Korean High School EFL Readers' Processing of Temporal Information in English Narrative Texts

한국 고등학생들의 영문 네러티브 텍스트
독해과정에서 시간 정보의 처리에 관한 연구

2015년 2월

서울대학교 대학원
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by

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ABSTRACT

There has been a consensus that readers create three different levels of representation such as surface, text-based, and situation model (Johnson-Laird, 1983; Just & Carpenter, 1987; Kintsch 1998; van Dijk and Kintsch, 1983). The surface and text-based representation refers to linguistic representation such as exact wording, sentences, and the semantic meaning representation conveyed by the text itself as a combination of sentences. The situation model has been regarded as "the reader's representation of the world the text to" (Just & Carpenter, 1978). Zwaan, Langston, & Graesser (1995) proposed a general situation model, which is empirically testable. This is called the Event-Indexing Model. The model assumes that events in a story are organized in memory based on a series of five dimensions: 1) temporality (e.g., the order or duration of events); 2) spatiality (e.g., locations); 3) causality (e.g., how one event influences another event); 4) intentionality (e.g., goals); 5) protagonist (e.g., main character actions or emotions). A group of studies have examined the effects for each dimension of situation model regarding L1 reading comprehension process. Until now, however, only one study (Zwaan & Brown, 1996) provided empirical support for the construction of situation model in L2 reading comprehension. In fact, there

has been no research in the Korean EFL contexts. Thus, the present study is the first attempt to broaden the theoretical approaching of Event-Indexing model into Korean high school EFL environment.

In line with prior research, this thesis is designed to investigate whether and how Korean High School EFL readers process and represent time (duration) in situation-model construction. This study poses following questions: 1) Will Korean EFL high school students detect inconsistency in duration-related information when they read narrative texts in English? 2) Is there any difference in EFL readers' temporal information processing according to their levels of English proficiency? In the experiment, the researcher examined how duration-related inconsistencies (consistent, short inconsistent, long inconsistent) influenced processing time of Korean high school students for three proficiency groups (High, Intermediate, Low). The data were analyzed by one-way within (& between)-subject ANOVAs and paired *t*-tests. The main findings of the study are as follows: (1) Korean EFL readers in overall group were found to detect inconsistency in duration-related information when they read narrative texts in English. Korean high school students did spend more time reading the target sentences with short duration inconsistency than with long duration inconsistency. (2) Considering readers' proficiency, there was processing speed difference among proficiency groups.

In other words, groups with higher level of proficiency read faster than groups with lower level of proficiency across three temporal conditions. In terms of processing time according to temporal inconstancy, High Proficiency group demonstrated significant difference across temporal conditions while Intermediate and Low Proficiency groups did not. Only High Proficiency group spent more time reading the sentences with short duration inconsistency than with consistent or long duration inconsistency. Results indicate that native-like L2 processing of temporal information was achieved by highly proficient Korean EFL learners and it was not the case for lower level of participants. This provides the first evidence for the Korean EFL readers' situation model construction during the English narrative comprehension. These results were discussed in terms of the Event-Indexing Model and implications for L2 pedagogy were considered.

Key words: situation model, Event-Indexing Model, temporal information, narrative text comprehension, L2 reading comprehension, psycholinguistics, self-paced reading

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CHAPTER 1.
INTRODUCTION

Reading behavior is considered as one of the most unique features of human beings. Its sophisticated nature distinguishes us from animals. We spend a good part of our days reading something. We read the signs on the streets and manuals of a new camera. Most of us get information from newspapers and enjoy reading stories since we begin to read.

Regarding the status of English as a foreign language (EFL) in South Korea, English proficiency has been considered a vital means of success in Korean society. In fact, English reading ability is considered one of the key skills as for institutional purposes. For instance, College Scholastic Ability Test as well as English language materials in Korean education are heavily dependent on the students' reading comprehension abilities.

Given the importance of reading in our everyday lives and social achievements, however, understanding what is going on in a EFL reader's brain when comprehending a text has been a challenging topic for researchers due to its daunting complexity of the cognitive processes associated with commonly called "deep" understanding of a text.

This study attempts to explain Korean EFL readers' comprehension

process by employing a reading theory called the Event-Indexing Model (Zwaan, Langston, & Graesser, 1995). Particularly, this study is interested in examining whether readers monitor the temporal information (duration of the common events) presented in narrative texts. By exploring Korean EFL readers' temporal processing, this thesis is expected to provide insight into the complex nature of readers' comprehension process.

The first section of this chapter provides the theoretical background and the purpose of the present study. The next section addresses the research questions. The last section describes the organization of the thesis.

1.1. Theoretical Background and Purposes of the Study

During the comprehension of a text readers build multilevel representations of the information conveyed. Based on the extensive first language (L1) reading comprehension research over a few decades, it has been widely accepted that readers not only represent its linguistic input such as words and sentences but also create a mental representation of the state of the affairs or the situation described by the linguistic input (Johnson-Laird, 1983; Grabe, 2011; Kintsch, 1974; Kintsh & van Dijk, 1978; van Dijk & Kintsch, 1983). In other words, readers not only process the linguistic

information at text level but also integrate the text information with their prior knowledge of the world to reach a higher-level understanding. This is commonly called as mental model (Johnson-Laird, 1983) or situation model (van Dijk & Kintsch, 1983). Situation model is based on the notion that reading comprehension is a flexible and ongoing cognitive and constructive process (Snow, 2002; van den Broek et al., 2005).

There have been several theoretical approaches to explain the internal structure of situation models as multidimensional. That is, readers create multilevel representations of the information from text (Gernsbacher, 1990; Glenberg & Langston, 1992; Johnson-Laird, 1983; Kintsch, 1988, 1998; van Dijk & Kinthsch, 1983; Zwaan, Langston, & Graesser, 1995; Zwaan, Magliano, & Graesser, 1995; Zwaan & Radvansky, 1998). Among them is the Event-Indexing Model proposed by Zwaan, Langston, & Graesser (1995).

According to Zwaan, Langston, & Graesser (1995), readers monitor a series of five situational dimensions during narrative text comprehension such as temporal, spatial, causal, intentional information as well as protagonist actions or emotions (Zwaan, Langston, & Graesser, 1995; Zwaan & Radvansky, 1998). Extensive L1 research has demonstrated how readers construct situation models during narrative comprehension in various multiple dimensions.

Specifically, among the five dimensions of situation model, the dimension of time has been regarded as a crucial part of situation building in narrative comprehension as it is in our real life (Anderson, Garrod, & Sandford, 1983; Mandler, 1986; Ohtsuka & Brewer, 1992; Zwaan, 1996).

Given the importance of temporal information in everyday linguistic use, however, little is known about how second language (L2) readers use this information to construct the aspect of situation model during the discourse comprehension. This topic in L2 text comprehension research has hardly been explored at all.

A typical research method used by cognitive psychologists in situation model research is to assess the representation of temporal information by measuring reading times of the sentences that contain manipulated temporal information. It is hypothesized that readers have difficulty processing temporal inconsistency and reading times of the sentences will increase, which is called inconsistency paradigm.

Prior L1 studies using this method showed that readers' comprehension processing increased when explicit time inconsistencies were introduced in the text (Zwaan, 1996; Rinck et al, 2001, Therriault & Raney, 2007). However, quite a few researches explore L2 reading comprehension processing on the basis of these assumptions, particularly in Korean EFL high

school reading class setting. The present study attempts to broaden the theoretical approaching of Event-Indexing model into Korean EFL high school environment. The results of this study may contribute to Korean EFL classrooms, suggesting a guideline for the readers in comprehending English narrative texts.

1.3. Research Questions

This thesis is an initial endeavor to explore whether Korean high school students are able to construct situation models during narrative comprehension. This study selectively take into considerations of the dimension of time among the five situational dimensions proposed by the Event-Indexing Model (Zwaan, Langston, & Graesser, 1995) to see how Korean EFL readers process and construct temporal information in narrative texts in English. The current study also takes into account the impact of the second language proficiency of the participants on their situation-model construction during narrative comprehension in English.

According to the inconsistency paradigm mentioned in the previous section, Korean high school EFL students are assumed to have difficulty (indicated by increased reading times) processing inconsistent time sentences,

providing evidence that temporal inconsistencies disrupt their reading and indirect evidence that Korean EFL readers represent the duration of an event described in the text. If reading times do not increase in the inconsistent sentences, this indicates that they do not monitor temporal information in text while reading. The author predicted that reading times for the inconsistent duration sentences would be longer than the consistent duration sentences.

In the course of investigating Korean high school students' processing and constructing temporal information in narrative texts, this study attempts to find answers to the following questions.

1) Will Korean EFL high school students detect inconsistency in duration-related information when they read narrative texts in English?

2) Is there any difference in EFL readers' temporal information processing according to their levels of English proficiency?

1.4. Organization of the Thesis

The thesis is organized as follows. Chapter 2 gives a theoretical background of reading comprehension and situation models. Chapter 3 describes the methodology of the present study, and Chapter 4 presents the results and discussion on the findings. Chapter 5 concludes the study with a summary of the findings, a discussion of some implications arising from the study, the limitation of the study, and some suggestions for further research.

CHAPTER 2.
LITERATURE REVIEW

This chapter reviews a body of literature relevant to the present study. Section 2.1 deals with the current theories in L1 text comprehension with prior studies on situation model. The section 2.2 deals previous studies on the processing of temporal information during narrative comprehension. Finally, the research on L2 reading comprehension is discussed examined in Section 2.3.

2.1. Current Theories in Text Comprehension

2.1.1. L1 Reading Research on Situation Model

Since the early 1980s, there has been a large consensus on the idea that readers create three different levels of representation such as surface, text-based, and situation model. (Johnson-Laird, 1983; Just & Carpenter, 1987; Kintsch 1998; van Dijk and Kintsch, 1983). The surface representation is equivalent to the exact wording and sentences of the text. The text-based representation refers to the semantic meaning representation conveyed by the

text. The textbase is conceived of as a network propositions that share one or more arguments which are connected in this representation (e.g., Kintsch, 1988, Kintsch & van Dijk, 1978).

Just and Carpenter (1978) defined the situation model as "the reader's representation of the world the text to" (cited in Tapiero, 2007). In other words, situation model is readers' subjective interpretation of the event or situation of what the text is about. Therefore, situation model includes a reader's background knowledge of the domain associated with the text and inferences that are beyond the scope of the text. According to Zwaan and Brown's (1996) definition of situation model, readers integrate information from different sentences as well as relevant information activated from long-term memory into a coherent mental representation of a narrated sequence of events, actions and states.

2.1.2. Multiple Aspects of Situation Model

According to Zwaan, Magliano, and Graesser (1995), there was no a general theory of situation model until Gernsbacher (1990) proposed the structural building framework which is a framework of reading comprehension. He addressed three dimensions of situation model such as

temporality, spatiality, and causality. According to the structural building framework, readers construct mental structure while mapping incoming information onto the evolving structure on these three dimensions. Zwaan, Magliano, and Graesser (1995) distinguished three dimensions of situation model and investigated whether readers simultaneously monitor these multiple dimensions.

In line with previous studies, Zwaan, Langston, and Graesser (1995) developed a situation model called the Event-Indexing Model. They tested a model of how readers construct and monitor a series of five dimensions during narrative text comprehension: 1) temporality (e.g., the order or duration of events); 2) spatiality (e.g., locations); 3) causality (e.g., how one event influences another event); 4) intentionality (e.g., goals); 5) protagonist (e.g., main character actions or emotions). They assumed that events in a story are organized in memory based on a series of dimensions, and that readers index each event in a story on each of the five dimensions and connect events in a memory representation. Therefore, events are considered as the focal points that hold together a situation model. Many experiments have demonstrated the effects for each dimension of situation models. With respect to temporal relations as the focus of the present study, research on the situation model construction of temporal information will be discussed.

2.2. Temporal Relations in Text Comprehension

2.2.1. Various Aspects of Temporal Information

Extended research has shown that the temporal information is one of the most central dimensions in narrative understanding (Magliano et al, 1995) and provides building blocks for situation model construction (Gernsbacher, 1990; Magliano & Schleich, 2000; Zwaan, 1996). In line with prior research, Therriault, et al (2006) examined relative contributions of time, protagonist, and space shifts in the context of the Event-Indexing Model. They reported the more robustness of time and protagonist dimension than spatial information, elucidating time as fundamental to coherent situation model construction.

Due to the complexity in conceptualizing time, various aspects of time have been explored as the focus of temporal research. A number of temporal aspects such as duration, succession, simultaneity, order, temporal sense of past or present, rhythm, impersonal time (socially constructed units of time), and alternative senses of time have been explored to confirm the importance

of the temporal dimension of situation models (Therriault & Raney, 2007).

For example, Rinck, Gámez, Díaz, and de Vega (2003) observed eyeball movements to examine how readers monitor temporal information when the discourse structure does not match the order of presented events in a narrative. The researchers demonstrated that reading comprehension was disturbed when the readers encountered the inconsistency in order of events in their attempt to update their situation model.

Zwaan (1996) showed that readers utilized temporal information to construct situation models while comprehending narratives when a connective or shift signifies a longer versus shorter time frame (e.g., a moment later vs. an hour later). The study examined how the chronological distance between 2 consecutively narrated story events affects the on-line reading comprehension. Other group of research examined whether comprehension processing increases when explicit time inconsistencies are introduced in the text (Anderson, Garrod, & Sanford, 1983; Rinck, Hahnel, and Becker, 2001; Therriault and Raney, 2007). Anderson, Garrod, & Sanford (1983) showed that inconsistent temporal information increased the reading times of the target sentences while sentences that started with consistent adverbial phrase were read faster. Rinck et al's (2001) study provided evidence that reading time increased when readers encountered inconsistent

temporal information with direct contradictions with specific time terms (e.g., at 4:10 p.m.).

Therriault and Raney (2007) explored how readers process and represent time by (duration) in situation-model construction. They measured L1 readers' reactions to the sentences that contained duration-related inconsistencies. With respect to temporal duration as the focus of this thesis, Therriault and Raney (2007) is directly relevant to the present study. The present study is an extension of Therriault and Raney (2007) into Korean EFL reading contexts.

2.2.2. Duration of Event in Narrative Comprehension

Therriault and Raney (2007) adopted the methodology from Rinck et al (2001) and measured readers' processing the narratives that contained duration-related inconsistencies. Therriault and Raney (2007) expanded Rinck et al (2001) by including the implicit duration terms as well as explicit statements. The results showed that reading times for sentences with implicit duration inconsistencies increased, suggesting that the readers had difficulty processing inconsistent duration information. Here is an example of an inconsistent duration in passage from Therriault and Raney (2007) (see Table 2.1)

Table 2.1

Sample Passage (Therriault & Raney, 2007)

Eric had just been to the dentist and had four cavities filled.

Eric's dentist recommended that Eric buy a sonic toothbrush.

The dentist said that it would save him from future dental work.

Eric agreed and decided that he would buy one on his way home.

Eric was surprised the toothbrush the dentist recommended cost over 80 dollars.

He reluctantly paid for it.

Before Eric went to bed he used his new toothbrush for the first time.

    Eric spent two minutes brushing his teeth. (target, consistent)

    Eric spent six seconds brushing his teeth. (target, short)

    Eric spent forty minutes brushing his teeth. (target, long)

Eric liked the toothbrush and decided to keep it.

He hoped that his purchase would save him money in the long run.

The sample passage above describes an individual's activity of brushing teeth, and different duration terms were used to describe that activity. In the consistent version, a sentence describes a man who spends 2 minutes brushing his teeth (normal amount of time). In the inconsistent versions, the individual spends 6 seconds (an unusually short time) or 45 minutes (an unusually long time). Using the duration term 2 minutes is generally

consistent with what we know about the average time spent for normal brushing teeth. L1 Readers in Therriault and Raney (2007) were expected to read the critical sentence fastest in this condition. The other duration terms are less consistent with our conceptualization of the normal amount of time spent for brushing teeth. Although it is possible to brush teeth for only 6 sec or for as long as 45 min, it is not likely to do so in the context given by the narrative texts.

The results in Therriault and Raney (2007) indicated that L1 participants of the experiment had difficulty (indicated by increased reading times) processing the inconsistent time sentences, providing evidence that they represented the duration of an event described in the text. The experimental passages were directly applied to the Korean high school students in the present study to explore whether L2 readers monitor information about the duration of events in text while reading as L1 readers in Thrriault & Raeny (2007) did. If reading times increase in the inconsistent versions, this suggests that L2 readers are able to monitor information about the duration of events in text while reading as L1 readers routinely do.

2.3. L2 Reading Comprehension Research

2.3.1. L2 Processing in Text Comprehension

Studies in reading comprehension have indicated that both lower-level processing (i.e., bottom-up approaches) and higher-level processing (i.e., top-down approaches) play a crucial role in successful reading comprehension (Grabe, 2011). Reading is a very intricate process involving all the different levels from auditory-phonetic awareness to interpretive meaning-making.

According to Tapiero (2006), reading is a "highly complex problem solving activity." In a similar vein, Gernsbacher (1996) mentioned that readers almost always have to some hypothesis about what is likely to come next. This could be significantly to true for less-skilled L2 readers whose limited processing ability with less linguistic knowledge would lead them to make use of all the available resources to understand what they hear. It is also in accordance with a failed version of 'psycholinguistic guessing game' proposed by Goodman (1967).

2.3.2. Situation Model Construction in L2 reading

Until recently, only a few researches have provided empirical support for the construction of situation model in L2 reading. Regarding the comprehension of texts in L1 versus L2, the reader's ability to construct a coherent situation model will be impaired in L2 compared to L1. In studies of L1, working memory capacity has been shown to account for individual differences in text comprehension (Daneman & Carpenter, 1980) and the ability to resolve syntactic ambiguity (Just & Carpenter, 1992).

Just and Carpenter's (1992) capacity hypothesis asserts that each reader has a limited amount of processing resources, expressed in amount of activation, available at any time during processing. According to the model, when the demand for processing resources is greater than the supply, lower level processes will be prioritized at the expense of higher level processes. While Just and Carpenter (1992) focused on single-sentence comprehension, Goldman and Varma (1995) extended the capacity constraint hypothesis to the processing of connected discourse.

With respect to the comprehension of texts in L2, Goldman and Varma (1995) showed that the reader's ability to construct a coherent situation model was impaired in L2 compared to L1. They argued that in non-

fluent L2 comprehension, word- and sentence-level processing would be more resource consuming than in L1. In studies of second language learning, Harrington and Sawyer (1992) and Geva and Ryan (1993) found that L2 reading skill is highly correlated with L2 working memory span. Fortkamp (1999) found significant correlations between the speaking and reading span tasks and measures of L2 fluency.

Zwaan and Brown (1996) took the language proficiency and comprehension skills of L2 reader into account by comparing comprehension of narrative texts in a reader's L1 with that in L2. A group of English native speakers performed a think-aloud task as they read stories in English and French, which was their L2, and performed a verb-clustering task. The scores on these tasks demonstrated that participants made more explanatory inferences in English, their L1, than in French, their L2. The results indicated that L1 readers construct stronger situation models than in L2.

The present study will take these results into consideration and further attempt to investigate whether Korean EFL readers will have difficulties processing inconsistent temporal information and represent a simulation model in comprehending narrative texts in English.

2.3.3. The Present Study

In line with prior research, the researcher hopes to see whether temporal information, specifically duration, is monitored by Korean L2 readers and represented in their memory as part of their situation model, adapting the methodology used in both Rinck et al. (2001) and Therriault and Raney (2007).

The researcher is interested in two factors that might influence the processing and constructing situation models for Korean L2 readers. The first factor is temporal consistency. The second factor is the readers' proficiency in English language. Specifically, the researcher will analyze the mean reading times of narrative texts from three proficiency groups with different levels of English: High Proficiency, Intermediate Proficiency, and Low Proficiency.

CHAPTER 3.
METHODS

In this chapter, the methodology of the present study is described in terms of participants, instrument, design and procedures.

3.1. Participants

This study involved 84 Korean first-year high school students. They are enrolled in "B" High School located in Seoul. The participants volunteered for the present study and were rewarded by a school cafeteria gift coupon for participating in the study. The participants had studied English as a foreign language for nine years since elementary school, but none of them had lived in an English-speaking country for more than 2 years. Thus, the EFL participants in the present study are considered as not fluent in English as the L1 participants in Therriault and Raney(2007) where English college students took part in the experiments.

To examine the effects of difference in language proficiency, total of 84 participants were segregated into three proficiency groups based on the

scores of the Nationwide Sample Test (NST)[1]: 28 in higher end for High Proficiency (HP), 28 in the middle for Intermediate Proficiency (IP), and 28 in lower end for Low Proficiency (LP), respectively. A one-way ANOVA for NST scores for proficiency group was conducted to ensure that the participants in three proficiency groups were not homogeneous in terms of English proficiency (see Table 3.1). Post hoc analysis using Tukey HSD indicates that the mean score for HP group (M = 132.32, SD = .90) was significantly different from both IP (M = 128.50, SD = 2.15) and LP (M = 117.46, SD = 8.01) groups. In addition, IP group significantly differed from LP group. Taken together, these results indicates that three proficiency groups are different one another in terms of English proficiency.

Table 3.1

Means, SDs & Results of ANOVA (NST Scores)

	Group	N	*M*	*SD*	*F*	*df*	*p*
	HP	28	132.32	.90	71.802	2	.000
NST Score	**IP**	28	128.50	2.15			
	LP	28	117.46	8.01			
	Total	84					

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[1] This test was developed to prepare high school students for the university entrance examination in Korea. This test is assumed to assess the testee's overall English proficiency and is composed of 50 items, 17 of which are for testing listening ability and 33 for reading ability. The standard score was used in the present study.

3.2. Instruments

The present study is an extension of Therriault and Raney (2007) into the EFL contexts in Korea. The experimental texts used in Therriault and Raney (2007) were adopted for the present study in order to compare the situation model building of Korean high school students to that of native readers of English.

Each participant read 18 short passages that contained approximately 100 words. There were 12 experimental passages and 6 additional passages (filler passages). Fillers did not contain any temporal inconsistencies and intended to draw attentions away from the duration inconsistencies in target passages in experimental passages.

12 Experimental passages exhibited one of the following three conditions: 1) consistent duration, 2) short inconsistent, 3) long inconsistent. Of the 12 experimental passages, 4 were consistent, 4 were short inconsistent, and 4 were inconsistent long. Participants were given a series of experimental passages of three conditions and filler passages in random order through a computer screen.

3.3. Experimental Design of the Present Study

Each of the experimental texts came in three versions in a 1 X 3 design with temporal consistency conditions (A: consistent duration, B: short inconsistent duration, C: long inconsistent duration). The experimental texts were distributed into three blocks with each one containing only one condition of experimental sentences following the Latin Square Design.

Table 3.2
Study Design with Three Passage Blocks

Passage Block 1 Item No.(condition)	Passage Block 2 Item No.(condition)	Passage Block 3 Item No.(condition)
Passage 1 A*	Passage 1 B*	Passage 1 C*
Passage 2 B	Passage 2 C	Passage 2 A
Passage 3 C	Passage 3 A	Passage 3 B
Passage 4 A	Passage 4 B	Passage 4 C
Passage 5 B	Passage 5 C	Passage 5 A
Passage 6 C	Passage 6 A	Passage 6 B
Passage 7 A	Passage 7 B	Passage 7 C
Passage 8 B	Passage 8 C	Passage 8 A
Passage 9 C	Passage 9 A	Passage 9 B
Passage 10 A	Passage 10 B	Passage 10 C
Passage 11 B	Passage 11 C	Passage 11 A
Passage 12 C	Passage 12 A	Passage 12 B

*A: Consistent / *B: Short Inconsistent / *C: Long Inconsistent

Each participant was to read to 12 passages in each condition, and across participants, each passage occurred in each condition an equal number of times (see Table 3.2). The order of the passages was random for all participants. A one-way ANOVA indicates that three passage groups were homogenous in terms of English proficiency based on their scores of Nationwide Sample Test (NST) (see Table 3.3). The post hoc analysis verified that there is no significant difference among passages groups.

Table 3.3

Means, SDs & Results of ANOVA (NST Scores)

	Passage Set	N	*M*	*SD*	*F*	*df*	*p*
	1	28	128.00	4.91	2.087	2	.13
NST Score	2	28	123.78	9.68			
	3	28	126.50	8.12			

3.4. Procedure

The primary dependent in the present study was reading time per target sentence (consistent, short inconsistent, long inconsistent). The reading time per second target sentences (target+1) were also measured to detect possible spillover effects or possible delays in the processing of the

inconsistent temporal information (Albrecht et al, 1995; Therriault & Raney, 2007). In psycholinguistic research, it has been commonly believed that the spillover effect of critical sentence could affect the following region and could delay processing the information in the next sentence.

The additional dependent measure was comprehension accuracy score. Comprehension Accuracy was measured to ensure that participants concentrate on the materials. Two true/false questions presented at the end of each passage. Total of 24 questions for 12 experimental passages were scored. Participants who achieved below 70% were to be excluded in analysis.

Passages were presented one sentence at a time via computer using a self-paced reading procedure. In other words, participants were instructed to read each sentence until they felt they have understood it. Then they hit a key to move onto the next sentence. Through this procedure, reading times for the critical sentences that contain manipulated temporal information of the situation in the text were measured and recorded via the computer program. The procedure was controlled using the program Linger [2]. Linger is a computer software that performs a variety of language experiments, particularly self-paced reading. This software was installed in 35 computers

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[2] Linger is a free software package for performing reading, listening, and other sentence processing experiments. Linger was primarily designed for masked, self-paced reading experiments.(http://tedlab.mit.edu/~dr/Linger)

in a computer lab. Students in groups of 20~35 were tested in each experimental session.

Overall, there were three sessions for the participants. Participants were guided to read the passages for comprehension and answer two follow-up questions per passage. They were informed they would use two keys in the experiment ('f' to move forward / 'f' and 'j' keys for true/false questions). Two comprehension questions were implemented after reading each passage to measure the accuracy of their reading. This was to make sure participants were carefully reading the passages. Neither comprehension question asked readers to answer about information from the target duration sentences which contained temporal consistency. Both questions were offered in Korean to ensure participants understood the comprehension questions.

Table 3.4

Example Passage and comprehension Accuracy Questions

Michael and his friend Kyle were on vacation from high school.

It was the second week of a big heat wave.

They decided today that they would go to the beach.

Michael and Kyle packed a lunch and a blanket to sit on.

They also made sure to bring plenty of suntan lotion and a Frisbee.

Michael and Kyle arrived at the beach and found a great spot to put their blanket.

They went swimming and played Frisbee in the water.

They spent twenty enjoyable minutes at the beach.

It was nice to relax in the water.

They decided that they would go tomorrow as well.

질문 1) Michael과 Kyle은 등산을 갔나요? (F)

질문 2) Michael과 Kyle은 즐거운 시간을 보냈나요? (T)

3.5. Data Trimming

Firstly, the accuracy of reading comprehension of the participants was measured. Accuracy questions were to ensure that participants concentrate on the materials. Participants who achieved below 70% were planned to be excluded in analysis (see Table 3.5).

Table 3.5
Data Trimming By Comprehension Accuracy Scores

Pass/Fail	Cut-off Score	N	Sum	*M*	*SD*
Passed	At or Above 70%	84	7670.83	88.17	6.92
Failed	Below 70%	3	179.1	59.7	1.96
(Excluded)	(Failed to read all 12 passages)	(14)			
		101	7849.93	87.22	8.56

The cut-off score of 70% was set in reference to Therriault and Raney (2007) because the present study intends to compare Korean EFL readers' situation model construction to that of English native readers in Therriault and Raney's (2007).

To attain 70% of comprehension accuracy, participants were expected to get more than 17 answers correct out of 24 questions. After scoring, out of 101 total participants, 3 participants failed to reach 70%. 14 participants were excluded in the scoring because they failed to read all the 12 experimental passages (They skipped some of the target sentences in the passages). In short, about 17% of participants failed to understand the passages properly or did not attend to the passages.

In addition to the exclusion of the participants' data that were below

70% of comprehension accuracy score, outlier data in mean reading time was removed prior to the statistical analysis. With upper and lower cutoffs of+2 standard deviations (within condition) for the target sentences, approximately 1.6% of the critical sentence and 3.8% of spillover sentence data were omitted. After outlier removal, 9 participants did not have data in one condition, 7 participants in two conditions, respectively. The condition mean was inserted for the participants to maintain an equal number of participants per condition.

CHAPTER 4.
RESULTS AND DISCUSSION

The goal of the thesis was to investigate whether and how Korean High School EFL readers process and represent time (duration) in situation-model construction. This study posed two research questions: 1) Will Korean EFL high school students detect inconsistency in duration-related information when they read narrative texts in English? 2) Is there any difference in EFL readers' temporal information processing according to their levels of English proficiency? First, the researcher examined how duration-related inconsistencies (consistent duration, short inconsistent duration, long inconsistent duration) influenced processing time of Korean high school students for overall group, and then three proficiency groups (High, Intermediate, Low) by using one-way within-subject ANOVAs and paired *t*-tests.

4.1. Reading Times for Overall Group

The current study is based on an assumption called inconsistency paradigm and adopted a typical research method commonly used by cognitive

psychologists in situation model studies. The researcher assessed the representation of temporal information by measuring reading times of the sentences that contain manipulated temporal information. The first research question was whether Korean EFL students detect inconsistency in duration-related information when they read narrative texts in English and it was hypothesized that the participants in overall group would have difficulty processing temporal inconsistency and, thus, reading times of the sentences would increase.

4.1.1. The Effects of Temporal Conditions on Target Sentence RTs

Mean reading times per target sentences were the primary dependent variable in the present study. The mean times were analyzed to explore whether inconsistent duration sentences would increase reading times relative to consistent duration sentences. Reading times were analyzed by subjects (F_1) and by items (F_2)[3]. The researcher can be confident of the results in the

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[3] In psycholinguistic research, separating subject and item ANOVAs($F_1 \times F_2$) is typically conducted for response times. Clark (1973) argued that we have to take into account the variability due to the difference due to the items in addition to the variability due to the participants (Brysbaert, 2007). Obtaining significant treatment effects in both analyses is referred to as meeting the $F_1 \times F_2$ criterion. If both F_1 and F_2 analyses yield significant findings, then the effect will generalize to different samples of subjects and items, assuming that the subjects and items in the experiment can each be considered random samples from larger populations (Raaijmakers, et al., 1999).

present study and generalize them to population groups if both F_1 and F_2 analyses are significant.

One-factor within-subject (repeated) analyses of variance (ANOVAs) were performed to see whether reading inconsistent duration sentences increase reading times relative to consistent duration sentences. The mean difference across three temporal conditions is presented (see Table 4.1). The ANOVA indicates significant main effects both by subject and item ($F_1(2,83)= 6.813$, $p<.05$; $F_2(2,11)=5.273$, $p<.05$) (see Table 4.2).

Table 4.1

Mean RTs, SD across Temporal Condition (in milliseconds)

Temporal conditions (Duration)					
Consistent		Short Inconsistent		Long Inconsistent	
M	*SD*	*M*	*SD*	*M*	*SD*
2941.73	754.81	3181.20	757.71	2834.43	837.05

Table 4.2

Results of ANOVAs on Temporal Condition

Source	F_1-F_2	*df*	*F*	*p*
Temporal Condition	*Subject*	2	6.813	.001
	Item	2	5.273	.013

Three separate paired-sampled t-tests followed to determine which temporal condition affected the reading times for target sentences. First, t-test between short inconsistent duration and consistent duration revealed that short inconsistent duration sentences were read 644ms slower than consistent duration sentences, and this difference was significant both by subject ($t1(84)= -2.604$, $p<.05$), and by items ($t2(11)=-3.325$, $p<.05$.) Second, t-test between consistent and long inconsistent duration showed that long inconsistent duration sentences were read 192ms slower than consistent duration sentences. This difference was not significant by participants, $t1(83)=1.159$, $p=.25$ and by items, $t2(11)=.837$, $p=.420$ (see Table 4.3). Thirdly, paired t-test between short inconsistent and long inconsistent indicates that there was a significant difference in reading times for short and long inconsistent duration sentences by participants, $t1(83)=3.349$, $p<.05$ and by items, $t2(11)=3.385$, $p<.05$. Specifically, reading times were 347ms longer for the short inconsistent duration sentences than for the long inconsistent duration sentences.

Table 4.3

Results of Paired Samples *t*-test for Temporal Conditions

Pair	By Subject (F1), N=84				By Item (F2,) N=12			
	M	*SD*	*t*	*p*	*M*	*SD*	*t*	*p*
Con-	2941.73	754.81	-2.60	.011*	2941.73	578.81	-2.33	.040
Short	3181.20	757.71			3181.20	594.54		
Con-	2941.73	754.81	1.16	.250	2941.73	578.81	.84	.420
Long	2843.43	2834.43			2843.43	487.48		
Short-	3181.20	757.71	3.35	.001*	3181.20	487.48	3.38	.006
Long	2843.43	2834.43			2843.43	487.48		

4.1.2. The Effects of Temporal Conditions on Spillover RTs

To detect the possibility of spillover effects or possible delays in the processing of the inconsistent information, mean reading times on the spillover sentences or second target (target + 1) sentences were analyzed as well. Mean reading times per sentences immediately following the target sentences were measured to evaluate the possibility of spillover effects (see Table 4.4 for means and standard deviations). One-factor within-subjects ANOVAs do not indicate any significant differences among reading times across temporal conditions, $F_1(2,83)=.17$, $p=.85$; $F_2(2,11)=.46$, $p=.64$, indicating no spillover (see Table 4.5).

Table 4.4

Mean RTs and SDs for Temporal Conditions (in milliseconds)

Temporal Conditions (Duration)					
Consistent		Short Inconsistent		Long Inconsistent	
M	*SD*	*M*	*SD*	*M*	*SD*
3246.48	1075.70	3156.64	934.97	3207.54	1282.18

Table 4.5

Results of ANOVAs for Temporal Conditions

Source	F_1 / F_2	*df*	*F*	*p*
Temporal condition	Subject	2	.17	.85
	Item	2	.46	.64

4.1.3. Korean EFL Readers' Processing Temporal Information

In line with the prior research (Therriault & Raney, 2007), it was questioned whether Korean high school students detect inconsistency in duration-related information when they read narrative texts in English. This first research question was answered by the results that the Korean participants in overall group were slower in reading sentences that introduced duration inconsistencies. This result indicates that Korean EFL readers did have difficulty processing the particular temporal information contained in

the target sentences. Therefore, this is a clear signal that Korean readers monitor the duration of events and construct a situation model while comprehending English narrative texts. Specifically, the results revealed that Korean high school students spent more time reading the target sentences with short duration inconsistency than with long duration inconsistency (see Table 4.3). This means that the participants in the current study felt a particular difficulty processing the inconsistently short duration of the events in the narrative texts and spent relatively more time understanding the target sentences.

4.2. Reading Times for Proficiency Groups

The second research question was to see if there is any difference in Korean EFL students' temporal information processing according to their levels of English proficiency. Regarding participants' processing temporal information according to temporal inconstancy, it was assumed that participants in different Proficiency group would demonstrate different patterns across temporal conditions in terms of reading time according to temporal conditions.

4.2.1. The Effects of English Proficiency on RTs

To examine whether there is any difference in Korean readers' processing temporal information according to their levels of English proficiency, a mixed between-within subject analysis of variance was conducted and compared mean reading times between three proficiency groups (High, Intermediate, Low) across three temporal conditions (consistent duration, inconsistent short duration, inconsistent long duration).

The main effect of group was statistical, $F(2,81)=4.40$, $p<.05$, partial eta squared=.098. Post hoc results suggest that there is difference in RTs among three proficiency groups. In general, Groups with higher level of proficiency read faster than groups with lower level of proficiency across three temporal conditions (see Table 4.6, 4.7 and Figure 4.1).

Table 4.6

Mean RTs, SD across Temporal Condition per Proficiency

Condition	*High Proficiency*			*Intermediate Proficiency*			*Low Proficiency*		
	M	*SD*	N	*M*	*SD*	N	*M*	*SD*	N
Con	2707.64	577.28	28	2875.32	638.08	28	3242.21	925.18	28
Short	3068.71	867.74	28	3158.89	674.37	28	3316.00	724.33	28
Long	2447.71	517.51	28	3043.04	962.77	28	3012.54	852.06	28

Table 4.7

Results of Post Hoc by Proficiency Groups

	Group		Mean Difference	*p*
TukeyHSD	1	2	-284.39	0.158
		3	-448.89*	0.012
	2	1	284.39	0.158
		3	-164.5	0.533
	3	1	448.89*	0.012
		2	164.5	0.533

Figure 4.1

Mean RTs for Proficiency Groups
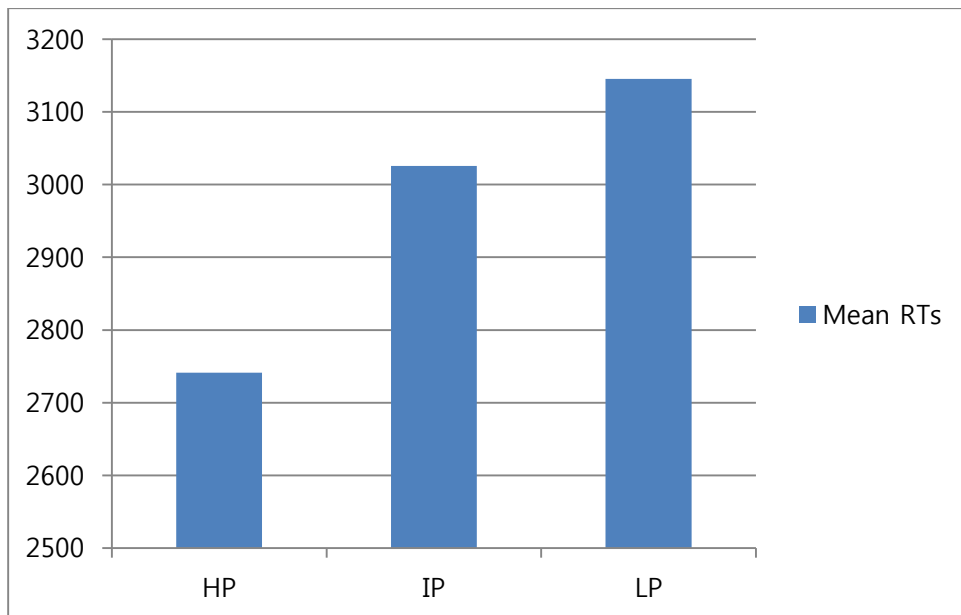
4.2.2. The Effects of Temporal Conditions on RTs within

Proficiency Groups

In addition to the mean RT difference among proficiency groups, three separate one-factor within-subject ANOVAs were performed within group to see the statistical effects of temporal condition in overall group analysis still hold true for each proficiency group. In other words, the researcher wanted to see if reading inconsistent duration sentences increase RTs relative to consistent duration sentences for three proficiency groups.

First, ANOVA within HP group indicates significant difference across temporal conditions ($F_1(1,27)=10.47$, $p<.05$; $F_2(1,11)=7.26$, $p<.05$). As for IP group, however, there was no significant difference ($F_1(1,27)=1.345$; $p=.27$; $F_2(1,11)=1.274$, $p=.30$). The results of LP group was not statistical as well ($F_1(1,27)=1.52$, $p=.23$; $F_2(1,11)= 2.427$, $p=.11$) (see Table 4.8).

Table 4.8

Results of ANOVAs within Proficiency Groups

Source	Proficiency Group					
	HP		**IP**		**LP**	
Temporal Conditions	*F*1	*F*2	*F*1	*F*2	*F*1	*F*2
df	2	2	2	2	2	2
F	10.47	7.26	1.35	1.28	1.52	2.43
p	.000*	.004*	0.27	0.3	0.23	0.11
Partial η^2	0.28	0.39	0.05	0.104	0.05	0.18

Additionally, to determine which temporal condition affected the reading times per target sentences within proficiency group, three separate paired *t*-tests were administered for each proficiency group. First, results of *t*-test for HP group showed that short inconsistent duration sentences were read 361ms slower than consistent duration sentences, and this difference was statistical ($t1(27)$=-2.47, p<.05; $t2(11)$=-2.25, p<.05). Short inconsistent duration sentences were read 608.35ms slower than long duration sentences, and this difference was significant ($t1(27)$=3.98, p<.05; $t2(11)$= 3.86, p<.05). There was significant difference as well between consistent and long inconsistent by subjects ($t1(27)$=2.59, p<.05), but not by items ($t2(11)$=2.1, p>0.5). (see Table 4.9).

Table 4.9

**Means RTs, SDs & Results of *t*-test for HP Group**

Pair	By Subject (*F1*)				By Item (*F2*)			
	M	*SD*	*t*	*p*	*M*	*SD*	*t*	*p*
Con-	2707.64	577.28	-2.47	.020	2696.91	680.70	-2.25	.046
Short	3068.71	867.74			3059.24	685.81		
Con-	2707.64	577.28	2.59	.015	2696.91	680.70	2.10	.060
Long-	2447.71	517.51			2450.89	515.73		
Short-	3068.71	867.74	3.98	.000	3059.24	685.81	3.86	.003
Long	2447.71	517.51			2450.89	515.73		

However, *t*-tests conducted for IP and LP groups revealed that there were no significant effects of temporal conditions in both groups. As for IP group, short inconsistent duration sentences were read 285.57ms slower than consistent duration sentences, and this difference was not significant by subjects ($t_1(27)=-1.91$, $p>.05$), but significant by items ($t_2(11)=-2.74$, $p<.05$). Short inconsistent duration sentences were read 115.85ms slower than long duration sentences, and this difference was not significant ($t_1(27)=.63$, $p>.05$; $t_2(11)=.54$, $p>.05$). There was no significant difference between consistent duration and long duration ($t_1(27)=-.9$, $p>.05$; $t_2(11)=-1.04$, $p>0.5$). Regarding LP group, short inconsistent duration sentences were read 73.79ms slower than consistent duration sentences, and this difference was not significant ($t_1(27)=-.41$, $p>.05$; $t_2(11)=-.86$, $p>.05$). Short inconsistent duration sentences were read 303.46ms slower than long duration sentences,

and this difference was not significant by subject ($t_1(27)=1.6$, $p>.05$), but significant by items ($t_2(11)=2.44$, $p<.05$). There was no significant difference between consistent duration and long duration ($t_1(27)=1.33$, $p>.05$; $t_2(11)=1.19$, $p>.05$). (see Figure 4.2 for mean plots for temporal conditions per group)

Figure 4.2

Mean Plots for Temporal Conditions per Group
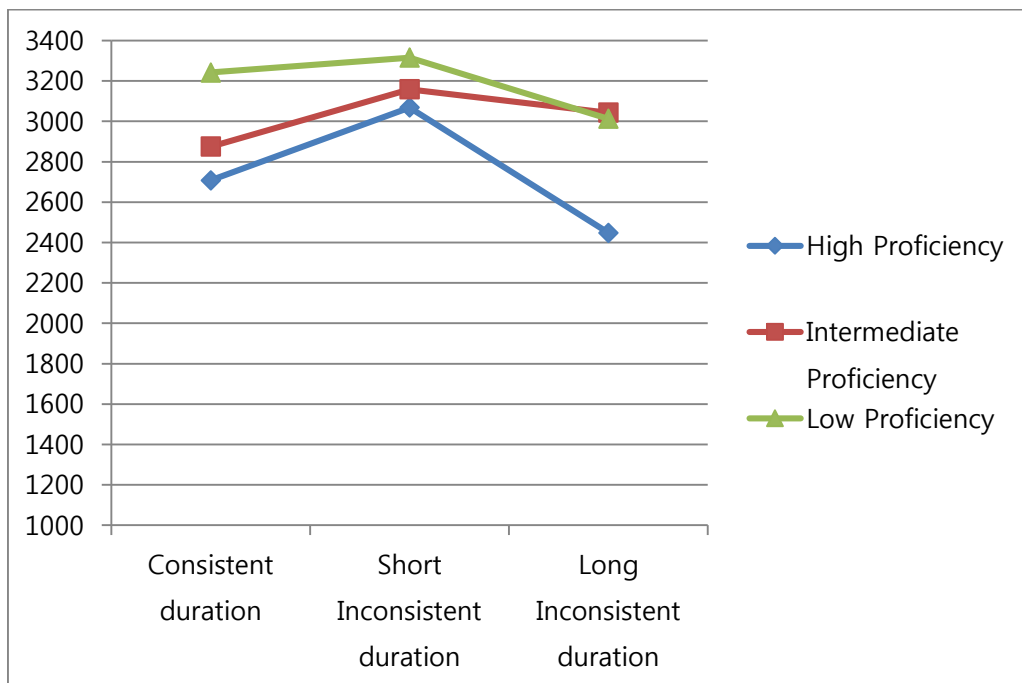
4.2.3. Group Differences Regarding Processing Temporal information

The second research question was to determine if there is any difference in Korean L2 readers' processing temporal information according to English proficiency. First, HP group read target sentences generally faster than IP and LP in all three temporal conditions (see Table 4.6 and Table 4.7). Secondly, considering the results from three separate paired t-test results, it is viable to say that only HP group was capable of detecting the inconsistent duration of events in the target sentences (see Table 4.9). Specifically, the mean reading times for short inconsistent duration were significantly longer than either consistent duration or long inconsistent duration.

This finding indicates that Korean students with higher English proficiency are able to build a situation model regarding temporal information while the Korean participants with lower level of English are not. Just and Carpenter (1992) have shown that readers with smaller working capacities may not have resources available that would be required to establish the implied relationships between sentences, thus failing to construct a coherent situation model. Conversely, readers with higher working memory capacities can hold the most relevant information in consciousness when completing complex tasks such as reading, resulting in better comprehension of the text

(Budd, Whitney, & Turley, 1995; Singer & Ritchot, 1996). Therefore, it can be assumed that the difference across readers of high and low reading comprehension skill leads to the discrepancy in constructing situation model among proficiency groups.

4.2.4. Comparison of RTs between Korean and American Participants

The present study was an endeavor to extend the understanding of situation model construction in Korean L2 learning contexts. In Therriault and Raney (2007), seventy-eight American college students read the same narrative texts in English, which is their native language. The experimental passages with three different temporal conditions (consistent duration, inconsistent short duration, and inconsistent duration) were applied to the Korean participants in the current study. Therriault and Raney (2007) found that American college students detected the inconsistency and they spent more time reading the target sentences. Specifically, the mean reading times per long inconsistent sentences were less than short inconsistent sentences ($F_1(1,77)=9.96$, $p<.001$; $F_2(2,22)=5.04$, $p=.016$). (see Table 4.8 for means and standard deviations).

Table 4.9

Data in Present Study and Therriault & Raney (2007)

Temporal Conditions (Source)	Korean High School Students (the Present study)			American College Students (Therriault & Raney, 2007)		
	M	N	*SD*	*M*	N	*SD*
Consistent	2942	84	755	2030	78	54
Short Inconsistent	3181	84	758	2418	78	59
Long Inconsistent	2834	84	837	2206	78	71

In general, despite the difference in general reading fluency between Korean and American participants (Korean students were slower in reading of the target sentences for all three duration conditions than American participants), the results in the present study are consistent with the results of experiments in Therriault and Raney (2007), suggesting there is similarity between American and Korean students in the estimating duration of the common events. The participants in the two studies demonstrated similar reading behavior regarding temporal inconsistency. There was mean reading time difference across the three temporal conditions in total participants (see Table 4.8). Specifically, Korean students read the sentences with inconsistent short duration slower relative to other two temporal conditions (consistent duration, long inconsistent duration). This result holds true for American participants in Therriault and Raney (2007).

As demonstrated in the both studies, the outcome is the possible manifestation of the effects of goal achievement (Therriault and Raney, 2007). It means that changing the duration of activities described in the text may have violated the expected completion of the activity. For example, in one passage an individual was described as taking a shower after a soccer match on rainy day. In the short inconsistent condition, the individual spends 1 minute in the shower, in the long inconsistent condition he spends 3 hours, and in the consistent condition he spends 15 minutes. The short inconsistent condition might cause a goal-completion problem because 1 minute is not likely to complete the goal of taking a shower after a vigorous soccer play. This is not the case for the 3-hour duration. The sample passage is presented below. (see Table 4.9)

Table 4.10

Sample Passage from Therriault & Raney (2007)

Miguel joined a fall soccer league to get back in shape. He enjoyed playing soccer in high school but that was years ago. He now worked as a computer programmer and didn't get much activity during his workday. Miguel wasn't sure that today's game would be held. It had been raining for part of the day and the field was wet. The game was held anyway and Miguel got covered in mud. When he got home he immediately went to take a shower.

<u>Miguel showered for fifteen minutes.</u> (target, consistent)
<u>Miguel showered for one minute.</u> (target, short)
<u>Miguel showered for three hours.</u> (target, long)

He felt much better. Miguel was excited to play again next week.

In addition, participants in two native language groups showed differences in the ratio of failure in Comprehension Accuracy test scores. About 14% of the total Korean participants' in the present study failed to pass the cut-off score of 70% in the comprehension accuracy test. This exclusion ratio of 14% is contrastive to that of Therriault and Raney (2007) in which no one's accuracy score was at or below 70%. This gap in the mean times measure and the ratio in passing minimum level of reading comprehension can attribute to the language proficiency gap between native speakers of

English and L2 learners of English.

As for the effect of temporal inconsistency in target sentence on the spillover (target+1) sentence, the reading time per next-to-target sentences (target+1) were analyzed. The prior study (Therriault & Raney, 2007) investigated English native readers' situation model construction in the narrative texts and found that American college students were able to construct situation model by monitoring temporal inconsistency in the target sentences in English narrative texts. The research further tested the spillover effect of temporal inconsistency of target sentence on target+1 sentence. The results did not indicate any significant differences in reading times across three temporal conditions (consistent, short inconsistent, long inconsistent), demonstrating no spillover. In line with the prior research, the present study tested the possibility of the spillover effects to see if this result would be consistent with that of Therriault and Raney (2007). According to the ANOVAs, increased reading times for sentences with duration inconsistencies did not transfer to the spillover sentences (see Table 4.5)

CHAPTER 5.
CONCLUSION

5.1. Summary of Findings and Pedagogical Implications

The aim of the present study was to investigate whether Korean EFL readers construct situation model when they read English narrative texts. The researcher examined how Korean high school students responded to inconsistency in duration-related information when they read narrative texts in English. The study addressed two points in the research questions: 1) Will Korean EFL readers detect inconsistency in duration-related information when they read narrative texts in English? 2) Is there any difference in high school students' temporal information processing according to their levels of English proficiency? Section 5.1.1 provides the summary of major findings, and section 5.1.2 discusses pedagogical implications. Lastly, section 5.1.3 provides some limitations of this study and suggestions on future research on situation model studies in Korean EFL contexts.

5.1.1. Summary of Findings

The current study investigated whether and how Korean EFL readers process and represent temporal information (duration) in situation-model construction. As revealed in the previous research (Therriault & Raney, 2007; Rinck et al, 2001; Rinck et al, 2003), some level of native-like L2 processing was achievable by highly proficient L2 learners. In the experiment, the researcher examined how duration-related inconsistencies (consistent, short inconsistent, long inconsistent) influenced processing time of Korean high school students for three proficiency groups. In addition, the present study attempted to compare Korean high school students' processing temporal information to that of American college students in reference to a prior study (Therriault and Raney, 2007). The major findings can be summarized as follows:

Overall, Korean EFL readers were found to detect inconsistency in duration-related information when they read narrative texts in English. In the analysis of total participants, Korean high school students spent more time reading the target sentences with short duration inconsistency than with long duration inconsistency. The present study further investigated if there is any difference in Korean readers' processing temporal information according to

their levels of English proficiency. First, the analysis revealed that there was processing speed difference among proficiency groups. In other words, groups with higher level of proficiency read faster than groups with lower level of proficiency across three temporal conditions. This discrepancy in processing temporal information could attribute to the different L2 reading skills. In addition to the gap in reading time among proficiency groups, the analyses in individual proficiency group indicated that HP group demonstrated significant difference across temporal conditions while IP and LP did not, suggesting that only Korean students with higher level of proficiency are capable of detecting the inconsistent duration of events in the target sentences.

The present extends a prior study (Therriault & Raney, 2007) into Korean EFL contexts. Specifically, the present study investigated if there is any difference in Korean high school students' temporal information construction from that of American L1 readers of English narrative texts. Despite the difference in general reading fluency (processing time) between Korean and American participants, the results in the present study are quite consistent with the results of experiments in Therriault and Raney (2007) that Korean high school students did monitor the temporal information and spent more time processing the target sentences with short duration inconsistency

than with long duration inconsistency, suggesting there is similarity between American and Korean students' estimating duration of the common events.

5.1.2. Implications

In light of the major findings above, the present study addresses the following implications for L2 reading research and pedagogical practices.

First of all, the findings of the current study add initial empirical evidence to the Event-Indexing Model in the Korean EFL contexts; as L1 natives routinely do, Korean high school students with higher proficiency monitor and construct multilayered structures, which include at least a temporal dimension while comprehending narrative texts. In addition, the implementation of the Event-Indexing Model in a computer model introduced an important tool to flesh out the details of the assumptions made with respect to the Event-Indexing Model.

Secondly, from a methodological view point, the self-reading technique that captures real-time (online) processing can explore how L2 learners process the L2 texts in real time. As Roberts (2012) suggested, online techniques in psycholinguistics are critical in exploring the nature of learners' real-time processing, relating to difficulty in accessing the relevant

knowledge in real time. While the conventional reading comprehension tests depend on readers' memory, online reading measure can simultaneously reflect more general processing capacity limitations (Hopp, 2010).

Furthermore, self-paced reading task can be useful in examining L2 reading processing in comparison to that of native speakers in various aspects (Cho, 2014). A number of studies have proposed the differences of L2 processing from L1 in grammatical, morphological rather than semantic or pragmatic aspects using psycholinguistic techniques (Clahsen & Felser, 2006; Jiang, 2004). The observation of the present study is also directly comparable with Therriault and Raney (2007) and renders support the prior findings on situation model research.

Caution should be exercised when drawing implications for classroom practice based on results of a single study such as this one. Even so, given the results of the current study, some assumptions about EFL reading instruction can be made. EFL teachers should bear in mind that they encourage students to establish both a local and a global coherence of text in order to build an accurate situation model of the text. Further, teachers and task designers should create reading tasks that enhance learners' situation model construction. It is advisable to incorporate both text-based and situation-level tasks to involve the situation model building on the part of students.

5.2. Limitations and Suggestions for Further Research

Along with the theoretical and pedagogical implications, the present study also has several limitations.

First of all, more research needs to be conducted with other dimensions of the Event-Indexing Model. The current study provides evidence that temporal information, in isolation, plays a central role in establishing a coherent situation model. However, events in narratives are related on several other dimensions, for example, space, causation, motivation, and protagonist. To yield a comprehensive understanding of the process, further attempts are to focus on another single dimension or the relationships between multiple dimensions within the context of the Event-Indexing Model.

Secondly, despite the empirical evidence to situation model construction in Korean EFL contexts, there are many unsolved issues with respect to individual differences factor that distinguishes situation-model readers from text-based readers. Thus, future situation model studies in EFL context might consider using various components of L2 reading comprehension that distinguish individuals, such as reading span (working memory capacity), language experience, reading strategies, L1 fluency, etc.

Thirdly, the present study based on the Event-Indexing Model is confined to comprehension of narrative texts. For example, expository text is different from narrative text in that there may be less focus on the time, the emotions, goals, and intentions for the protagonist in the processing of events. As Zwaan et al (1995) pointed out, readers' domain knowledge is typically low in expository reading and they may have placed a high priority on encoding the explicit text at the expense of constructing a situation model. Thus, employing expository text instead of narrative texts might produce different results.

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APPENDICES

APPENDIX 1

CONSENT FORM

연구 자료 수집 동의서

본 연구는 외국어(영어) 독해과정에 대한 연구입니다. 귀하는 영어를 배우는 고등학생이기 때문에 이 연구 참여하도록 권유 받았습니다. 이 연구를 실시하는 이원일 (불암고, 010-3762-5725)이 귀하에게 이 연구에 대해 설명해 줄 것입니다. 이 연구는 자발적으로 참여 의사를 밝히신 분에 한하여 수행 되며, 참여 의사를 결정하기 전에 본 연구가 왜 수행되는지, 연구의 내용이 무엇과 관련 있는지 이해하는 것이 중요합니다. 아래 내용을 읽어보신 후 참여 의사를 밝혀 주시길 바라며, 필요하다면 가족이나 친구들과 의논해 보십시오. 질문이 있다면 담당 연구원이 자세하게 설명해 줄 것입니다. 이 연구의 목적은 영문독해 시 한국인이 겪는 어려움의 원인을 파악하여 영어교육에 기여하기 위한 것입니다. 불암고에서 약 120 여명의 고등학생이 참여 할 것이며 귀하가 참여의사를 밝혀 주시면, 귀하는 고 1 수준의 영어지문 18 개(지문당 100 단어 내외)를 컴퓨터 화면으로 약 30 분정도 읽게 될 것입니다. 독해속도에 따라 시간은 20 분에서 40 분 정도로 차이가 날 수 있습니다. 그 후 지문의 내용에 관한 2 개의 참/거짓 질문에 응답하며, 그 결과에 따른 불이익은 없고, 결과도 누구에게도 공개되지 않습니다. 독해 후 약 3 분간의 설문 조사를 하게 될 것입니다. 모든 과정은 일과 중 교내 컴퓨터실에서 실시될 것입니다. 연구 참여 기간은 1 회, 약 30-40 분이 소요될 것입니다. 언제든지 어떠한 불이익 없이 참여 도중에 그만 둘 수 있고, 연구에 참여하는 것을 그만두고 싶다면 연구 책임자에게 즉시 말씀해 주십시오. 연구 참여 도중 발생할 수 있는 부작용이나 위험 요소는 없습니다. 귀하가 이 연구에 참여하는데 있어서 직접적인 이득은 없으나 귀하가 제공하는 정보는 한국인의 영문독해과정을 이해하는데 도움이 될 것입니다. 귀하는 본 연구에 참여하지 않을 자유가 있습니다. 또한, 귀하가 본 연구에 참여하지 않아도 귀하에게는 어떠한 불이익도 없습니다. 개인정보관리책임자는 서울대학교의 이원일 (영어교육과 석사과정 02-880-7670)입니다. 저희는 이 연구를 통해 얻은 모든 개인 정보의 비밀 보장을 위해 최선을 다할 것입니다. 이 연구에서 얻어진 개인 정보가 학회지나 학회에 공개 될 때 귀하의 이름과 다른 개인 정보는 사용되지 않을 것입니다. 그러나 만일 법이 요구하면 귀하의 개인정보는 제공될 수도 있습니다. 또한 모니터 요원, 점검 요원, 생명윤리심의위원회는 연구참여자의 개인 정보에 대한 비밀 보장을 침해하지 않고 관련규정이 정하는 범위 안에서 본 연구의 실시 절차와 자료의 신뢰성을 검증하기 위해 연구 결과를 직접 열람할 수 있습니다. 귀하가 본 동의서에 서명하는 것은, 이러한 사항에 대하여 사전에 알고 있었으며 이를 허용한다는 동의로 간주될 것입니다. 귀하의 연구 참여시 감사의 뜻으로 2000 원 상당의 매점이용권이 증정될 것입니다. 본 연구에 대해 질문이 있거나 연구 중간에 문제가 생길 시 다음 연구 담당자에게 연락하십시오. (이원일, 010-

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3762-5725) 언제라도 연구 참여자로서 귀하의 권리에 대한 질문이 있다면 다음의 서울대학교 생명윤리심의위원회에 연락하십시오. (서울대학교 생명윤리심의위원회, Tel. 02-880-5153)

1. 나는 이 설명서를 읽었으며 담당 연구원과 이에 대하여 의논하였습니다.

2. 나는 위험과 이득에 관하여 들었으며 나의 질문에 만족할 만한 답변을 얻었습니다.

3. 나는 이 연구에 참여하는 것에 대하여 자발적으로 동의합니다.

4. 나는 이 연구에서 얻어진 나에 대한 정보를 현행 법률과 생명윤리심의위원회 규정이 허용하는 범위 내에서 연구자가 수집하고 처리하는데 동의합니다.

5. 나는 담당 연구자나 위임 받은 대리인이 연구를 진행하거나 결과 관리를 하는 경우와 보건 당국, 학교 당국 및 서울대학교 생명윤리심의위원회가 실태 조사를 하는 경우에는 비밀로 유지되는 나의 개인 신상 정보를 직접적으로 열람하는 것에 동의합니다.

6. 나는 언제라도 이 연구의 참여를 철회할 수 있고 이러한 결정이 나에게 어떠한 해도 되지 않을 것이라는 것을 압니다.

7. 나의 서명은 이 동의서의 사본을 받았다는 것을 뜻하며 연구 참여가 끝날 때까지 사본을 보관하겠습니다.

학 생 성명: 서명: 날짜:

보호자 성명: 서명: 날짜:

연구자 성명: 서명: 날짜:

APPENDIX 2

Experimental Passages Items

All 12 experimental passages with critical sentences underlined (sentence type and condition information presented in parentheses). Note that only one of the three possible target sentences was presented to participants in each version of a passage. (Therriault and Raney, 2007)

Passage 1

Sally had just finished her last college final in Organic Chemistry. She was going home for the summer soon. Sally decided to meet her friend Cleo for lunch that day. Cleo and Sally were old friends from High School. Cleo attended a different college across town. Sally and Cleo went to a small Thai restaurant that was located between their schools.

Sally and Cleo spent an hour at the restaurant. (target, consistent)
Sally and Cleo spent five minutes at the restaurant. (target, short)
Sally and Cleo spent seven hours at the restaurant. (target, long)
Then Sally decided to head back. (spillover sentence)

Sally was glad that she had a chance to talk with Cleo.

Passage 2

Daniel was going to buy a house. He had finally saved enough money for the down payment. Today he had planned on meeting with the agent. Daniel was very excited. He drove over to the house and met the agent. The agent asked Daniel if he was prepared to make his payment. Daniel smiled and pulled out his checkbook.

<u>Daniel spent fifty seconds writing out the check.</u> (target, consistent)
<u>Daniel spent five seconds writing out the check.</u> (target, short)
<u>Daniel spent thirty minutes writing out the check.</u> (target, long)
<u>He was now the proud owner of a new home.</u> (spillover sentence)
Daniel began to think about all the work that would be involved in moving.

Passage 3

Eric had just been to the dentist and had four cavities filled. Eric's dentist recommended that Eric buy a sonic toothbrush. The dentist said that it would save him from future dental work. Eric agreed and decided that he would buy one on his way home. Eric was surprised the toothbrush the dentist recommended cost over 80 dollars. He reluctantly paid for it. Before Eric went to bed he used his new toothbrush for the first time.

<u>Eric spent two minutes brushing his teeth.</u> (target, consistent)
<u>Eric spent six seconds brushing his teeth.</u> (target, short)
<u>Eric spent forty minutes brushing his teeth.</u> (target, long)
<u>Eric liked the toothbrush and decided to keep it.</u> (spillover sentence)
He hoped that his purchase would save him money in the long run.

Passage 4

Bella had just woken up from a nap. She remembered that she had a doctor's appointment scheduled for later that day. Bella did not like going to her yearly physical. Bella would be unable to use her insurance if she didn't go. She decided to take a quick shower to help her wake up. After showering and calling to verify her appointment, she decided to get dressed.

     Bella spent ten minutes getting dressed. (target, consistent)

     Bella spent twenty seconds getting dressed. (target, short)

     Bella spent four hours getting dressed. (target, long)

Bella then drove over to the doctor's office. (spillover sentence)

The physical went quickly and she was given a clean bill of health.

Passage 5

Mary and John were brother and sister. Mary lived in New York and John lived in Seattle. They loved to play board games whenever they were together. One of their favorite games was Scrabble. This Thanksgiving John went to Mary's house. It was becoming a tradition that Mary and John would play Scrabble. This Thanksgiving was no exception.

     They spent an hour playing Scrabble. (target, consistent)

     They spent five minutes playing Scrabble. (target, short)

     They spent six hours playing Scrabble. (target, long)

Mary beat John by thirty points. (spillover sentence)

After they finished putting the game away, they ate their Thanksgiving meal. John was so full he suggested that they go for a walk.

Passage 6

Tamara was a terrible procrastinator. She rarely began studying more than a day before an exam. Fortunately for Tamara, she was very bright. She often did well on her exams even without studying. Tamara had an exam scheduled for tomorrow. Even so, she watched TV most of the night. She then decided that she needed to call a friend. Tamara promised herself that she would start studying as soon as she got of the phone.

> Tamara talked on the phone for thirty minutes. (target, consistent)
> Tamara talked on the phone for twenty seconds. (target, short)
> Tamara talked on the phone for six hours. (target, long)

Tamara then hung up and opened her book. (spillover sentence)

Tamara knew that it would be another late night studying.

Passage 7

Maxine liked to try new things. Just recently she had finished a cooking class on Italian specialties. Maxine wasn't too busy tonight so she thought that she would try out one of the new recipes. She decided that she would make a fancy white clam sauce over pasta. Maxine went to the store and purchased all the necessary ingredients. Maxine also called her best friend Laura to come over to help her eat her creation.

> Maxine spent fifty minutes preparing the meal. (target, consistent)
> Maxine spent twelve minutes preparing the meal. (target, short)
> Maxine spent five hours preparing the meal. (target, long)

It turned out well and Laura ate seconds. (spillover sentence)

Maxine decided that she would add this recipe to her list of favorites.

Passage 8

Michael and his friend Kyle were on vacation from high school. It was the second week of a big heat wave. They decided today that they would go to the beach. Michael and Kyle packed a lunch and a blanket to sit on. They also made sure to bring plenty of suntan lotion and a Frisbee. Michael and Kyle arrived at the beach and found a great spot to put their blanket. They went swimming and played Frisbee in the water.

<u>They spent three enjoyable hours at the beach.</u> (target, consistent)

<u>They spent twenty enjoyable minutes at the beach.</u> (target, short)

<u>They spent ten enjoyable hours at the beach.</u> (target, long)

<u>It was nice to relax in the water.</u> (spillover sentence)

They decided that they would go tomorrow as well.

Passage 9

Miguel joined a fall soccer league to get back in shape. He enjoyed playing soccer in high school but that was years ago. He now worked as a computer programmer and didn't get much activity during his workday. Miguel wasn't sure that today's game would be held. It had been raining for part of the day and the field was wet. The game was held anyway and Miguel got covered in mud. When he got home he immediately went to take a shower.

<u>Miguel showered for fifteen minutes.</u> (target, consistent)

<u>Miguel showered for one minute.</u> (target, short)

<u>Miguel showered for three hours.</u> (target, long)

<u>He felt much better.</u> (spillover sentence)

Miguel was excited to play again next week.

Passage 10

Ivan had long hair since graduating from college. He thought that it looked cool. It also kept his head warm during Minnesota's winters. Ivan's friend bill just asked him to be best man at his wedding. Ivan was excited about being in the wedding. Unfortunately, Bill also asked Ivan if he would get a haircut. Ivan was reluctant to get his haircut. When the wedding was less than a week away Ivan made an appointment at a barbershop.

     Ivan's haircut took thirty minutes. (target, consistent)

     Ivan's haircut took three minutes. (target, short)

     Ivan's haircut took five hours. (target, long)

Ivan hoped that Bill appreciated his sacrifice. (spillover sentence)

Ivan figured it would take six months to grow all of his hair back.

Passage 11

Gail and Betty like to go on excursions together. Today Gail had planned a shopping trip for them at a fairly large mall. Gail was looking to buy a gift for her husband's birthday. Betty thought that she would take the opportunity to start her Holiday shopping. Gail picked up Betty and then drove to the mall.

     They spent three hours shopping. (target, consistent)

     They spent fifteen minutes shopping. (target, short)

     They spent eight hours shopping. (target, long)

After they were done they decided to have lunch and head home. (spillover sentence)

They ate at a nice French restaurant inside the mall.

Passage 12

Jim loved to drink coffee. He often started his day by drinking a cup of coffee. Jim had a favorite coffee shop that he liked to go to on weekends. The shop had exotic blends that were difficult to find elsewhere. Today Jim decided to walk to his favorite shop and get a cup. The shop had an Ethiopian blend that Jim thought he would try. Jim bought a cup and sat down to enjoy it.

> Jim spent twenty minutes drinking his coffee. (target, consistent)
> Jim spent twenty seconds drinking his coffee. (target, short)
> Jim spent two hours drinking his coffee. (target, long)

Then Jim decided to walk home. (spillover sentence)

He wanted to get some chores done around the house.

APPENDIX 3

Screen Shots in the Experiment Using *Linger*

Welcome! 실험에 참여해 주셔서 감사합니다! 이 실험에서 당신은 영어지문을 컴퓨터 화면을 통해 읽게 됩니다. 영어지문은 한 문장씩 제시됩니다. 매 지문을 읽을 때마다, 아래와 같은 밑줄이 먼저 나옵니다. 한 번 읽은 문장은 다시 읽을 수 없습니다.

----

press any key to continue

하나의 지문을 읽고 나면, 두 개의 질문이 나옵니다. 맞으면 **f**(왼손검지) , 틀리면, **j**(오른손검지) 를 누르세요. 맞으면 다음으로 넘어가고 틀리면, **Oops! Wrong Answer**라고 나옵니다. 뒤로 가서 지문을 다시 읽거나 문제를 새로 풀 수 없습니다.

press any key to continue

먼저 간단한 문장 하나로 연습해 볼까요?

press any key to continue

자, 이제 실험을 시작합니다. **Here we go~!..**

press any key to continue

```
_____
The temperature would be in the 80's all day and there was going to be plenty of sun.
_____
_____
_____
_____
_____
_____
_____
```

질문1) Jim은 커피를 좋아하나요?

"F" for yes.   "J" for no.

Oops. Wrong answer.

실험이 끝났습니다! 참여에 감사합니다.
Thank you for participating!

press any key to continue

국 문 초 록

본 연구는 한국 고등학생의 영문독해처리과정을 살펴보기 위한 것이다. 특히, 네러티브 텍스트의 독해 중 담화 수준에서의 시간 정보의 처리과정을 중점적으로 관찰하여 제2언어 독해 시 한국학생들의 시추에이션 모델 형성을 시간정보 측면에서 관찰하고 영어능숙도별로 그 양상을 비교 및 대조하였다. 나아가 선행연구의 영어 모국어 독자의 독해처리과정과의 차이점을 규명하여 한국의 영어학습자들이 독해과정에 갖는 어려움을 보다 잘 이해하고 교수학습에 유용한 함의를 얻고자 하였다. 이에 따라 본 연구는 다음과 같이 연구문제를 설정하였다: (1) 한국의 고등학생들은 영문 네러티브 독해과정에서 시간정보를 인식하고 처리할 수 있는가? (2) 한국 고등학생들의 영문 네러티브 독해과정에서 시간정보의 처리양상은 능숙도 집단에 따라 어떤 차이가 있는가?

본 연구는 서울 소재 B고등학교에 재학 중인 고1 학생을 선정하여 실험을 진행하였다, 참여자들은 컴퓨터 화면으로 제시되는 총 12의 실험지문을 문장 단위로 읽고 Comprehension check 문제에 답하였다. 각 문장을 읽는 시간은 키보드를 통해 자동으로 기록되며, 조작된 시간정보를 담고 있는 목표문장들의 Reading Time을 수집 및 분석하였다. 전국학력평가(영어과목)의 점수를 기준으로 수준집단을 High (상위28명), Intermediate (중위28명), Low (하위 28명)로 나누어 산출된 Reading Time을 통계 분석하였다.

연구방법으로 첫째, 전 참여자를 대상으로 일원반복측정아노바(One way repeated ANOVAs) 를 사용하여 세 가지 시간정보(Consistent duration, Short duration inconsistent, Long duration inconsistent)에 따른 독해시간 측정치(Reading Times)에 나타난 유의미한 차이를 관찰하였다. 둘째, 영어능숙도 집단 간 효과 및 집단 내 시간정보에 따른 유의미한 차이가 있는지 관찰하기 위해 혼합 반복측정아노바(one-way mixed repeated ANOVAs)를 실시하였다. 마지막으로, 본 연구의 결과를 선

행연구 (Therriault & Raney, 2007)에서의 영어 원어민을 대상으로 얻은 결과와 비교, 논의하였다.

분석 결과, 평균독해시간 비교에서, 전체 집단의 학습자들은 시간정보가 일관적이지 않은 지문의 시추에이션 모델 형성에 있어 부담을 느끼고 Reading Time이 증가하였다. 그러나 능숙도 별로 세 가지 시간조건에 따른 평균독해속도에 있어서의 차이는 뚜렷하게 나타나지 않았다. 다시 말하면, 상, 중, 하 세 가지 능숙도 수준 학습자들의 경우, 시간조건 간에 읽기속도의 양상에 큰 차이가 없는 것으로 나타났다. Therriault & Raney(2007)의 영어 원어민 화자를 대상으로 한 연구의 결과와 본 연구에서의 한국학생을 대상으로 얻은 결과를 비교할 때, 한국 고등학생들의 경우, 원어민 집단보다 평균독해시간이 전반적으로 느렸음에도 불구하고, 시간정보에 따라 유의미한 차이를 보였으며 이는 미국 대학생들의 결과와 유사한 경향을 보인 것이다. 즉, 비일관적인 짧은 지속시간(short inconsistent duration)의 경우에 일관적(consistent) 또는 비일관적으로 긴 지속시간(long inconsistent duration)의 독해시간보다 상대적으로 긴 Reading Times을 보여주었다. 따라서 한국과 미국 간의 언어, 문화배경의 차이에도 불구하고 두 집단은 독해지문 속 시간정보에 대해 유사한 민감도를 보여주었다고 판단할 수 있다.

이러한 연구 결과는 학교 현장의 독해교육과 실제 영어 수업과 관련하여 다음과 같은 시사점을 준다. 첫째, 영어 원어민과 제2언어 학습자의 실시간 언어처리와 산출과정을 비교, 대조하여 한국 고등학생들이 영문독해 과정에서 갖는 어려움을 인식할 수 있다. 둘째, 학습자의 기억력에 의존하는 독해 이해도평가 방식에서 나아가, 심리언어학의 실시간(online) 독해시간 측정을 통해 독자의 실제적인 독해양상을 관찰할 수 있게 하여, 목표언어가 자동성(automaticity), 절차화(proceduralization)되어 가는 과정에 대한 이해를 도울 수 있다. 마지막으로, 교사들은 시추에이션 모델 연구를 통해 텍스트수준(Text-based)의 정보처리과정 뿐 아니라 상위 담화 영역의 시추에이션 모델 형성을 증진시키는 독해 교수법의 개발 및 활용에 대한 함의를 얻을 수 있다.

주요어: 시추에이션 모델, 상황모델, 시간정보처리, 제 2 언어 처리과정,
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