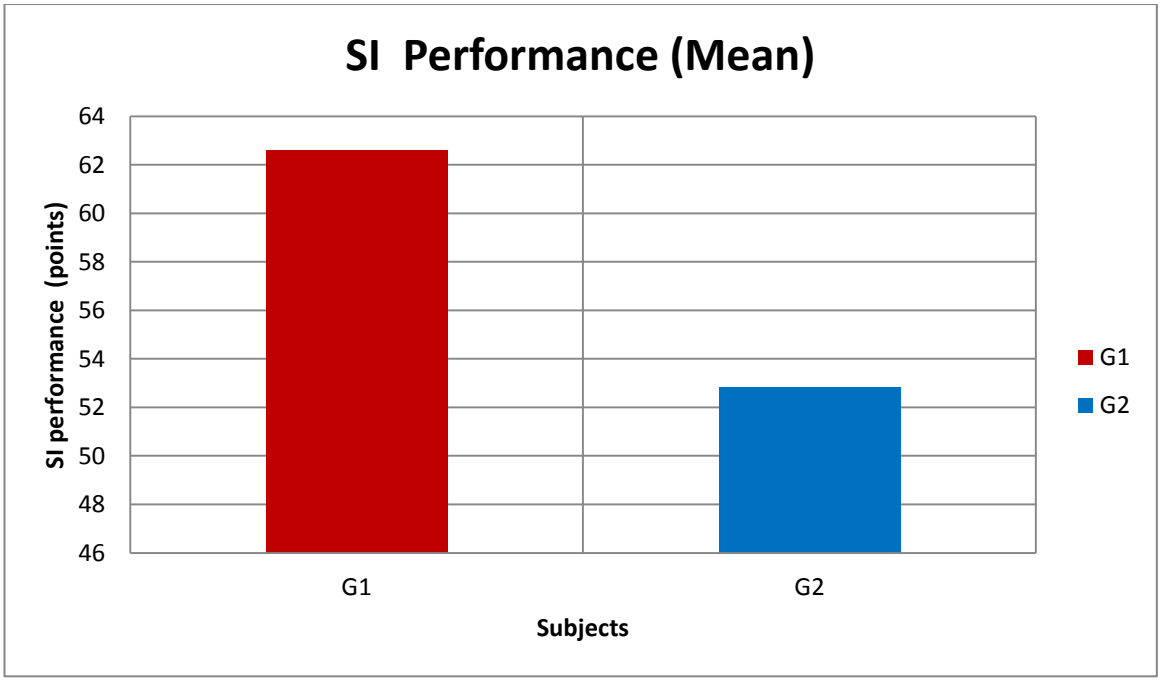


Table 21

Statistical Analysis of SI Performance for G1 and G2 – Ranks

	Group	N	Mean Rank	Sum of Ranks
SI Performance	G1	6	7.83	47.00
	G2	6	5.17	31.00
	Total	12		

Table 22

Statistical Analysis of SI Performance for G1 and G2 - Test Statistics

	SI Performance
Mann-Whitney U	10.000
Wilcoxon W	31.000
Z	-1.281
Asymp. Sig. (2-tailed)	**.200**
Exact Sig. [2*(1-tailed Sig.)]	.240[a]

4.2.4. Questionnaire

Subjects in both groups gave expected answers to the questions in the questionnaire with few exceptions. For instance, approximately 85% of the subjects in G1 (5 out of 6) stated that preparatory reading before SI has helped them in interpreting and all of them found the time allocated for preparatory reading sufficient. Still, approximately 68% of the subjects in G1 (4 out of 6) stated that they have exerted additional effort to read faster, although only approximately 34% of them (2 out of 6) stated that they used specific reading strategies. In G2, although approximately 68% of the subjects stated that they

exerted additional effort to read faster, none of the subjects reported using any specific reading strategy.

Statement 9 (I easily remembered the text during SI) was considerably important in terms of assessing the effect of text on SI performance for G1. Only approximately 34% of the subjects (2 out of 6) answered this question in the affirmative manner (the sum of strongly agree and agree). The rest was unsure or stated that they did not easily remember it. In this respect, it is important to remind that G1 scored slightly better than G2 in SI test. It is interesting that the subjects in G1 scored better than G2 in both SI and the retention test even though they stated that could not remember the text well during SI. It leads us to think that the underlining reason behind better or worse SI performance may also be multiplicity of the tasks and divided attention, along with the comprehension level associated with reading within SI.

Another expected yet noteworthy point is that approximately 83% of the subjects in G1 stated that they would have preferred to have the text during SI as well and only one subject was unsure about it (see Chart 9). It can be concluded that G1 generally regarded the textual aid as beneficial, presumably because they did not have the opportunity to experience such a condition in the main test. The same question was posed to the subjects in G2 from a different viewpoint and asked whether they would have preferred not to have the text during SI. Only two of the subjects (approx. 33%) strongly agreed with the idea of having the text during SI. On the other hand, one subject (approx. 17%) strongly disagreed and one subject (approx. 17%) disagreed with the idea of having the text during SI. Two subjects in the same group remained unsure. The views about the existence of the written text were strong and mostly negative in G2 possibly due to traumatic experiences of deviations that made to test their reactions. It can be asserted that subjects in G2 did not take the textual aid for granted and approached the condition with suspicion. In a sense, they questioned the efficacy of the text during SI unlike the subjects in G1, who had highly positive opinions about the benefit of the texts during SI. In this

regard, the subjects in G2 may have associated their self-acknowledged poor performance with the existence of the text. On the other hand, views of G1 about the existence of the written text during SI were mostly positive although they did not perform SI under such a working condition. Results clearly show that having the text during SI is mostly a psychological relief. It can be inferred that interpreters may not be able to benefit or does not necessitate benefiting from the text during SI; however, having the text may increase their self-confidence and therefore, possibly SI performance. In the final analysis, it is concluded that the interpreters would prefer having the text during SI in any case.

Unexpectedly, the success in spotting deviations was not found as contrasting between the groups. Only two subjects in G1 (34%) and again, two subjects in G2 stated that they spotted the deviations during SI. It is predictable for G1 not to spot deviations easily due to temporal gap between reading and SI tasks. However, low spotting rate for G2 is rather intriguing considering the fact that subjects in G2 listened to the speech with the text and experienced deviations in real-time. The result illuminates erratic reading patterns of G2 during SI even with synchronized reading. The stress of SI *per se* may be another explanation for the low spotting rate of G2. As a result, they could not easily understand where the speaker deviated from the text or even if they did, they could not remember deviations afterwards.

As for the shared questions posed to both groups, similar answers were found again with few exceptions. Regarding the questions about the difficulty level of the text, the high majority of the subjects in both groups (n=5 in G1 and n=6 in G2) regarded the theme of the text as easy, found the sentences within the text semantically easy to interpret (n=4 in G1 and n=5 in G2) and more than half of the subjects (n=4 in G1 and n=4 in G2) found the sentences within the text structurally easy to interpret. As for self-evaluation with regard to SI performance, slightly different yet expected results were found. Although all subjects in both groups reported excessive or moderate difficulty in interpreting

numbers, names of organizations and institutions and pronouncing proper names of persons, the level of experienced difficulty was different based on the groups. For instance, in G1, three subjects strongly agreed and three subjects agreed that they had difficulty in interpreting numbers; in G2 however, two subjects strongly agreed, three subjects agreed and one subject remained unsure about having difficulty in interpreting numbers. The difference most probably stems from the variation between working conditions designed for the groups. Subjects in G2 benefitted from the written text at the maximum level when it comes to interpreting specific linguistic segments such as numbers, proper names etc. Therefore, they reported slightly less difficulty in interpreting such units. Similarly, G2 stated experiencing heavier stress compared to G1. Along with that, four subjects in both groups reported difficulty in keeping pace with the speaker during SI.

The results of the questionnaire were rather unexpected or rather contradictory when analysed in connection with reading patterns, SI performances or retention tests. To be more specific, subjects' self-evaluations about their performances do not usually reflect their actual performance. Furthermore, the subjects who had poor performance in SI and the retention test generally labelled their performance with better remarks than the subjects who had indeed better results in both SI and the retention test. For instance, while approximately 51% of the subjects in G1 (3 out of 6) stated that they have understood the text well when they finished reading, only approximately 17% of the subjects in G2 stated that they have understood the text. However, G2 scored better than G1 in the retention test. Thus, in can be concluded that novice interpreters in the sample were not good at evaluating their own performance. It may be related with the high cognitive effort they exerted during the main task, which resulted in losses in the memory about their performance.

Chart 9

Question: Would you have preferred to have the written text during SI? (G1)

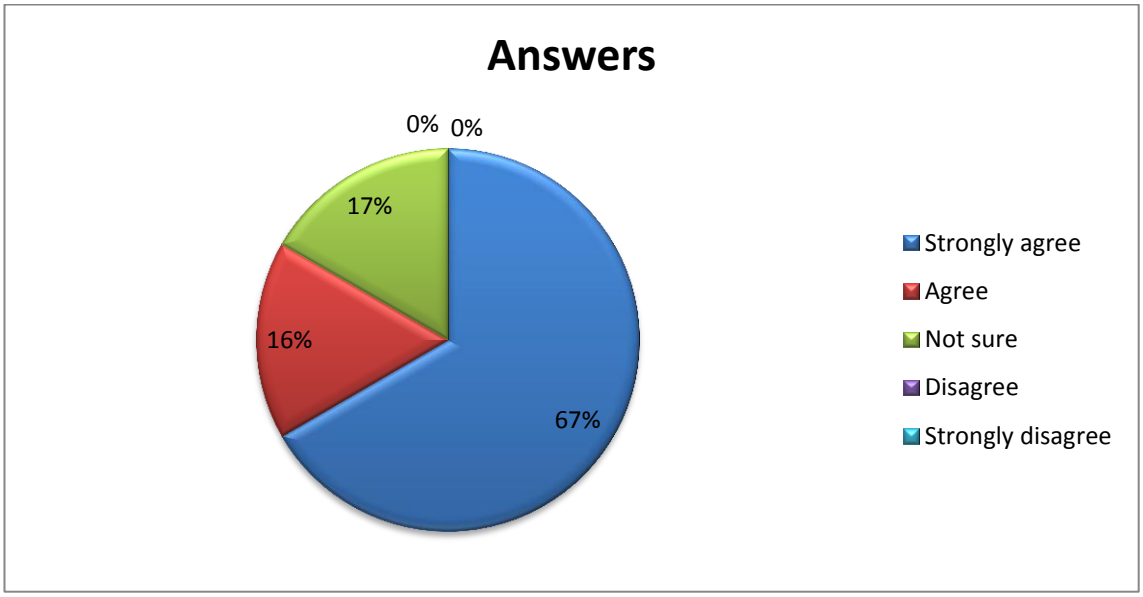
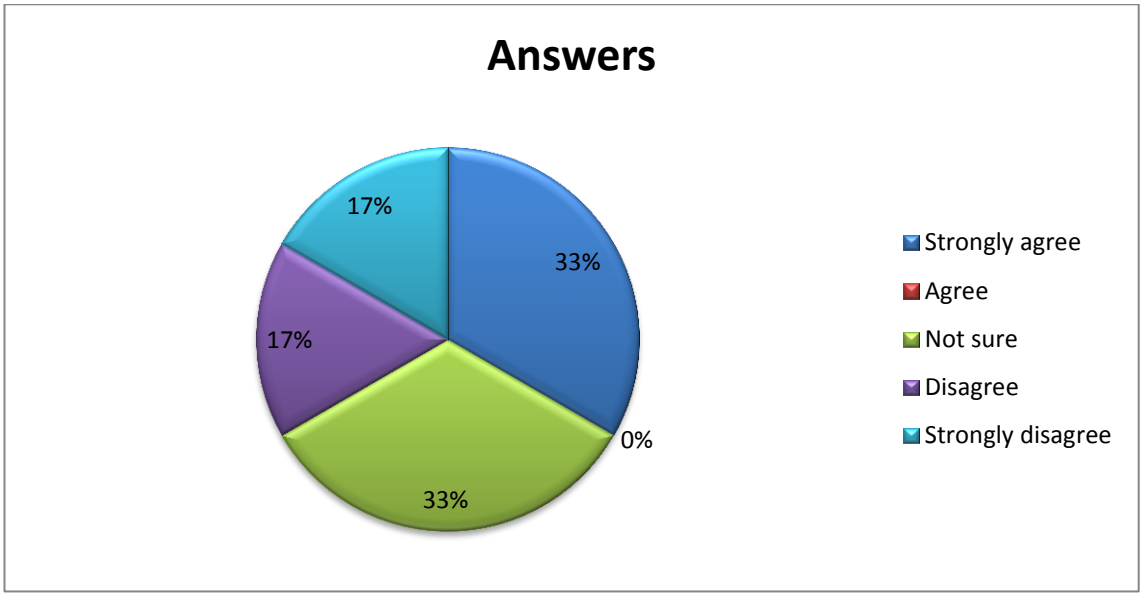


Chart 10

Question: Would you have preferred not to have the written text during SI? (G2)



4.2.5. Retention Test

There exists a difference between G1 and G2 in favour of G2 in terms of the scores taken from the retention test (see Table 24 and Chart 12). However, the difference is not statistically significant based on Mann-Whitney U test (see Table 25), since p value in this analysis is not lower than the critical p value, although it is still below 1. What is important here is the fact that G2 scored higher than G1 in retention test. This implication is supported when individual scores from retention test are studied as well (see Chart 11). It can be observed that the highest score of the test was made by two subjects in G2 (Subject 3 and Subject 6) and one subject in G1; in contrast, Subject 4 in G1 got the lowest score.

In this regard, the results are rather intriguing and unexpected. It demonstrates that although the subjects in G1 underwent double information processing, in which they read (listened) and interpreted the same text (speech), their mean score is considerably lower than the subjects in G2, who did not read the text beforehand. The result indicates that overall comprehension may be better in G2 as well. The results of the retention test contradict with the questionnaire as specified in 4.2.4. It is noteworthy that the retention test scores of Subject 2 and Subject 3, who stated that they have understood the text well, are only average. In contrast, Subject 6, who reported to be unsure about understanding the text, got the highest score from the retention test. As a result, there seems to be a vaguely negative correlation between the self-evaluation of the subjects and the actual results in terms of retention. It may be caused due to stress or rather unawareness of the self-performance.

The difference between G1 and G2 in retention levels may be due to more than one reason. It is known that more effort causes deeper memory trace (see Craik and Tulving, 1975), which may presumably result in better retention and higher scores in retention test. In this regard, higher cognitive load of G2 may have caused deeper memory trace and as a result, better retention. Thus, this result

can be regarded as another proof that SI with text requires much more cognitive effort compared to pure SI. Another explanation may be the difference between the reading types employed in both tasks. It can be argued that G1 performed a passive reading without interpreting and in contrast, G2 read the text during interpreting. As a result, it is assumed that reading with interpreting (SI with text) intensifies comprehension during and after the task. It can be viewed one of the positive features of SI with text in terms of overall SI performance. Unlike gaze data, it is not possible to mention about inter-group similarities between scores in retention test. For instance, the lowest score (25) was shared by two subjects (Subject 4 and 7) from different groups. Furthermore, there are three subjects in total both from G1 and G2 who got the highest score (see Chart 11). A possible explanation for this can be cognitive differences between individuals (see Carroll, 1980).

Table 23

Retention Test Results

Subject (Group)	Score	Subject (Group)	Score
Subject 1 (G1)	40	Subject 7 (G2)	25
Subject 2 (G1)	37.5	Subject 8 (G2)	45
Subject 3 (G1)	32.5	Subject 9 (G2)	60
Subject 4 (G1)	25	Subject 10 (G2)	40
Subject 5 (G1)	35	Subject 11 (G2)	35
Subject 6 (G1)	60	Subject 12 (G2)	60
MEAN	**38.33333**	**MEAN**	**44.16667**
TOTAL	**230**	**TOTAL**	**265**

Chart 11

Subject-based Comparison between G1 and G2 for Retention Test

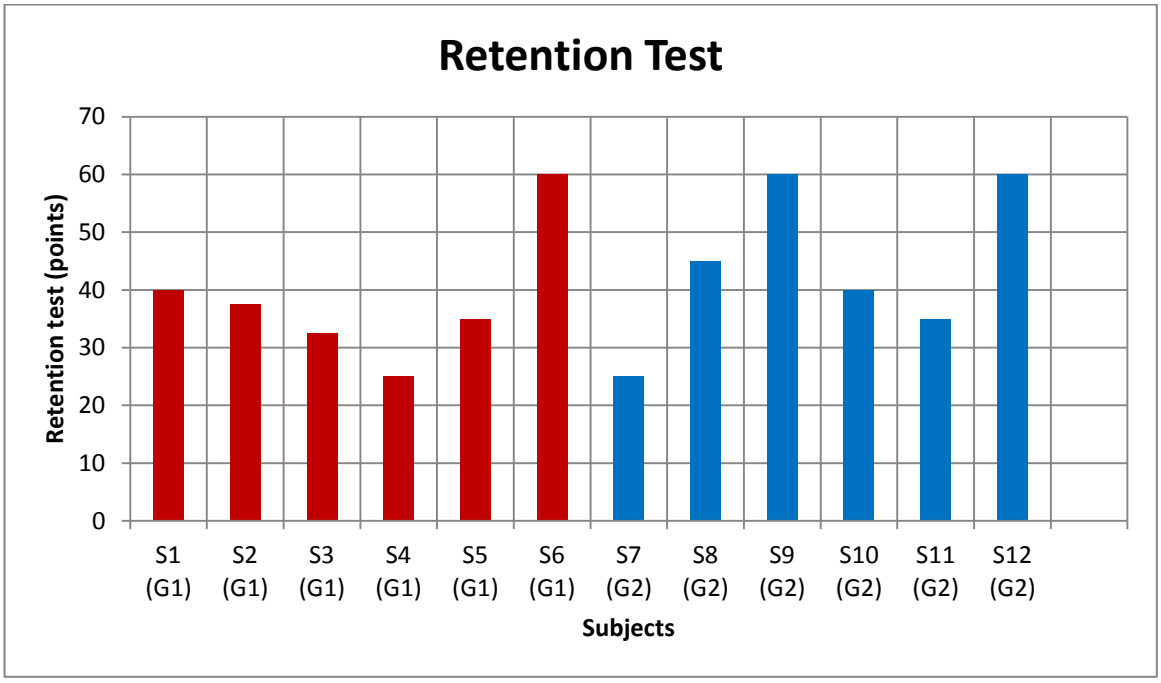


Chart 12

Comparison between G1 and G2 for Retention Test (Mean Value)

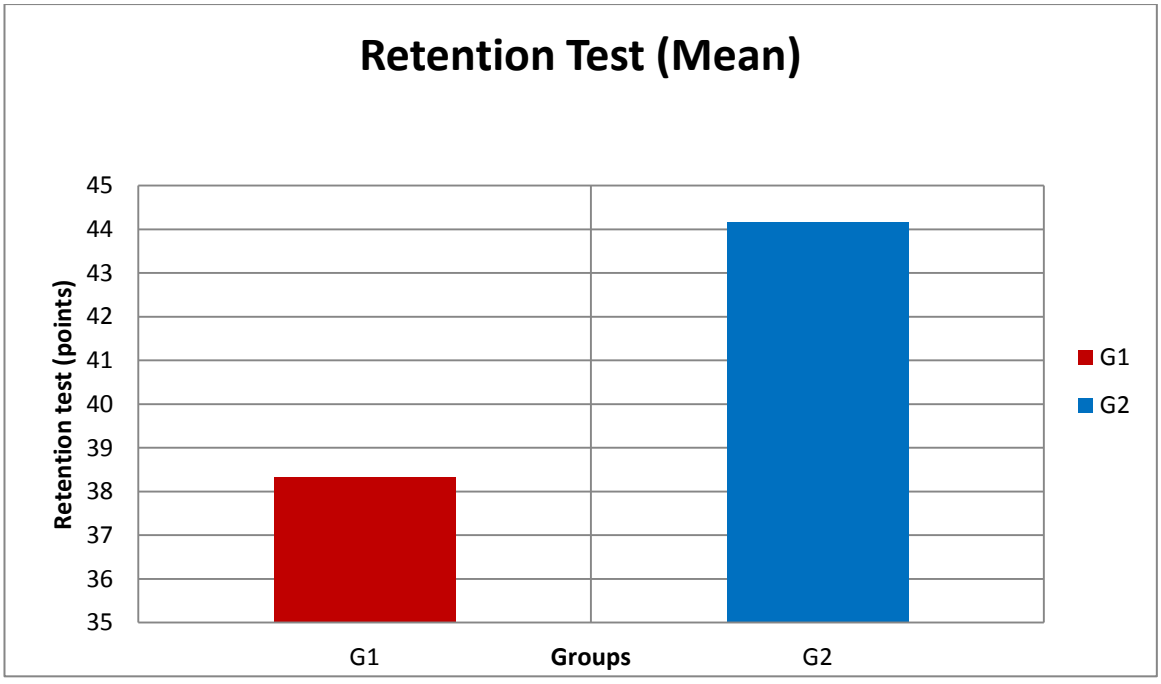


Table 24

Statistical Analysis of Retention Test Results for G1 and G2 – Ranks

	Group	N	Mean Rank	Sum of Ranks
Retention Test	G1	6	5.58	33.50
	G2	6	7.42	44.50
	Total	12		

Table 25

Statistical Analysis of Retention Test Results for G1 and G2 - Test Statistics

	Retention Test
Mann-Whitney U	12.500
Wilcoxon W	33.500
Z	-.892
Asymp. Sig. (2-tailed)	**.373**
Exact Sig. [2*(1-tailed Sig.)]	.394[a]

4.2.6. Relation between Indicators

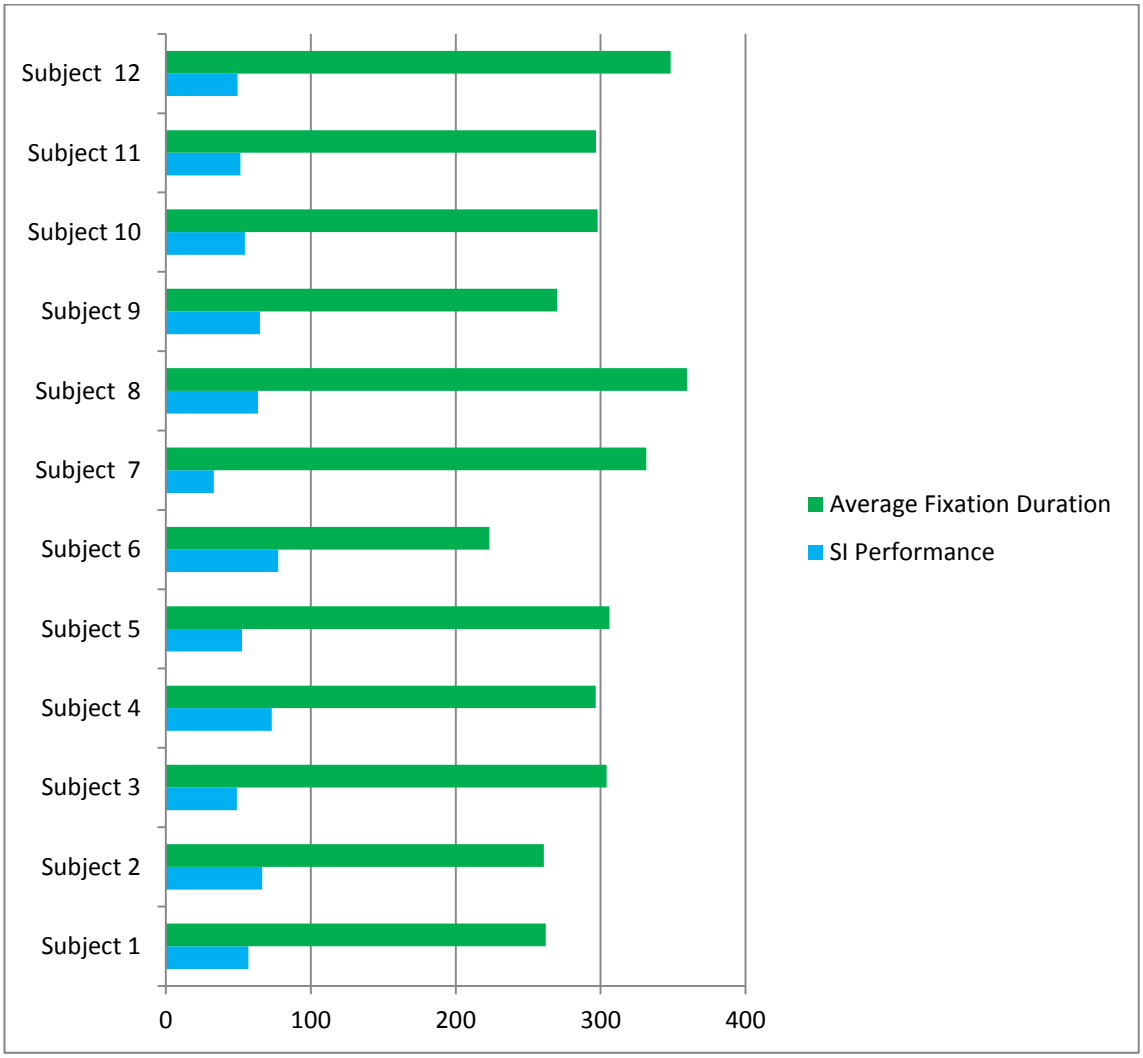
The relation between certain indicators; *i.e.*, retention test, SI performance and average fixation duration standing for the cognitive load, were analysed in order to detect a probable direct or inverse proportion between the measures in question. Such an assumptive relation between these important indicators of SI with text is exceptionally important in developing performance strategies and training methods regarding SI with text, which is in line with the aims of this study.

4.2.6.1. Cognitive Load and SI Performance

Average fixation duration and SI performance of the subjects are presented in a comparative fashion in Chart 13. As seen from the chart, there is not a positive or negative relation between the cognitive load and SI performance. In this regard, measures regarding Subject 7 are illuminating. It can be seen that there is a remarkable gap between the average fixation duration value and SI performance of the subject. In contrast, the measures of Subject 2 regarding the two indicators are proximate to each other. As a result, it is difficult to claim a direct proportion between the cognitive load and SI performance as values regarding the two indicators do not increase and/or decrease proportionally. Similarly, it would not be right to hypothesize a casual relation between these measures. In other words, it is difficult to state that higher cognitive load causes better SI performance or better SI performance requires higher cognitive load. The result was found as excepted.

Chart 13

Relation between Cognitive Load and SI Performance



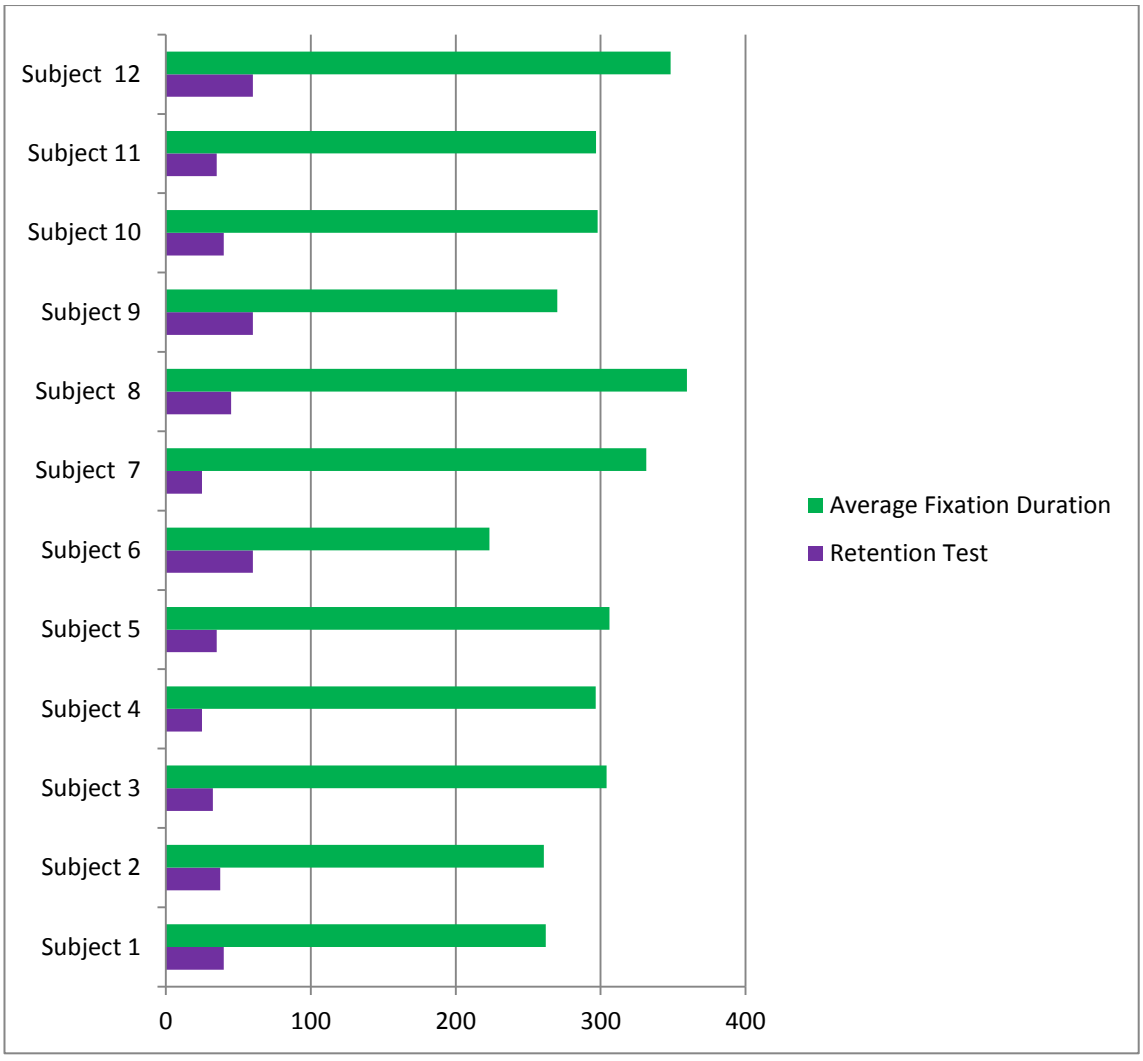
4.2.6.2. Cognitive Load and Retention Test

Chart 14 compares the cognitive load of the subjects in terms of average fixation duration and results of the retention test. Findings reveal that it would be misleading to assert a relation between cognitive load and retention test regardless of being negative or positive. Subject 8, for instance, had the highest amount of average fixation duration (approx. 359 ms); however, she got an average score (40) in the retention test. On the contrary, Subject 6's average

fixation duration was the lowest in the main test (approx. 223 ms), yet she got the highest point (60) in the retention test. This can be regarded as an expected result as well, since a probable relation between the cognitive load and the retention test would be highly indirect within the scope of SI, despite the fact that deeper memory trace is thought to be related with retention (see Craik and Tulving, 1975).

Chart 14

Relation between Cognitive Load and Retention Test



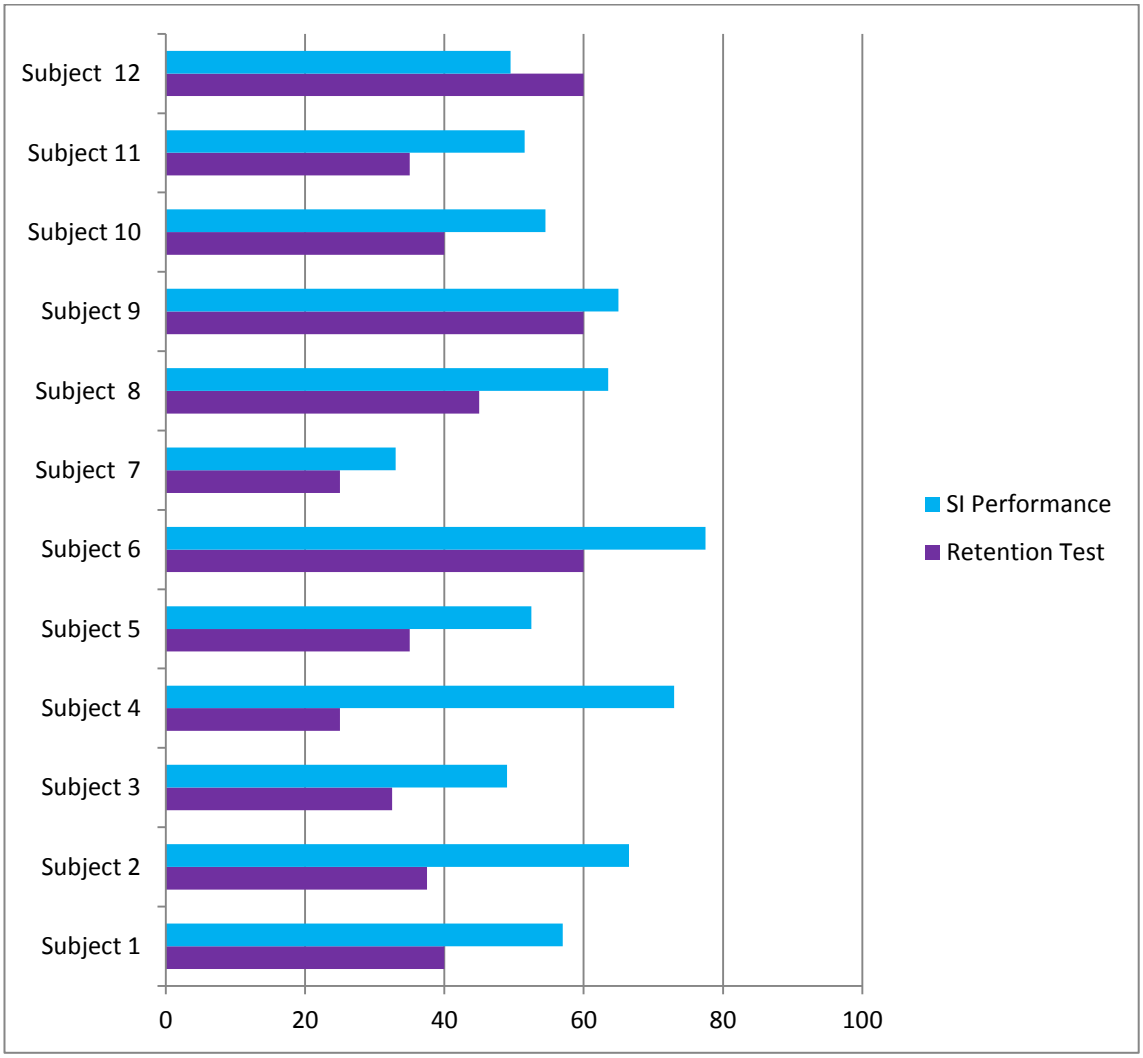
4.2.6.3. SI Performance and Retention Test

Expecting a positive correlation between the retention test and SI performance seems to be reasonable considering the fact that better SI performance may refer to better comprehension, which may affect the results of the retention test in a positive way. Furthermore, it is both observed and suggested in literature that there is a strong correlation between SI performance and comprehension and memory processes of interpreters (see Bajo *et al*., 2001). In accordance with the literature, there seems to be a direct proportion between the results of the retention test and SI performance of the subjects as seen from Chart 15. Results of Subject 6, Subject 9, Subject 10 and Subject 11, in particular, are salient examples of such a relation, in which both measures increased and decreased proportionally.

However, the results of Subject 4 constitute an exception, considering the difference between her score in SI and retention test. As seen from the Chart, although the subject scored remarkably well (73) and ranked second in SI test, her result in the retention test (25) was the lowest in both groups. However, the majority can be considered as sufficient to introduce such a presumptive relation between the retention test and SI performance. However, the test may be repeated with a larger sample size and by manipulating the related variables as well.

Chart 15

Relation between SI Performance and Retention Test



CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

"The work of science is to substitute facts for appearances,
and demonstrations for impressions."
John Ruskin, Author

This thesis has discussed the phenomenon of SI with text, a specific SI modality, with its multifarious dimensions including terminology, history, technology, cognition and text processing with a specific focus on reading and eye movements. In this regard, the main test of the study took two working paradigms within the domain of SI with text as cases using the eye tracker at METU-HCIRAL as the data collection instrument to understand the nature of the process. Accordingly, subjects, who performed pure SI with a preparatory reading beforehand and subjects, who performed SI with text, were compared in terms of reading patterns, SI performances, cognitive loads and retention levels. Data collected from the main test were presented with tables and charts and discussed accordingly in the previous chapter.

In this chapter, conclusions drawn from the data analysis and recommendations regarding training for SI with text and reading for/during SI and lastly, recommendations for further research will be presented. The main and sub research questions of the research, which are put forward in 1.4, will be provided with possible answers based on the findings of the main test to present conclusions in a more condensed fashion. Additional observations and conclusions inferred from the test, which cannot be discussed under research questions, will be presented as well.

5.1. CONCLUSIONS REGARDING RESEARCH QUESTIONS

5.1.1. Main Questions

(1) Is there a difference between G1 and G2 in terms of reading patterns for and during SI?

Yes. Findings reveal that there exists a considerable and observable difference between G1 and G2 in terms of reading patterns. The patterns are contradistinctive enough to define two distinct reading paradigms. Reading behaviour of G1 can be termed as **reading for SI**, which is performed by interpreters frequently in the booth via computer screen and for a short duration before SI performance. Observations on eye movements of the subjects demonstrate that reading for SI can be characterized with relatively regular reading patterns with more or less stable and linear gaze paths, only with the exception of deviations in gaze when subjects come across with linguistic difficulty and ambiguity. The subjects in G1 also presented relatively regular fixations with a duration of approximately 275 ms, regressive eye movements during heavy load of information processing, frequent word skipping especially in case of familiar and stereotyped linguistic segments in terms of SI, rapid scrolling down behaviour and rapid text processing during initial sentences of the text, resulting in skipping. In general, all subjects in G1 tended to fixate for longer durations and/or re-read certain words with sharp regressions, when encountered with information-dense segments. Furthermore, it is observed that subjects in G1 had SI task in their mind during reading for SI and therefore, construct their reading ‘strategy’ based on SI whether consciously or not. This strategy affects a surprisingly wide spectrum of reading behaviours from word skipping to second reading. It can also be put forward that the subjects in G1 employed or at least tried to employ reading strategies including speed-reading; however, these strategies were not virtually deliberate. It is observed that reading for SI is a matter of time-management. In this regard,

subjects, who managed to finish reading the text before the allocated time, were able to go for a second reading. It is also observed that the eye movements during second readings were more like scanning rather than reading and resembled reading patterns of the subjects in G2, in a sense. Furthermore, the second reading behaviours were considerably analogous for subjects who managed to perform it. For instance, subjects frequently started the second reading from the paragraphs with heavier information load instead of the first paragraph with token and familiar expressions as to SI.

On the other hand, it is possible to term reading behaviour of G2 as **reading during SI**, a kind of silent and on-line reading. It is observed that reading during SI is not a monotype reading style and it can be classified into two sub-types as **synchronized** and **non-synchronized reading**, considering the mostly interpreter-controlled matching between auditory and visual input and free searching mechanisms employed to find the relevant segment within the text. Patterns showed remarkable difference in each (sub-) types. In this regard, synchronized reading during SI can be regarded as similar to reading for SI with the exception of longer, denser and multiple fixations on the same spot, quick, short yet excessively frequent regressions, repetitive saccadic movements between the same sites. It is estimated that characteristics of reading patterns of synchronized reading during SI are closely related with the inverse syntactic structure of English and Turkish languages as subjects performed sight interpreting during synchronization. This may be regarded as the reason of frequent regressions. Furthermore, subjects in G2 tended to re-read the previous segments again with sharp regressions, assumedly to construct the general context of the text. In contrast, non-synchronized reading during SI manifests a wholly contrasting reading type, which may even not be labelled as ‘reading’ at all due to various reasons. This kind of reading can be characterized by excessively rapid and spontaneous eye movements, unstable, unplanned, non-linear and considerably long gaze paths that are directed simply any spots on the

page, very frequent and long fixations that are seemingly not related with the linguistic difficulty of the specific segment, yet momentarily cognitive load of the subjects, frequent and unexpected regressions, very rapid scrolling between the pages and 'freezing' the page at times, especially under deviation conditions. On the other hand, it is also observed that subjects in G2 did not always search for information even during non-synchronized reading behaviour. At times, they discarded the text and preferred performing SI with auditory input only. It is concluded that reading during SI is a matter of synchronization, considering the overall SI performance, which constitutes the final aim of the whole act.

(2) Is there a significant difference between the cognitive load of G1 during the reading process before SI and G2 during SI with text?

Yes and in favour of the expected group (G2); however, not significant in statistical terms. In order to compare cognitive load, average fixation duration was taken as the main indicator considering that it is the only measure providing cognitive data, irrespective of the task duration. According to the analysis of average fixation duration, it was observed that G2 exerted more cognitive effort than G1. Contrasting the cognitive tasks that both groups had to perform during eye tracking can help in understanding and interpreting the difference. In this respect, eye tracking record covers reading for SI performance of G1 and reading during SI performance of G2 and reading during SI was accompanied by listening, speaking and interpreting tasks, by definition. Thus, this result can well be regarded as expected. Yet, the study suggests tentative values for average fixation duration as regards reading for/during SI. In this respect, it can be stated that approximate mean fixation duration is **275 ms** for reading for SI and **317 ms** for SI with text. However, values may vary under different operational and textual circumstances.

(3) Is there a significant difference between G1 and G2 in terms of SI performance?

Yes and in favour of the expected group (G1); however, not significant in statistical terms. The result is expected yet highly prominent in the sense that it helps demonstrate the role and value of the text during SI. This study clearly reveals that visual aid, or text in our case, is not necessarily an 'aid' during SI although it is taken for granted to be so not only by the interpreters but also by other constituents of interpreter-mediated events such as organizers, speakers and the audience etc. Let alone serving as an aid, the written text may turn out to be a distractor especially when deviations during speech delivery are concerned and if it is to be processed without preparatory study. Therefore, when texts are involved in SI, preparation is vital in order to ameliorate overall SI performance. Accordingly, it can be put forth that delivering the texts to the interpreters at a reasonable time before the conference is much more important, effective and beneficial than delivering the text at the very moment of the SI performance, which is still the case in many organizations.

In qualitative terms, the most striking difference between the performances of G1 and G2 is that G1 was better in contextualising information by using SI strategies such as deverbalization, anticipating, paraphrasing or dividing long sentences into shorter ones. On the other hand, subjects in G1 frequently misinterpreted the details and specific linguistic segments such as numbers or proper names due to the lack of visual aid and pre-defined laboratory conditions that detained subjects from note-taking. In contrast, G2 over-depended on the text and therefore, was not as successful as G1 in contextualising the text. Therefore, most of the subjects in G2 could not understand and convey the main idea of certain paragraphs and often could not complete the sentences or they misconstructed sentences in the target language. In contrast, most of the subjects in G2 managed to interpret specific linguistic items such as figures and proper names correctly as long

as they synchronized the text with the speech. Both groups had severe difficulty in noticing and interpreting conjunctions such as *despite the fact that*, *even if* etc. Within the scope of SI with text, conjunctions are of utmost importance in conveying the message of the text. Thus, misinterpreting these linguistic items led to critical errors in SI performance in both groups. It was observed that having the text during SI did not have a remarkable or restorative effect on the problem.

5.1.2. Sub-questions

(1) Is there a difference between G1 and G2 and/or within G1 and G2 in terms of reading patterns and SI performance of right, left and mid-branching sentences?

No. The text is manipulated based on right, left and mid-branching syntactic structure to balance the structural difficulty throughout the text, as specified in Chapter 3. Along with that, eye tracking records and SI performances are analysed by keeping an eye on any probable difference in the processing of right, left and mid-branching sentences both visually and orally. However, such a difference was not observed neither with analysis of the eye movements nor SI performances. Although more than half of the subjects found the text easy with regard to its structure, eye movements and SI performances suggest that the subjects experienced a shared difficulty presumptively stemming from the long and complex sentences with numerous sub-clauses following one another. Along with that, subjects in both groups tended to read the text with more frequent regressions when abnormal sentence constructions are concerned for a specific language (left branching for English, for instance). In terms of text-linguistics, cognitive difficulty mostly arises from inverse syntactic structures between source and target languages more than other factors. Furthermore, syntactic problems within interpreting are mainly psycholinguistic and arise due to the

conditions of perception and the constraints on human working memory, in other words, due to the temporal gap between the auditive perception of the utterance and initiation of the oral translation (Chernov, 2004, p. 137). All points considered, the main difference was not between right, left and mid-branching sentences, yet between two languages and the two working paradigms: pure SI and SI with text. Nonetheless, further studies are required in order to observe the relation between text-linguistics and SI with text performance.

(2) Is there a difference between G1 and G2 in terms of the effect of deviations from text on SI performance?

Yes. There is a clear and expected difference. G2 was much more deeply affected from deviations most probably due to the continuous existence of the written text during SI and as a result, interference of the visual input with the auditory one. During deviations, the subjects in G2 generally lost track of the text and their concentration, became distracted, felt stressful and anxious, which resulted in critical errors in SI by all accounts. Furthermore, the effect of deviations lasted for long, even until the very end of the speech. Meanwhile, majority of the subjects endeavoured to synchronize the speech with the text again, while some of them gave up and relied solely on the auditory input. Although synchronizing the speech with the text once more after the deviations provided the subjects with a **performance boost** and associated self-confidence, these effects lasted for very limited durations and had a minimal contribution to the overall SI performance. In the final analysis, the effect of the deviations was a considerably negative one and can be assumed as one of the reasons of relatively poor SI performance of G2 compared to G1. On the other hand, G2 was minimally affected from the deviations if not any, due to non-existence of the visual input and the evanescence of memory trace following the reading task before SI. Although better retention levels can easily be taken for granted in terms of better SI performance within the scope of SI with text, speech

delivery with deviations shifted the balance in favour of G1 for this specific case. Along with that, it is of interest that only two subjects in both groups stated that they easily noticed the deviations from text during speech delivery. Although higher awareness level in G2 was expected in terms of the deviations, the fact that the majority of the subjects in both groups were unsure about noticing deviations during SI with text is highly interesting. This suggests that deviations are indeed **traumatic experiences** for interpreters during SI with text.

(3) Is there a difference between G1 and G2 in terms of answers to the shared questions in the questionnaire?

Both yes and no. Different results were found according to the question types. To illuminate, no or very slight difference was detected in answers to the questions about the difficulty of the written text. Both groups found the text and the speech easy from many perspectives, although their views contradict with the results of the SI test. However, G1 and G2 reported slightly different experiences with regard to their SI performances. To be more precise, G2 had relatively less difficulty in interpreting specific linguistic segments such as numbers, proper names etc. thanks to the availability of the text. In a similar fashion, G2 mentioned about experiencing heavier stress during SI. However, both groups had similar difficulty in keeping pace with the speaker regardless of the availability of written text. The results set forth that interpreters are affected by certain conditions regarding SI with text such as the textual difficulty in a similar way. However, what makes the difference is the interpreter's reaction towards these conditions. In this respect, the existence or non-existence of the written text may alter the stress levels and SI experience of the interpreters if all other factors kept constant (see 4.2.4)

(4) Is there a difference between G1 and G2 in terms of the results of the retention test?

Yes but not significant. Furthermore, the difference was in favour of the unexpected group (G2). Prior to the main test, it was assumed that if subjects in G1 process the text twice from different channels, visual and auditory channels, respectively, they would score higher in retention test. However, findings showed exactly the opposite and G2 scored higher in the retention test, although the difference was not significant. The result is assumed to be related with the depth of memory trace. In this regard, concurrent tasks of G2 may have created deeper trace compared to G1, which led to better performance in the retention test.

(5) Is there a relation between cognitive load and SI performance, between cognitive load and retention test and between SI performance and retention test?

No relation was observed between cognitive load and SI performance and between cognitive load and the retention test. It is concluded that cognitive load in terms of average fixation duration does not seem to affect any of the measures. Therefore, it would be erroneous to state higher cognitive effort or load leads in better SI performance or better results in the retention test. However, it can safely be suggested that average fixation duration is one of the main indications of cognitive load and higher cognitive load is the indicator that the interpreter is overworking, exerting higher cognitive effort and having cognitive difficulty in performing the task in question. On the other hand, there seems to be a direct proportion between SI performance and the retention test. Such a relation is expected, considering that both tasks require a certain amount of **comprehension**. As a result, a subject who deeply comprehends the speech (and the written text) can reasonably be assumed to have higher scores in both SI and retention tests.

5.2. ADDITIONAL CONCLUSIONS AND OBSERVATIONS

In addition to the answers provided for the main and sub-questions of the research, additional and noteworthy observation and conclusions drawn from the study can be enlisted as follows:

(1) There exists an individual working modality as SI with text, considering the peculiarity of cognitive efforts/load and specific working conditions involved. SI with text as a modality *per se*, does not cover a vast volume in IS yet; it has already been practised and acknowledged within professional circles.

(2) From many aspects, SI with text is an extreme working modality, which requires highly specific strategies and training methods.

(3) SI (with text) has become a human-computer interaction process with the development of information and communication technologies. Hence, it is now practically impossible to regard SI (with text) without the intervention of computers and other electronic devices. Better management of electronic environment in the booth may be related with better SI performance. In this respect, further studies are required in order to understand the relation between ICTs and SI performance.

(4) In general, novice interpreters cannot use the time effectively during reading for SI when time is limited. Some subjects in G1 only focused on specific linguistic segments such as numbers and proper nouns; however, since they were not allowed to take notes, they could not keep in mind and efficiently use them during SI.

(5) Reading for SI is beneficial as long as novice interpreters focus on meaning rather and words and comprehend the main idea of the text by contextualizing individual segments.

(6) Lack of eye contact between the interpreter and the speaker affected the subjects adversely. Natural visual materials including the speaker and the audience are critically important for SI performance (see Figure 3).

(7) The subjects in G1 chose to scan the text quickly during reading for SI when they were pressed for time. Eye movements during quick scanning were observed as triangular-shaped.

(8) It is observed that the subjects in G1 preferred going for a second reading whenever they had the opportunity, however, the second reading that the subjects performed was not time-effective and strategic at all. In this regard, interpreters are recommended to perform second reading in a more rational manner. For instance, they may be trained to focus on key words, figures and proper nouns etc. with proper and deliberate exercises.

(9) On the other hand, the second reading within reading for SI does not appear as the only option for better SI performance. Slow reading accompanied with less skipping and dense fixations resulted in better comprehension and better SI performance as well, for certain subjects in G1. In this regard, reading strategies within reading for SI may reflect individual preferences. Although reading strategies clearly affect SI performance, the nature of the effect is not clear. Therefore, further studies are required in order to clarify and understand the influence of reading strategies and time management during reading for SI on SI performance.

(10) Reading for SI is highly different from standard silent reading and requires much more cognitive effort (275>225 ms). On the other hand, SI with text requires nearly as much cognitive effort as visual search (317≈330 ms).

(11) It is observed that reading and interpreting tasks in synchronized reading during SI are not performed simultaneously. The subjects in G2 processed segments of the text before they received the same segment from auditory channel. This phenomenon is called as **eye-voice span** (see Levin and Buckler-Addis, 1979). It is further observed that the occurrence of eye-voice span increased the performance of the interpreter. In other words, when the subjects in G2 read the sentence before they heard it, their SI performance increased. Thereby, the

interpreter may have the opportunity to grasp the general idea of the interpreting unit to come at least. It is assumed that information processed by the working memory during SI is stored in the episodic buffer (or in our case, visuospatial buffer for visual input and phonological buffer for auditory input) for a limited duration in a temporal sequence (see Cowan, 2000/01). In this regard, the existence of episodic buffer may also have a function in eye-voice span. Reading and interpreting tasks bear resemblance to listening and interpreting tasks in a sense that there is also a temporal gap between listening and interpreting called as **ear-voice span** (see 2.1.3.2).

(12) Following the text with the exact pace of the speaker even in synchronized reading during SI may not be practically possible after all. In that sense, a lag between the speaker's output and the interpreter's visual processing is inevitable.

(13) Instead of waiting, scrolling up or slightly scrolling down, the majority of the subjects in G2 tended to scroll down rapidly towards the end of the text when they came across a deviation. It appears as an inadvisable behaviour since most of the times the correct segment was approximate to the segment that the interpreter was processing at that time. Moreover, the subjects generally lost control of the text during and/or after such a dramatic page scrolling. In general, scrolling behaviour distracted the subjects in both groups for a short time and caused distortion in the SI performance for G2.

(14) Anticipation may be risky even when following the text. Thus, faulty anticipations resulted in errors in both groups. For instance, overwhelming majority of the subjects interpreted *to stabilize greenhouse gas concentrations* as *to decrease greenhouse gas concentrations* as they expected the segment to be so.

(15) There seems to be presumptive correlation between the sense of self-confidence in the tone of the interpreter and (re-)synchronization in reading during SI. In other words, subjects sounded more self-confident

when they were tracking the text with the auditory input; however, when they lost the track of the text, they sounded doubtful.

(16) There seems to be presumptive correlation between eye movements and (re-) synchronization in reading during SI. Duration of fixations became longer and eye movements accelerated when (re-) synchronization occurs. It is assumed to be related with the momentarily increased cognitive load.

(17) Synchronized reading during SI does not guarantee error-free SI performance. To illustrate, some subjects in G2 failed in interpreting certain figures although they were reading them along with the auditory input.

(18) Deviations led to confusion for the subjects in G2. As a result, the subjects in G2 could not understand at times that they were reading the text in synchronization with the speech following deviations. Eye movements at these intervals shared similarity with non-synchronized reading during SI.

(19) Similarly, subjects in G2 did not remember the paragraphs they read during SI at times. This was evident from the fact that some subjects could not synchronize the text with the speech although they were reading ahead of the auditory input. In other words, they had already read the concerned segment before they received it from the auditory channel. Surprisingly enough, they did not manage to synchronize the text with the speech. This phenomenon is assumed to be another proof that SI with text is an extreme working modality, causing excessive stress, confusion and mental load for the novice.

(20) Reading can be regarded as much more beneficial in interpreting details and specific linguistic segments such as proper nouns and figures compared to long and contextualized expressions.

(21) Branched sentences in the text regardless of being left, right or mid, increased the number of regressions in both reading for and during SI.

(22) Having the text during SI was observed to have a psychological effect on the subjects. In this context, visual input can be regarded as fructuous in building up interpreters' self-confidence, even if they cannot effectively benefit from it.

(23) There are cue segments in the text, which can be defined as 'hooks' that helped subjects to re-synchronize the text with the speech following deviations. It is observed that iconic linguistic items such as numbers, specific linguistic items such as proper names and non-frequent and non-familiar words served as hooks for the subjects in G2.

(24) Numbers are considerably significant as to SI (with text) and both groups had difficulty in this context. There seems to be a correlation between text processing and interpreting numbers. Subjects who followed the text along with the speech were naturally better in interpreting numbers. However, others preferred to approximate figures whenever they found them too many, challenging or entangled to interpret. Professional interpreters tolerate approximation when figures represent magnitude rather than technical measuring (Nolan, 2008, p. 288) Furthermore, considering the iconic nature of numbers when written in digits instead of letters, processing them may be cognitively different from other textual units. Therefore, further studies are required within the scope of interpreting numbers from a cognitive linguistics point of view.

5.3. RECOMMENDATIONS FOR TRAINING

This study demonstrates that visual processing or reading, in particular, in SI with text is both a *sine qua non* due to speaker preferences developed with the conference technologies and vital in terms of overall interpreting performance. Although existence of visual aid during SI is taken for granted as beneficial for interpreters, the study suggests that it is only so, when visual aid or text in our case is managed properly. Otherwise, let alone being an aid, the written text may turn out to be a distractor, which results in critical distortion in SI

performance. Such cases become quite common when the speaker deviates from the text during speech delivery for a number of reasons. In this regard, the study also asserts that novice interpreters are quite fragile in terms of deviations. The fact that G1 scored relatively higher than G2 in SI test is a salient proof that visual materials become more beneficial when novice interpreters study it before SI task.

Considering the abovementioned points and the fact that SI with text is a fairly common modality, it would be highly beneficial to insert ‘reading’ as a constituent cognitive task of interpreting into curricula of interpreting training programmes. It would either be as a part of simultaneous interpreting courses or favourably, as individual courses. In this regard, it is important to remind that reading within the scope of SI was found to be remarkably different from other reading types. Therefore, specialized reading courses are to be different as well from other general reading courses such as reading skills or reading L2, which focus on general reading strategies and text types and usually offered during the first years of the training programmes for translation and interpreting. However, recommended reading courses are recommended to cover reading as a part of and a cognitive tool for the training in SI. Reading for SI and reading during SI, as designated in this study, may be two main subjects of these courses. In this respect, it is possible to regard these specialized reading courses within SI as the counterpart of note-taking courses for the training in consecutive interpreting. Apart from reading for/during SI, these courses may also cover reading strategies such as speed-reading techniques, parsing and chunking in reading, reading specific types of visual input such as presentation files, infographs, charts, figures, etc. Reading exercises specifically designed for reading for/during SI such as linguistic deciphering; for instance, attributing meaning to the referents in the text may also be included in the courses. Such courses are recommended to include ICT skills for interpreters as well, which would enable novice interpreters to manage and thus, benefit from their electronic environment in the booth in a better manner. It is observed that novice interpreters, who receive intensive training to become professional

interpreters, perform reading for/during SI rather intuitively. They (try to) employ speed-reading or parsing techniques thanks to their previous learnings; however, these efforts are not metacognitively conscious. Lastly but equally important, pedagogical methods that aim to enable the students to acquire and harness metacognitive skills with regard to reading within the scope of interpreting, may be highly beneficial. Apart from specific reading courses, SI courses are also recommended to include extreme SI conditions as advanced training exercises, such as interpreting a speech with excessive deviations or delivered at high speeds, as the case of this study. Considering the need for competent, highly trained and specialized interpreters, who would provide service for a country, which claims regional power and makes strides to move forward in the accession process of EU, any effort to enhance interpreting programmes by adding specific courses would not be quixotic.

5.4. RECOMMENDATIONS FOR FURTHER RESEARCH

SI with text, as an established working modality yet a relatively new research field within the scope of IS and eye tracking both as a research technique and data collection instrument provide vast amount of possibilities for further research. To begin with, varying observations and experiments, which would possibly have stirring and illuminating results, may be performed with minor manipulations in the main test design of this study. To name few of them;

- Same test can be repeated only with a larger sample size in order to observe any probable difference in the significance level as to statistical analysis. In this case, results can be analysed generally instead of subject-based method.
- Parameters and variables such as reading pace, language directions, texts, speeches, subjects in the groups and time can be manipulated to observe the effect of various elements regarding SI with text.

- For instance, time allocated for reading task can be equalized with the duration of SI task with or without longer texts in order to use number of fixations and total fixation duration to calculate cognitive load. It would be beneficial in having results that are more enhanced.
- Allocated time for preparation may be manipulated. For instance, the text or other related documents may be delivered to the subjects one week, a day or one hour ago, before the SI task and SI performance may be compared between subjects who study on the text for varying durations.
- Text can be manipulated and thereby, the frequency of deviations can be increased or decreased and the type of deviations can be altered. Moreover, the same test can be repeated with a text without any deviations.
- Subject groups can be manipulated as well and novice and professional interpreters can be compared in terms of reading patterns, cognitive load and SI performances in SI with text. Moreover, novice interpreters from the translation and interpreting departments of different universities can be compared using the same test design in order to discuss the efficiency of interpreting and possible reading for/during SI courses.
- Furthermore, visual materials can be changed or varied. For instance, instead of written text of speeches, another common visual material, MS PowerPoint™ presentations can be used. Using presentation slides would provide the researcher with numerous different research scenarios and test variables. The difference between subject-controlled and speaker-controlled presentation management, difference between image-dense and information-dense presentations and their possible effects on SI would be few of them. Along with that, web sites, videos, figures and photographs with information, graphics, and infographs can also be used as visual material (see Chart 2).
- Two additional groups (G3 and G4), can be added to the test in order to further understand the nature of SI with text by contrasting other working paradigms. In this regard, G3 would both study the text by reading before SI and have the text during SI. On the other hand, G4 would have the

text neither before nor during SI task and perform pure SI without preparatory reading. Whether there is a significant difference between G1, G2, G3 and G4 in the cognitive load and SI performance may be a illustrative research question.

Different test designs can also be used in order to study varying dimensions of SI with text either with eye tracker or not. In this context, further tentative and broad research questions, which may use different research designs and methodologies, would be the following:

- Is it possible to extend visual focal loci with reading for/during SI exercises? Do reading exercises have any effect on SI performance or cognitive load?
- Can the capacity of visuo-spatial memory be enhanced? If so, what kind of exercises can be utilized? What would be the effect of these exercises on cognitive load and SI performance?
- Is it possible to mitigate cognitive load of interpreters during SI with text?
- Is there a relation between the text-linguistics and reading patterns in reading for/during SI? If so, how can we define an ideal text for interpreting?
- Is there a difference between shadowing, sight interpreting, sight translation, SI and SI with text in terms of cognitive load and output quality?
- What is the relation between the interpreter and her/his electronic environment? What would be effect of developing HCI management exercises on SI with text performance?
- What is the effect of cooperation between simultaneous interpreters in the booth on SI with text? Is it possible to develop strategies for better cooperation between boothmates in order to cope with extreme SI with text conditions?

- Is it possible to diminish stress levels during SI with text? Can general stress relief techniques be regarded as beneficial also for interpreting situations?
- What do expert interpreters think about extreme working conditions such as SI with text? What are their strategies or coping mechanisms? In this regard, how can we define ‘expertise’ in SI with text?

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APPENDIX 1:

THE WRITTEN TEXT (1)
Subjects' Copy Used on the Screen (Visual Input)

Mr. Chairman,
Excellencies,
Ladies and gentlemen,

Good morning. As the President of the United States of America, it's an honour for me to join this distinguished group of leaders from nations and organizations around the world. Today, we are here to discuss a very serious and challenging problem that our planet has confronted with: Global warming and climate change. In fact, I majored political science in Colombia University with a speciality on international relations and then worked at Business International Cooperation, as you may know. To tell the truth, when I first received the invitation that you generously extended to me to come and speak to you, I was surprised since I am not an expert in global warming, nor climate.

In this respect, the speech that I am going to deliver will be of an introductory nature and will mainly focus on our role as decision makers, on the solution plans for and political dimensions of global warming and lastly on the controversy about the topic, instead of the expected effects and the scientific dimension of climate change; because without any doubt, the speakers who will use this rostrum following me will go deeper into the technical details and touch on other specific issues related to our theme, as I can clearly figure out from the schedule before me. I hope that my presentation; in the first part of which I would like to express my sincere thanks and heart-felt regards to the organization committee, to William Carver, the European Commissioner for the Environment; to Allen Rooks, the European Representative for the Climate

Action; to Prof. Cristina Badescu from Georgetown University; to Travis Blornick from United States Environmental Protection Agency; to Dr. Ville Vesterinen, from the Union of Concerned Scientists and to Angela Crooper, the deputy Executive Director of United Nations Environment Programme; will not make you, the participants, asleep.

The Earth's temperature has reached to the highest point of the last 10.000 years while we have been constructing excessively tall buildings, driving our super-luxurious cars that are larger than needed and watching the nature die; leaving us without food and water and which will spark serious consequences that would affect the security of the globe, dynamism of our markets, sustainability of civilization and therefore, living of our people. As climate change and global warming have started to pose much more danger to our people, by deteriorating public welfare and health, weakening global economies and domestic markets, increasing income inequalities between and within countries with justifiable reasons and leading psychological hardships since the beginning of 1970s, with the rising level of atmospheric carbon dioxide with a result of greenhouse effect; here in Copenhagen, we came together.

Ladies and gentlemen, nature calls us for help. The last three decades were the warmest in the United States since 1895 when our national record-keeping began, despite the fact that international declarations such as Millennium Goals issued by the United Nations, scientific studies conducted in many prestigious universities, remarks made by NGOs which exert enormous efforts about the issue in question and coordinated work of governmental bodies have been pointing out to the problem for years.

However, you proved your decisiveness and deserve thanks in this regard by being here. I can see many brave and enthusiastic faces in front of me now, ready to take immediate action. Unless you were convinced that this danger is real, unless you believed that those facts and figures are not fiction but science, unless you preferred to put a lid on this alarming trend and unless you wanted

to be a part of this team consisted of players from different parts of the world working for the same goal, and without giving up while playing a dramatic role in the mankind’s most demanding fight, you would not be here. As a matter of fact, it is clear that the question here before us, which is no longer related to the severity of the problem but our capacity to meet it and made more complicated by the addition of other problems such as heavy use of fossil fuel, doubts among the industrial sector about the efficiency of renewable and alternative energy resources such as solar and wind energy, is one of a multi-dimensional, multi-national and trans-border one.

U.S.A., with a total area of around 9 million and 820 thousands km2 and a population of around 308 million, which is the world's largest economy, embodying the majority of the multi-national companies and therefore, the world's second most problematic country in terms of carbon dioxide emission after China; with approximately 5 million 700 thousand metric tonnes annually and 18.99 metric tonnes per capita of carbon dioxide emission, which accounts for 20.2% of the total emission of the world, bears a great share of responsibility in addressing climate change and necessitates even more diligent work accordingly. So, we will do what we should.

Yet still, whether climate change is preventable or not is a hot topic in the United States.

It is crystal clear that, The Earth would still get warm by approximately one degree Fahrenheit even if we stopped emitting greenhouse gases today, start utilizing our forestal resources wisely, reducing chlorofluorocarbon gases by altering our choices into the environmentally-friendly household appliances and using non-CFC anti-perspirants, in order to stop the ozone depletion, which results in ultraviolet rays to be emitted by earth more easily, global warming and climate change. But on the other hand, as scientists predict that the Earth could eventually warm by as little as 2.5 or as much as 10 degrees Fahrenheit, depending on the choices we make; what we can, and to tell the truth, what we

must, do from today forward can make a big difference. In accordance with this, actions that can be undertaken by the governments, including being a signatory to the international agreements such as Kyoto Protocol, Montreal Protocol, Vienna Convention for the Protection of the Ozone Layer and participating environmentalist platforms such as G8+5 Climate Change Dialogue and Asia Pacific Partnership on Clean Development and Climate can make an enormous difference and show the resolution of the states. Hence, I call each and every government to active duty.

In this respect, United Nations Framework Convention on Climate Change, an international environmental treaty, which is signed by the majority of UN countries and whose objective is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous changes in the climate system and which was produced at the United Nations Conference on Environment and Development, shortly known as the Earth Summit, held in Rio de Janeiro from 3 to 14 June 1992, means a lot in reducing carbon emissions and therefore, preventing climate change.

Not only governments but also industrial and business sectors have numerous things to do in order to mitigate global warming and stop, or better still, reverse catastrophic climate change, including adopting low-carbon economy and low-carbon manufacturing methods that have a minimal output of greenhouse gas emissions into the biosphere; for example, agricultural sector should produce foodstuff as close as possible to the final consumers, preferably within walking or cycling distance and other manufacturing sectors such as automotive should lie heavy on hybrid cars using hydrogen, electric and other alternative energy resources with the usual ones in designing, manufacturing and promoting automobiles.

And yet, there are still those who are sceptic about global warming. Although numerous indicators show that the phenomena of global warming and climate change cannot be denied, apart from the international platforms I mentioned

which have reached a consensus on the existence of global warming, a few events including Global Warming Agreement Project, usually referred to as the Oregon Agreement opposing the Kyoto Protocol, and Leipzig Declaration on Global Climate Change, a statement made in 1995, seeking to refute the claim that there is a scientific agreement on the global warming issue and therefore, represent the voice of those opposers.

Ladies and gentlemen, we cannot waste our valuable time by questioning the existence of global warming. I wish you all a fruitful series of conferences. Thank you.

APPENDIX 2:

THE WRITTEN TEXT (2)
The Copy on the Digital Player (Auditory Input)

Mr. Chairman,
Excellencies,
Ladies and gentlemen,

Good morning. As the President of the United States of America, it's an honour for me to join this distinguished group of leaders from nations and organizations around the world. Today, we are here to discuss a very serious and challenging problem that our planet has confronted with: Global warming and climate change. As politicians, opinion makers, academics, representatives from non-governmental organizations and multi-national companies, we should define the problem thoroughly, find tangible solutions and take immediate action accordingly at every level possible. To tell the truth, when I first received the invitation that you generously extended to me to come and speak to you, I was surprised since I am not an expert in global warming, nor climate.

In this respect, the speech that I am going to deliver will be of an introductory nature and will mainly focus on our role as decision makers, on the solution plans for and political dimensions of global warming and lastly on the controversy about the topic, instead of the expected effects and the scientific dimension of climate change; because without any doubt, the speakers who will use this rostrum following me will go deeper into the technical details and touch on other specific issues related to our theme, as I can clearly figure out from the schedule before me. I hope that my presentation; in the first part of which I would like to express my sincere thanks and heart-felt regards to the organization committee, to William Carver, the European Commissioner for the

Environment; to Allen Rooks, the European Representative for the Climate Action; to Dr. Cristina Badescu from Georgetown University; to Travis Blornick from United States Environmental Protection Agency; to Prof. Ville Vesterinen, from the Union of Concerned Scientists and to Angela Crooper, the deputy Executive Director of United Nations Environment Programme; will not make you, the participants, asleep.

As climate change and global warming have started to pose much more danger to our people, by deteriorating public welfare and health, weakening global economies and domestic markets, increasing income inequalities between and within countries with justifiable reasons and leading psychological hardships since the beginning of 1970s, with the rising level of atmospheric carbon dioxide with a result of greenhouse effect; here in Copenhagen, we came together. The Earth's temperature has reached to the highest point of the last 10.000 years while we have been constructing excessively tall buildings, driving our super-luxurious cars that are larger than needed and watching the nature die; leaving us without food and water and which will spark serious consequences that would affect the security of the globe, dynamism of our markets, sustainability of civilization and therefore, living of our people.

Ladies and gentlemen, nature calls us for help. Our beautiful planet, our one and only home; contaminated by the dangerous waste from factories producing chemical substances, suffocated by the fumes produced by petrol-driven cars, by residential and industrial zones, captivated by the skyscrapers full of glass, metal, concrete and plastic, needs our help more urgent than ever before. The last three decades were the warmest in the United States since 1895 when our national record-keeping began, despite the fact that international declarations such as Millennium Goals issued by the United Nations, scientific studies conducted in many prestigious universities, remarks made by NGOs which exert enormous efforts about the issue in question and coordinated work of governmental bodies have been pointing out to the problem for years.

However, you proved your decisiveness and deserve thanks in this regard by being here. Unless you were convinced that this danger is real, unless you believed that those facts and figures are not fiction but science, unless you preferred to put a lid on this alarming trend and unless you wanted to be a part of this team consisted of players from different parts of the world working for the same goal, and without giving up while playing a dramatic role in the mankind’s most demanding fight, you would not be here. As a matter of fact, it is clear that the question here before us, which is no longer related to the severity of the problem but our capacity to meet it and made more complicated by the addition of other problems such as heavy use of fossil fuel, doubts among the industrial sector about the efficiency of renewable and alternative energy resources such as solar and wind energy, is one of a multi-dimensional, multi-national and trans-border one.

U.S.A., with a total area of around 9 million and 820 thousands km2 and a population of around 308 million, which is the world's largest economy, embodying the majority of the multi-national companies and therefore, the world's second most problematic country in terms of carbon dioxide emission after China; with approximately 5 million 700 thousand metric tonnes annually and 18.99 metric tonnes per capita of carbon dioxide emission, which accounts for 20.2% of the total emission of the world, bears a great share of responsibility in addressing climate change and necessitates even more diligent work accordingly. So, we will do what we should.

Yet still, whether climate change is preventable or not is a hot topic in the United States.

It is crystal clear that, The Earth would still get warm by approximately one degree Fahrenheit even if we stopped emitting greenhouse gases today, start utilizing our forestal resources wisely, reducing chlorofluorocarbon gases by altering our choices into the environmentally-friendly household appliances and using non-CFC anti-perspirants, in order to stop the ozone depletion, which

results in ultraviolet rays to be emitted by earth more easily, global warming and climate change. But on the other hand, as scientists predict that the Earth could eventually warm by as little as 2.5 or as much as 10 degrees Fahrenheit, depending on the choices we make; what we can, and to tell the truth, what we must, do from today forward can make a big difference. In accordance with this, actions that can be undertaken by the governments, including being a signatory to the international agreements such as Kyoto Protocol, Montreal Protocol, Vienna Convention for the Protection of the Ozone Layer and participating environmentalist platforms such as G8+5 Climate Change Dialogue and Asia Pacific Partnership on Clean Development and Climate can make an enormous difference and show the resolution of the states. Hence, I call each and every government to active duty.

In this respect, United Nations Framework Convention on Climate Change, an international environmental treaty, which is signed by the majority of UN countries and whose objective is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous changes in the climate system and which was produced at the United Nations Conference on Environment and Development, shortly known as the Earth Summit, held in Rio de Janeiro from 3 to 14 June 1992, means a lot in reducing carbon emissions and therefore, preventing climate change.

Not only governments but also industrial and business sectors have numerous things to do in order to mitigate global warming and stop, or better still, reverse catastrophic climate change, including adopting low-carbon economy and low-carbon manufacturing methods that have a minimal output of greenhouse gas emissions into the biosphere; for example, agricultural sector should produce foodstuff as close as possible to the final consumers, preferably within walking or cycling distance and other manufacturing sectors such as automotive should lie heavy on hybrid cars using hydrogen, electric and other alternative energy resources with the usual ones in designing, manufacturing and promoting automobiles.

And yet, there are still those who are sceptic about global warming. Although numerous indicators show that the phenomena of global warming and climate change cannot be denied, apart from the international platforms I mentioned which have reached a consensus on the existence of global warming, a few events including Global Warming Agreement Project, usually referred to as the Oregon Agreement opposing the Kyoto Protocol, and Leipzig Declaration on Global Climate Change, a statement made in 1995, seeking to refute the claim that there is a scientific agreement on the global warming issue and therefore, represent the voice of those opposers.

Ladies and gentlemen, we cannot waste our valuable time by questioning the existence of global warming. We should collaborate and get to work as soon as possible. I wish you all a fruitful series of conferences. Thank you.

APPENDIX 3:

THE WRITTEN TEXT (3)
The Evaluation Copy

WU: Warming up sentences
RB: Right branching sentences
MB: Mid-branching sentences
LB. Left branching sentences

Mr. Chairman,
Excellencies,
Ladies and gentlemen,

1 Good morning. (WU) As the President of the United States of America, it's an honour for me to join this distinguished group of leaders from nations and organizations around the world. (WU) Today, we are here to discuss a very serious and challenging problem that our planet has confronted with: Global warming and climate change. (WU) As politicians, opinion makers, academics, representatives from non-governmental organizations and multi-national companies, we should define the problem thoroughly, find tangible solutions and take immediate action accordingly at every level possible. (WU) To tell the truth, when I first received the invitation that you generously extended to me to come and speak to you, I was surprised since I am not an expert in global warming, nor climate. (WU)

2 In this respect, the speech that I am going to deliver will be of an introductory nature$_1$ and will mainly focus on our role as decision makers$_{2,}$ on the solution plans for and political dimensions of global warming$_3$, and lastly on

the controversy about the topic$_{4,}$ instead of the expected effects$_5$ and scientific dimension of climate change$_6$; because without any doubt, the speakers who will use this rostrum following me$_7$ will go deeper into the technical details$_8$ and touch on other specific issues related to our theme$_{9,}$ as I can clearly figure out from the schedule before me$_{10}$. (RB) I hope that my presentation$_1$; in the first part of which I'd like to express my sincere thanks$_2$ and heart-felt regards to the organization committee$_3$, to William Carver, the European Commissioner for the Environment$_4$; to Allen Rooks, the European Representative for the Climate Action$_5$; to Dr. Cristina Badescu from Georgetown University$_6$; to Travis Blornick from United States Environmental Protection Agency$_7$; to Prof. Ville Vesterinen from the Union of Concerned Scientists$_8$ and to Angela Crooper, the deputy Executive Director of United Nations Environment Programme$_9$; will not make you, the participants, asleep.$_{10}$ (MB)

3 As climate change and global warming have started to pose much more danger to our people$_1$, by deteriorating public welfare and health$_2$, weakening global economies and domestic markets$_3$, increasing income inequalities$_4$ between and within countries with justifiable reasons$_5$ and leading psychological hardships$_6$ since the beginning of 1970s$_7$, with the rising level of atmospheric carbon dioxide$_8$ with a result of greenhouse effect$_9$; here in Copenhagen, we came together$_{10}$. (LB) The Earth's temperature has reached to the highest point of the last 10.000 years$_1$ while we have been constructing excessively tall buildings$_2$, driving our super-luxurious cars that are larger than needed$_3$ and watching the nature die$_4$; leaving us without food and water$_5$ and which will spark serious consequences$_6$ that would affect the security of the globe$_7$, dynamism of our markets$_8$, sustainability of civilization$_9$ and therefore, living of our people$_{10}$. (RB)

4 Ladies and gentlemen, nature calls us for help. (SS) Our beautiful planet, our one and only home$_1$; contaminated by the dangerous waste$_2$ from factories producing chemical substances$_3$, suffocated by the fumes$_4$ produced by petrol-driven cars$_5$, residential and industrial zones,$_6$ captivated by the

skyscrapers$_7$ full of glass, metal, concrete and plastic$_8$, needs our help$_9$ more urgent than ever before.$_{10}$ (MB) The last three decades$_1$ were the warmest in the United States$_2$ since 1895 when our national record-keeping began$_3$, despite the fact that international declarations$_4$ such as Millennium Goals issued by the United Nations$_5$, scientific studies conducted in many prestigious universities$_6$, remarks made by NGOs$_7$ which exert enormous efforts about the issue in question$_8$ and coordinated work of governmental bodies$_9$ have been pointing out to the problem for years$_{10}$. (RB)

5 However, you proved your decisiveness and deserve thanks in this regard by being here. (SS) Unless you were convinced that this danger is real$_1$, unless you believed that those facts and figures are not fiction but science$_2$, unless you preferred to put a lid on this alarming trend$_3$ and unless you wanted to be a part of this team$_4$ consisted of players from different parts of the world$_5$ working for the same goal$_6$, and without giving up$_7$ while playing a dramatic role$_8$ in the mankind's most demanding fight$_9$, you would not be here.$_{10}$ (LB) As a matter of fact, it is clear that the question here before us$_1$, which is no longer related to the severity of the problem$_2$ but our capacity to meet it$_3$ and made more complicated by the addition of other problems$_4$ such as heavy use of fossil fuel$_5$, doubts among the industrial sector$_6$ about the efficiency of renewable$_7$ and alternative energy resources$_8$ such as solar and wind energy$_9$, is one of a multi-dimensional, multi-national and trans-border one.$_{10}$ (MB)

6 U.S.A., with a total area of around 9 million and 820 thousands $km^2{}_1$ and a population of around 308 million$_2$, which is the world's largest economy$_3$, embodying the majority of the multi-national companies$_4$ and the world's second most problematic country in terms of carbon dioxide emission after China$_5$, with approximately 5 million 700 thousand metric tonnes annually$_6$ and 18.99 metric tonnes per capita of carbon dioxide emission$_7$ which accounts for 20.2% of the total emission of the world$_8$, bears a great share of responsibility in addressing

climate change$_9$ and necessitates even more diligent work accordingly.$_{10}$ (LB) So, we will do what we should. (SS)

7 Yet still, whether climate change is preventable or not is a hot topic in the United States. (SS)

8 It is crystal clear that, The Earth would still get warm$_1$ by approximately one degree Fahrenheit$_2$ even if we stopped emitting greenhouse gases today$_3$, start utilizing our forestal resources wisely$_4$, reducing chlorofluorocarbon gases$_5$ by altering our choices into the environmentally-friendly household appliances$_6$ and using non-CFC anti-perspirants$_7$, in order to stop the ozone depletion$_{8,}$ which results in ultraviolet rays to be emitted by earth more easily$_9$, global warming and climate change$_{10}$. (RB) But on the other hand$_1$, as scientists predict that$_2$ the Earth could eventually warm$_3$ by as little as 2.5$_4$ or as much as 10 degrees Fahrenheit$_5$, depending on the choices we make$_6$; what we can, and to tell the truth$_7$, what we *must$_8$,* do from today forward$_9$ can make a big difference$_{10}$.(LB) In accordance with this, actions that can be undertaken by the governments$_1$, including being a signatory to the international agreements$_2$ such as Kyoto Protocol$_3$, Montreal Protocol$_4$, Vienna Convention for the Protection of the Ozone Layer$_5$ and participating environmentalist platforms$_6$ such as G8+5 Climate Change Dialogue$_7$ and Asia Pacific Partnership on Clean Development and Climate$_8$, can make an enormous difference$_9$ and show the resolution of states.$_{10}$ (MB) Hence, I call each and every government to active duty. (SS)

9 In this respect, United Nations Framework Convention on Climate Change$_1$, an international environmental treaty$_2$, which is signed by the majority of UN countries$_3$ and whose objective is to stabilize greenhouse gas concentrations in the atmosphere$_4$ at a level that would prevent dangerous changes in the climate system$_5$, and which was produced at the United Nations Conference on Environment and Development$_6$, shortly known as the Earth

Summit$_7$, held in Rio de Janeiro from 3 to 14 June 1992$_8$, means a lot in reducing carbon emissions$_9$ and therefore, preventing climate change$_{10}$. (MB)

10 Not only governments but also industrial and business sectors have numerous things to do$_1$ in order to mitigate global warming$_2$ and stop, or better still, reverse catastrophic climate change$_3$, including adopting low-carbon economy and low-carbon manufacturing methods$_4$ that have a minimal output of greenhouse gas emissions into the biosphere$_5$; for example, agricultural sector should produce foodstuff as close as possible to the final consumers$_6$, preferably within walking or cycling distance$_7$ and other manufacturing sectors such as automotive$_8$ should lie heavy on hybrid cars using hydrogen, electric and other alternative energy resources with the usual ones$_9$ in designing, manufacturing and promoting automobiles$_{10}$. (RB)

11 And yet, there are still those who are sceptic about global warming. (SS) Although there are numerous indicators$_1$ showing that the phenomena of global warming and climate change cannot be denied$_2$; apart from the international platforms I mentioned which have reached a consensus on the existence of global warming$_3$; a few events including Global Warming Agreement Project$_4$, usually referred to as the Oregon Agreement$_5$ opposing the Kyoto Protocol$_6$, and Leipzig Declaration on Global Climate Change$_7$, a statement made in 1995$_8$, seeking to refute the claim that there is a scientific agreement on the global warming issue$_9$ and therefore, represent the voice of those opposers$_{10}$. (LB)

12 Ladies and gentlemen, we cannot waste our valuable time by questioning the existence of global warming. (ER) We should collaborate and get to work as soon as possible. (ER) I wish you all a fruitful series of conferences. (ER) Thank you. (ER)

APPENDIX 4:

QUESTIONNAIRE (1)
Group 1

Aşağıda biraz önce yapmış olduğunuz okuma ve çeviri sırasındaki yaşantılarınızı yoklayan ifadeler var. Lütfen ifadelerin yanına verilen beş yanıt seçeneğinden sizin için en uygun olanını seçerek yazınız:

Kesinlikle katılıyorum / Katılıyorum / Kararsızım / Katılmıyorum / Kesinlikle katılmıyorum

İfade:

1. Ön okuma süreci daha kolay çeviri yapmamı sağladı.
2. Ön okuma için verilen süre yeterliydi.
3. Ön okuma yaparken hızlı okumak için çaba sarf ettim.
4. Ön okuma yaparken okuma tekniği kullandım.
5. Konuşma metnini ekrandan okumak yerine (yine not almadan) kâğıttan okumayı tercih ederdim.
6. Ön okumamı bitirdiğimde metnin tamamını anlamıştım.
7. Metinde okuduğum cümleler yapısal olarak kolaydı.
8. Metinde okuduğum cümleler anlamsal olarak kolaydı.
9. Çeviri yaparken metni kolayca hatırladım
10. Konuşmanın konusu çeviri için kolaydı.
11. Konuşmacının kurduğu cümleler anlamsal olarak çeviri için kolaydı.
12. Konuşmacının kurduğu cümleler yapısal olarak çeviri için kolaydı.
13. Konuşmacının metinden saptığı yeri çeviri yaparken kolaylıkla fark ettim.
14. Çeviri yaparken konuşma metninin önümde olmasını tercih ederdim.
15. Sayıları çevirmekte zorlandım.

16. Kişi isimlerini aktarmakta zorlandım.
17. Kurum, kuruluş ve organizasyon isimlerini çevirmekte zorlandım.
18. Konuşmacının hızına yetişmekte zorlandım.
19. Dikkatimi aynı anda hem konuşmacıya hem de kendi konuşmama vermekte zorlandım.
20. Çeviri yaparken stres altındaydım.

Açık uçlu sorular:

1. Ön okuma performansınızı nasıl değerlendiriyorsunuz?
2. Andaş çeviri performansınızı nasıl değerlendiriyorsunuz?
3. Varsa ek açıklama yapabilirsiniz.

APPENDIX 5:

QUESTIONNAIRE (2)
Group 2

Aşağıda biraz önce yapmış olduğunuz çeviri sırasındaki yaşantılarınızı yoklayan ifadeler var. Lütfen ifadelerin yanına verilen beş yanıt seçeneğinden sizin için en uygun olanını seçerek yazınız:

Kesinlikle katılıyorum / Katılıyorum / Kararsızım / Katılmıyorum / Kesinlikle katılmıyorum

İfade:

1. Metnin çeviri boyunca önümde olması daha kolay çeviri yapmamı sağladı.
2. Çeviri esnasında konuşmadan çok metinden faydalandım.
3. Metni takip ederken hızlı okumak için çaba sarf ettim.
4. Metni takip ederken okuma tekniği kullandım.
5. Konuşma metnini ekrandan takip etmek yerine (yine not almadan) kâğıttan takip etmeyi tercih ederdim.
6. Çeviriyi bitirdiğimde konuşmanın tamamını anlamıştım.
7. Metindeki cümleler metinden sözlü olarak çevirmek için yapısal olarak kolaydı.
8. Metindeki cümleler metinden sözlü olarak çevirmek için yapısal olarak kolaydı.
9. Dikkatimi aynı anda hem konuşmacıya hem de önümdeki metne vermekte zorlandım.
10. Konuşmanın konusu çeviri için kolaydı.
11. Konuşmacının kurduğu cümleler anlamsal olarak çeviri için kolaydı.

12. Konuşmacının kurduğu cümleler yapısal olarak çeviri için kolaydı.
13. Konuşmacının metinden saptığı yeri çeviri yaparken kolaylıkla fark ettim.
14. Çeviri yaparken konuşma metninin önümde olmasını tercih etmezdim.
15. Sayıları çevirmekte zorlandım.
16. Kişi isimlerini aktarmakta zorlandım.
17. Kurum, kuruluş ve organizasyon isimlerini çevirmekte zorlandım.
18. Konuşmacının hızına yetişmekte zorlandım.
19. Dikkatimi aynı anda hem konuşmacıya hem de kendi konuşmama vermekte zorlandım.
20. Çeviri yaparken stres altındaydım.

Açık uçlu sorular:

1. Çeviri esnasında metin okuma performansınızı nasıl değerlendiriyorsunuz?
2. Andaş çeviri performansınızı nasıl değerlendiriyorsunuz?
3. Varsa ek açıklama yapabilirsiniz.

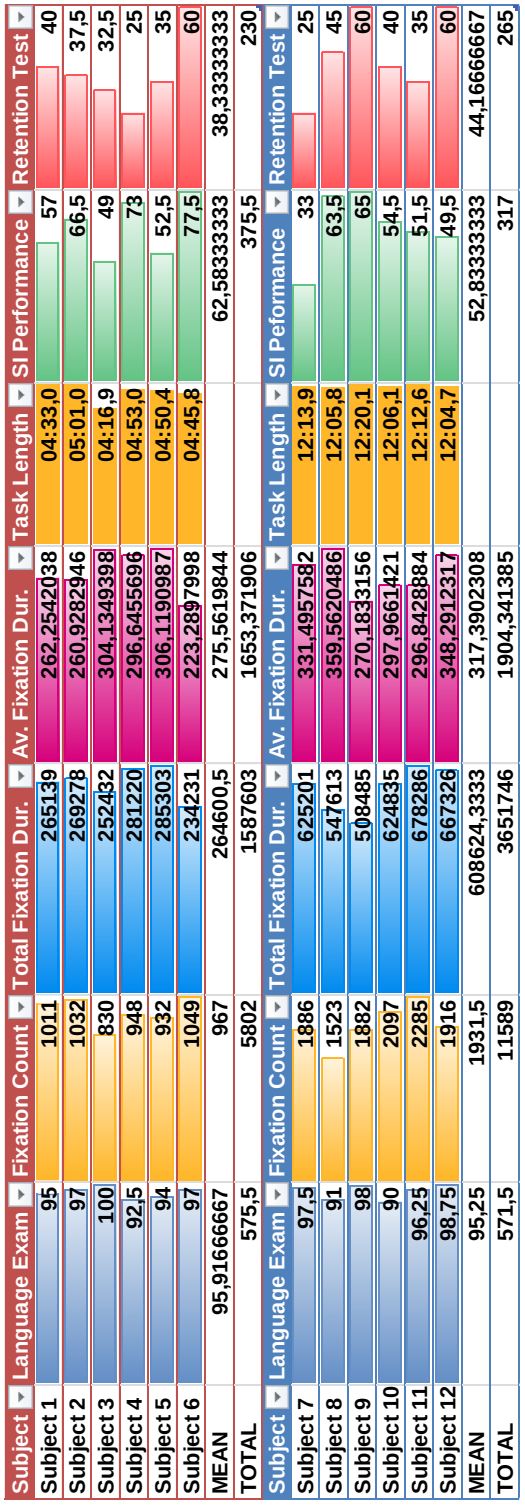
APPENDIX 6:

RETENTION TEST
Group 1 and 2

1. Who is the speaker?
2. Where does the event take place?
3. When did the temperature record keeping begin in the United States of America?
4. Which country becomes in the first place in terms of carbon dioxide emission?
5. Why should agricultural sector produce foodstuff as close as possible to the final consumers?
6. Is Angela Crooper, the deputy Executive Director of United Nations Environment Programme among the organization committee?
7. According to the scientists' prediction, how much could the Earth eventually warm depending the choices we make?
8. United Nations Conference on Global Warming is shortly known as the Earth Summit. Is this statement true or not?
9. Montreal Convention denies the existence of global warming. Is this statement true or not?
10. Leipzig Declaration on Global Climate Change admits the existence of global warming. Is this statement true or not?

APPENDIX 7:

DATA TABLE



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Subject 1	95	1011	265139	262,2542038	04:33,0	57	40
Subject 2	97	1032	269278	260,9282946	05:01,0	66,5	37,5
Subject 3	100	830	252432	304,1349398	04:16,9	49	32,5
Subject 4	92,5	948	281220	296,6455696	04:53,0	73	25
Subject 5	94	932	285303	306,1190987	04:50,4	52,5	35
Subject 6	97	1049	234231	223,2897998	04:45,8	77,5	60
MEAN	95,91666667	967	264600,5	275,5619844		62,58333333	38,33333333
TOTAL	575,5	5802	1587603	1653,371906		375,5	230
Subject	Language Exam	Fixation Count	Total Fixation Dur.	Av. Fixation Dur.	Task Length	SI Peformance	Retention Test
Subject 7	97,5	1886	625201	331,4957582	12:13,9	33	25
Subject 8	91	1523	547613	359,5620486	12:05,8	63,5	45
Subject 9	98	1882	508485	270,1833156	12:20,1	65	60
Subject 10	90	2097	624835	297,9661421	12:06,1	54,5	40
Subject 11	96,25	2285	678286	296,8428884	12:12,6	51,5	35
Subject 12	98,75	1916	667326	348,2912317	12:04,7	49,5	60
MEAN	95,25	1931,5	608624,3333	317,3902308		52,83333333	44,16666667
TOTAL	571,5	11589	3651746	1904,341385		317	265

ÖZGEÇMİŞ

Kişisel Bilgiler

Adı Soyadı : Alper KUMCU

Doğum Yeri ve Tarihi : AFYONKARAHİSAR, 16.08.1986

Eğitim Durumu

Lisans Öğrenimi : Hacettepe Üniversitesi, Mütercim-Tercümanlık Bölümü. Anadolu Üniversitesi, Açık Öğretim Fakültesi, Halkla İlişkiler Bölümü (İkinci Üniversite).

Yüksek Lisans Öğrenimi : Hacettepe Üniversitesi, Mütercim-Tercümanlık Bölümü, İngilizce Mütercim-Tercümanlık Ana Bilim Dalı.

Bildiği Yabancı Diller : İngilizce, Almanca.

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İletişim

E-Posta Adresi : alperkumcu@hacettepe.edu.tr
Web Sayfası : http://www.alperkumcu.com/

Tarih : 27.06.2011