

Native-nonnative differences in word defining tasks in timed and untimed conditions: An experimental study in interactive model perspective.

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Abstract

To study whether time plays a significant role in nonnative reading developmental continuum and to capture the developing reading skills in controlled-automatic continuum, 12 unusual (but real) vocabulary words were presented in 12 passages to adult nonnative speakers who were graduate students at the University of California in Los Angeles (UCLA) under time controlled reading conditions and time unrestricted conditions. The subjects were asked to infer the meaning of a target word in each passage as well as answer certain metacognitive questions related to time and information available in the tasks. Results indicated that the developmental nature of the second language reading processes could be captured along the controlled-automatic continuum and that additional time does generally assist nonnative speakers in capturing additional information and thereby does significantly improve the quality of their comprehension.

Introduction

Inferring the meaning of an unknown word in context in real time is not a small task. It involves various mental processes and is considered an interactive and integrative process (Vanniarajan 1997). Reading psychologists (Elshout-Mohr 1978, Elshout-Mohr & van Daalen Kaptejins 1987) consider it a special skill and also claim that it is an ability that is necessary for further success in language learning. Research studies have also shown that nonnative speakers' difficulties in reading comprehension highly correlate with vocabulary comprehension difficulties than with any other variable including syntax. Furthermore, according to cognitive psychologists, a nonnative reader's success in inferring the meaning of an unknown word in context in real time depends on the speed with which he/she processes the information (Daneman 1987, Daneman & Carpenter 1980) and the speed with which he/she is able to identify and interpret the contextual cues provided in the context (Beck & McKeown 1991, Sternberg 1987). The research claim is that like L1 reading process, L2 reading process also develops from controlled to automatic processes in a continuum.

Samuels and LaBerge (1983) propose that the developmental continuum of reading from controlled to automatic processes has three stages: (i) non-accurate non-automatic stage, (ii) accurate non-automatic stage, and (iii) accurate automatic stage. Non-automatic reading processes are generally considered to be conscious, capacity demanding, form-oriented (primarily bottom-up processing), sequential, inefficient, time consuming, and involving smaller chunks. In contrast, automatic processes are generally considered to be unconscious, capacity undemanding, meaning-

oriented, parallel, efficient, less time consuming, and involving larger chunks.

Research (Favreau & Segalowitz 1983) suggests that educated native speakers can be considered to be primarily in the accurate-automatic stage, fast and automatic at most components of reading, including encoding, lexical access, and higher level semantic and syntactic processings (Daneman & Carpenter, 1980). Cognitive psychologists working on L2 reading claim that like L1 reading, in the early stages of its development, L2 reading processes also require a great deal of functional capacity in retrieving the existing knowledge of the new language for decoding. Geva and Ryan (1993, p.9) state, “for the L2 learner, reading in L2 requires higher degrees of analyzed linguistic knowledge and cognitive control than does reading in L1.” For them, syntactic processes are less automatized in L2 than in L1. Also, during this stage, lexical access requires longer time and meanings do not emerge automatically. For Bialystok and Ryan (1985, p.215), “practice using the language improves the learner’s access to knowledge, and this improvement is reflected in greater fluency. The important distinction here is that fluency need not require any new or different information; rather, it requires more automaticity in the retrieval of existing information.”

If fluency does not require any new or different information, then it is possible that time may play a critical role in nonnative comprehension of contextual vocabulary tasks. For example, the advanced nonnative readers who consider themselves in the accurate-non-automatic stage with regard to reading may not be able to get the meanings of the words in context in real time since the reading process will not be able to identify all of the contextual cues and work on them in real time; however, they will be able to get the meanings of the unknown words if given additional time by backtracking, identifying the relevant cues, and combining them to infer the meaning of the word. The critical question to be explored is whether time plays a critical role as a variable in nonnative reading process.

What follows is a description of the experiment that was conducted in a laboratory like setting at the University of California, Los Angeles. This being the first report of the experiment, for the sake of reliability, all relevant details with regard to the design and conduct of the experiment have been reported.

The Experiment

Subjects

The subjects were 30 nonnative speakers who were all graduate students from the University of California at Los Angeles (UCLA). It was decided to conduct the experiment with graduate students for the main reason that their verbal reasoning capacities would be high enough to work on the types of tasks designed. The average age of the subjects was 27.96 years. The subjects were from the following three Asian countries, China, Korea, and Taiwan. The mean number of years the nonnative subjects had been studying and using English as an academic language was 10.9 years.

UCLA requires a TOEFL score of 620 and above for admission to its graduate school. As such, all of these subjects had a TOEFL score of 620 and above. No restrictions were made with regard to the disciplines the subjects would belong to, and whoever responded to the advertisement in Daily Bruin, the official student run newspaper at UCLA, was invited to take part in the experiment after the verification of their student identification cards but subject to one condition that they would strictly follow the instructions given by the researcher at every stage of the experiment.

Primary Tasks

The tasks used in the experiment required the subjects to infer the meanings of unknown words that fit in well with the ongoing pragmatic and linguistic contexts. The tasks were chosen for two reasons: (i) L1 reading research suggests that in an online discourse, while inferring the meanings of unknown words, a skilled reader decodes (bottom-up processing), and at the same time works out the meanings of unknown words which fit in well with the ongoing linguistic and pragmatic contexts (top-down processing). The unskilled readers find this process of inferring the meanings of unknown words a very difficult and frustrating experience. However, they also eventually end up with the meanings of unknown words but only after adopting divide and conquer strategies and devoting a lot of time and attention to each of the individual intermediate processes involved. Considering that the nature of tasks would make considerable demands on both processing and storage components of one's reading skill, it was hypothesized that if the tasks were well constructed, on the one hand, they would fairly be valid measures of the reading processes of L2 readers, and on the other hand, would serve as valid instruments of finding out whether or not the subjects were able to keep the contextual cues in their working memories for later computations of meanings. Also, more importantly, such tasks could successfully be administered on a computer. Apart from practicality and reliability considerations, by doing the experiment on the computer, it would also be possible to control as well as measure the subjects' processing time.

Vocabulary Words Used in the Experiment

Twenty-four (24) low frequency words were selected from two dictionaries of low frequency and unusual words (Byrne, 1974; Dickson, 1982) out of which twelve (12) were used in passage tasks and twelve (12) others in sentence tasks. This report will concern only with the passage tasks. Though the words chosen were unusual, their meanings, however, were not; in other words, their concepts were not totally uncommon or unfamiliar. The words were chosen in such a way that they could not be substituted by synonyms and that they represented multi-concepts (not polysemous, i.e. multiple meanings - but a meaning that has multidimensions) to ensure that subjects had to infer all the embedded concepts in the words in terms of the contextual (including linguistic) cues provided in the tasks, and in certain tasks, in terms of their background knowledge also. For an example of the kinds of words used in the experiment, consider the word ghooming. It means `to hunt wild animals

in the dark.' The word cannot be substituted by a synonym and it has three familiar concepts: (1) to hunt, (2) wild animals, and (3) in the dark. What is important is that such words enable researchers to construct passages and sentences with contextual cues well spread out so that readers will have to read the entire items to infer their meanings. The words used in the passage tasks and their meanings are presented in Table 1. In the table, the numbers within parentheses next to the words used in the experiment refer to the dictionary from which the word is taken and the page on which it occurs. For example, for the word, 'anacampserote', the numbers (1:20) refer to that the word is taken from *Mrs. Byrne's Dictionary of Unusual, Obscure, and Preposterous Words* and that it occurs in that dictionary on page 20. Numbers such as (2:20) refer that the word is taken from Dickson (1982), *Words*.

TABLE 1

Novel Target Words Used in the Experiment and their Meanings

	Word	Meanings
1	agio (2:17)	the percentage or the commission/rate of exchange for changing, i.e. converting an inferior currency into a more valuable one in a private or illegal transaction
2	Agunah (2:18)	a married woman whose husband has deserted her and she cannot remarry without divorce or proof of his death
3	anacampserote (2:20)	something prepared (made) by psychic readers which can bring back lost love.
4	anacrisis (2:21)	police brutality during interrogation
5	chummage (1:33)	money or favors or both given to an oldie (old prisoner) by a newcomer for protection from other oldies in a prison
6	drilligate (1:52)	to detain somebody against his/her will from leaving by continuing the conversation endlessly (or to detain a person when he wants to get away by talking endlessly)
7	gazump (1:334)	to raise, increase the price (of something) after a verbal agreement (ie. after a sale transaction is finalized)
8	ghoom (2:84)	to hunt wild animals in the dark
9	groak (2:87)	desire for an invitation to join in a meal
10	mithridatism (1:169)	art of obtaining immunity from poison that is realized (built up) after (through) taking (ingesting)it in a series of small doses
11	qualtagh (2:174)	the first person seen after leaving the house in the morning (or for the first time during the day)
12	Shebeen (2:196)	a place where unauthorized liquor is sold

The length of the tasks ranged from 209 to 325 words; the position of the target word whose meaning to be inferred varied across all the tasks. The passages were written with a minimal requirement that they contained sufficient unambiguous contextual and pragmatic cues for inferring the intended overall contextual meanings and that the reader had to read the entire passages for inferring the meanings of the underlined words. In order to fulfill this requirement, the items were pilot tested with 10 monolingual native speakers of English and 10 advanced level nonnative speakers of English to make sure that (i) the subjects would not come up with unanticipated meanings, that is, definitions that differed from the ones intended by the researcher but that could have been plausible in their respective contexts and that (ii) the successful completion of tasks required the entire reading of the passages. What follows is a sample of the passage tasks used in the experiment.

Sample Passage Task: Agio

Mr.Kwan was a longtime aspirant for U.S. immigration. His dream came true when at last his application was approved. He was instantly ready to move, but for his huge savings in the bank. He knew very well that it was very difficult to convert his savings into the equivalent U.S. dollars not only because his country's currency enjoyed no great reputation in the money exchange market but also because there was a lot of local restrictions with which to comply, most of which did not qualify Mr.Kwan for an official transaction. What could he do? Should he leave behind all his savings in his home country and go to the United States or should he remain in his home country because he couldn't afford to lose them? Luckily, when Mr.Kwan told a friend who was working in a travel agency of his dilemma, the friend told him not to worry; the problem was not uncommon and the solution was simple. The friend would look for people coming from abroad, and if they preferred to exchange their money privately, Mr.Kwan could pay them a higher agio, much higher than what was generally asked for in the money exchange market, and in this way he could slowly overcome his anxiety. Mr. Kwan was happy despite the fact that he would lose a substantial portion of his savings in the transaction because he would be able to take along in major currencies a greater proportion of his savings to the United States.

Research procedures

The tasks were presented under two different reading conditions, (1) in one condition with no time allowance for backtrackings (hereafter time restricted condition), and (2) in another condition with unlimited time allowance for backtrackings (hereafter time unrestricted condition); the time unrestricted condition followed the time controlled condition. The following three research assumptions were made in terms of the goal of the experiment which was to find out whether time,

as a variable, played a significant role in the nonnative reading process:

Hypothesis 1: There would be significant differences between the amount of time made available to nonnative subjects under restricted reading time conditions and the amount of time they had actually taken for processing the tasks.

Hypothesis 2: When required to comprehend an unknown word in real time that has multi meaning dimensions, nonnative subjects with limited language proficiency would be less able to construct the meaning from cues provided by the verbal context because of their overexertion of working memory for other purposes such as syntactic processing and understanding the meaning of individual words. When given unrestricted reading time, nonnative subjects with limited language proficiency would be able to construct meanings of the unknown words through backtrackings and by using divide and conquer strategies. Hence, it is assumed here that there would be significant qualitative differences between the definitions given under real time processing conditions and the definitions given under time unrestricted conditions provided by the nonnative subjects.

Hypothesis 3: Nonnative subjects' perception of the amount of information available in the tasks would correlate with the success in their performance.

Secondary Tasks

Apart from providing the contextual meanings for the target words, the subjects were also required to provide information on a rating scale of 1 to 3 (i) how sufficient was the time made available to them in time restricted settings, (ii) how adequate was the given information in the passages for inferring the meanings of target words, and (iii) how familiar they were with the concepts embedded in these words. They were also required to answer a question on whether or not they backtracked while reading for inferring the meanings of target words, and if so, how many times.

To ensure that subjects did not differ in their prior knowledge of the target words under study, the subjects were handed the list of words to appear in the experiment prior to the administration of the experiment and were asked to put a checkmark against the words they already knew. No subject happened to know the meaning of any of the target words in isolation.

After the experiment, the subjects were handed a list containing low frequency words which appeared in the tasks. The list was prepared by using the [The American Heritage Word Frequency](#)

Book (Carroll, Davies, & Richman, 1971). The subjects were asked to put a checkmark against the words they did not know. Finally, they were asked to comment on the experimental design and/or any aspect of the experiment in an informal interview.

Timing Methods

The program was written in such a way that in the time controlled settings, as soon as the time was up, the screen would scroll over to the next screen. In order to decide the appropriate amount of time to be provided in the time controlled settings for that level of readers, the program was pilot-tested with 5 monolingual native speakers of English and 5 advanced level nonnative speakers of English. After a few trials and errors, it was decided to present each task in one full screen at the rate of 188 words per minute.

In time unrestricted settings, the computer kept track of the amount of time each subject took for processing the passages, from the time the passage appeared on the screen to the time the subjects pressed a specific button to indicate that they were ready to provide the meaning of the word. During their reading time, they were allowed to take notes and work out the definitions, and were informed that until they were really ready to provide the definitions, they should not press the button.

Administration of the Experiment

After the subjects filled in the subject information sheets and check marked the known words on the pre-experiment list, they were brought to the computer room. They were then asked to be at ease and were clearly informed that their performance in the experiment would be strictly confidential and that they would not be rated for grammar, spelling, or organization. The subjects were then asked to work on two sample tasks. The practice passages illustrated the kinds of meanings expected of them and the details of the kinds of definitions required. The practice passages had another effect also. They made it clear to the subjects that they would have to carefully read the entire passages from the beginning to the end, mentally store the cues provided at various places in the passages, and then determine the meanings of the target words. Also, the subjects came to understand that there was no single word synonym for any of the target words.

As soon as the subjects became familiar with the types of tasks they were going to work on and with the computer program, they were again clearly informed that they would see the passages on the screen at the reading speed which they had experienced while doing the sample tasks, and that the reading passages would automatically disappear from the screen once the time allocated for them to stay on the screen was over. They were then made to understand that they could take any amount of time for typing their definitions and that they could be of any length. They were also informed that they should answer the feedback questions also.

Once the subjects completed the first part of the experiment, they were asked to relax for a day and to come back the next day to continue with the second part of the experiment. When the subjects came back the next day, to almost all of them, it came as a surprise that they would be working on the same tasks but with no time limit. But they were clearly instructed that they would have to read the passages entirely as if they were reading them for the first time. The researcher sat next to all of the 30 subjects to make sure that they carried out this instruction. In fact, this was crucial as a preventive measure to preclude especially the highly proficient nonnative subjects from using any information they had stored in their memory from the previous condition. After the experiment, the subjects were asked to check the words which they did not know from the post-test word list. With this, the proceedings of the experiment would come to an end.

Data

The software was developed in such a way that the answers were automatically recorded in C drive (hard disk), A drive (floppy disk), and E drive (flash drive). This was a preventive measure to ensure that even if the data were accidentally erased from one of the disks, the other would still contain them.

Scoring of Definitions

The definitions were evaluated by two native speakers who were faculty members in the department of English at UCLA. In order to obtain scorer reliability, before the evaluation was made, a meeting was held among the graders and the researcher. It was agreed by all three that the number of meaning components the word contained would be its maximum score; in other words, for 'ghooming', since the word has three meaning components, the definitions given for that word would be rated along a scale of 0 to 3. This was done to ensure that the graders perceived the number of meaning components used in the definition. The final value was given to each definition by averaging the ratings of both the graders. An analysis of the score patterns of the two scores indicated that there was a high correlation between the two scorers ($r=.89$)

Results

Hypothesis #1

The findings with regard to hypothesis 1 confirmed that the nonnative subjects indeed took significantly additional time to process all the 12 tasks in time unrestricted settings. Compared to the mean time of 80.667 seconds provided for processing a task in time controlled settings, they took a mean time of 131.441 seconds ($t = -17.07$, $df = 11$, $p < .05$) for processing the same in time unrestricted condition. Also, of the 30 subjects, 22 subjects took significantly longer time, 5 subjects about the same time with no significant differences between the two means, and 3 subjects significantly less time. The lowest mean time was 63.633 seconds and the highest mean time was

228.100 seconds.

Hypothesis #2

Hypothesis #2 implies that owing to the nature of their reading processes, the nonnative subjects would not be able to complete processing the tasks within the time allocated, and therefore, would not be able to extract all the available information under time restricted condition. However, when asked to redo the tasks under time unrestricted condition, these subjects, with no time related processing constraints, would be able to use the divide and conquer strategy through frequent backtrackings and complete processing the tasks, for they would be in a position to perceive whatever information that was available in the passages; hence the definitions they would provide under time unrestricted condition would significantly differ from the definitions they would provide under time controlled condition. Table 2 shows the comparative performance of nonnative subjects under time controlled and time unrestricted condition.

TABLE 2
The comparative performance of nonnative subjects in each of the passage tasks under NRTC and URTC.

Vocabulary	Max Score	Mean Score NRTC	Std. Dev.	Mean Score URTC	Std. Dev.	Corr.	2-tail prob.	p≤0.05 yes/no
agio	6	1.417	1.175	2.617	1.023	0.381	0.000	yes
agunah	7	2.083	1.635	3.683	1.822	0.200	0.000	yes
anacampserote	6	1.067	1.264	2.033	1.266	0.532	0.000	yes
anacrisis	4	1.433	1.375	2.133	1.575	0.609	0.007	yes
chummage	6	1.600	1.632	2.883	1.507	0.275	0.001	yes
drilligating	7	1.533	1.408	2.867	2.059	0.418	0.001	yes
gazumping	5	1.067	1.496	2.283	1.888	0.363	0.002	yes
ghooming	3	0.967	0.830	1.383	1.023	0.615	0.010	yes
groaking	4	0.858	1.150	1.650	1.636	0.376	0.011	yes
mithridatism	7	2.283	1.722	4.067	1.701	0.515	0.000	yes
qaltagh	6	0.933	1.202	1.967	1.732	0.529	0.001	yes
shebeen	4	1.967	1.727	2.750	1.461	0.588	0.007	yes

Table 2 shows that in line with the hypothesis, there were significant differences between the two data sets on all the tasks ($F=161.5899$, $p<0.00$, $df=1$). The results of repeated measures ANOVA furthermore indicated that the difference was nonadditive. The Tukey estimate of 0.5822 which was far below 1 confirmed that the difference was not additive and that there was subject by time interaction. In order to study how nonnative subjects as individuals performed on the tasks between the two conditions, t-test statistics were computed between the two scores for each individual. The results are presented in Table 3.

TABLE 3

Individual nonnative performance on passage tasks under NRTC and URTC:

Subject	Mean score NRTC	Std. Dev.	Mean score URTC	Std. Dev.	Corr.	T value	2- tail prob.	p≤0.05 yes/no
nonnat01	0.521	0.588	0.917	1.019	0.458	-1.50	0.162	no
nonnat02 ..	1.292	1.201	1.375	1.151	0.670	-0.30	0.768	no
nonnat03 ..	1.583	1.184	1.833	1.337	0.871	-1.32	0.214	no
nonnat04 ..	1.083	1.041	1.083	1.145	0.814	0.00	1.000	no
nonnat05 ..	0.937	1.244	1.562	1.652	0.619	-1.64	0.128	no
nonnat06 ..	0.208	0.396	1.583	1.794	0.421	-2.86	0.016	yes
nonnat07 ..	1.500	1.297	2.500	1.796	0.410	-2.00	0.071	no
nonnat08 ..	1.417	1.649	2.979	1.848	0.514	-3.12	0.010	yes
nonnat09 ..	1.771	1.717	2.187	1.144	0.681	-1.15	0.276	no
nonnat10 ..	0.792	1.196	3.500	1.552	0.208	-5.36	0.000	yes
nonnat11 ..	1.750	1.588	2.937	1.390	0.455	-2.63	0.023	yes
nonnat12 ..	1.375	1.281	3.146	1.653	0.374	-3.67	0.004	yes
nonnat13 ..	0.854	0.842	2.167	2.219	0.646	-2.53	0.028	yes
nonnat14 ..	0.437	0.585	3.292	1.588	-0.113	-5.64	0.000	yes
nonnat15 ..	1.500	1.173	4.104	1.750	-0.152	-4.01	0.002	yes
nonnat16 ..	1.125	1.597	3.125	1.893	0.423	-3.66	0.004	yes
nonnat17 ..	1.562	1.478	3.458	1.177	0.361	-4.32	0.001	yes
nonnat18 ..	1.042	1.469	3.687	1.386	0.096	-4.77	0.001	yes
nonnat19 ..	3.042	1.405	3.833	1.231	0.674	-2.55	0.027	yes
nonnat20 ..	3.521	1.100	3.479	0.932	0.555	0.15	0.884	no
nonnat21 ..	0.604	1.231	1.833	1.723	0.303	-2.38	0.036	yes
nonnat22 ..	1.771	1.521	1.958	1.936	0.830	-0.60	0.561	no
nonnat23 ..	2.271	1.241	3.083	1.579	0.655	-2.32	0.040	yes
nonnat24 ..	0.033	0.537	2.042	1.529	0.397	-4.21	0.001	yes
nonnat25 ..	2.687	1.378	2.979	1.973	0.518	-0.59	0.570	no
nonnat26 ..	0.708	1.177	2.042	1.764	0.729	-3.81	0.003	yes
nonnat27 ..	0.417	0.669	0.917	1.104	0.605	-1.97	0.074	no
nonnat28 ..	2.354	1.618	3.500	1.348	0.786	-3.96	0.002	yes
nonnat29 ..	1.646	0.772	1.896	1.321	0.668	-0.88	0.400	no
nonnat30 ..	2.917	1.717	2.875	1.416	0.809	0.14	0.889	no

Table 3 shows that of the 30 nonnative subjects, there were no significant differences between the scores for 13 subjects. Significant differences between the scores existed for the remaining 17 subjects. Of these 17 subjects, while 15 subjects significantly improved their scores under time unrestricted conditions, 2 others actually earned significantly less scores. The existence of these 2 negatively correlated scores somewhat show that the performances of these two subjects were somewhat inconsistent. The highest correlation between the two scores was 0.871 and the lowest correlation was -0.152. Overall, the finding was that there was wide variation within the nonnative group.

Other Significant Findings

Subjects' answers to the follow-up questions revealed that the subjects had backtracked the passages wholly 199 times and partially 187 times. With regard to the sufficiency of time as perceived by the subjects, the findings indicated that the subjects had indicated a score of 2.16 (3 being sufficient, 2 somewhat sufficient, and 1 insufficient) which was close to somewhat sufficient. In order to find out, whether the subjects' perceptions of available processing time had any significant relationship with their performances in that setting, Kruskal-Wallis 1-way ANOVA was obtained. The nonnative performances under time controlled conditions seemed to have significant relationships with their perceptions of time (corrected chi-square=35.0114, $p=.00$) since distinctively significant different rankings existed for these perceptions.

With regard to the subjects' perceptions of the available information in the tasks, the subjects' ratings of the passages under both time controlled and time unrestricted conditions on a scale of 1 to 3 (3 being sufficient, 2 somewhat sufficient, and 1 insufficient) were obtained. Kruskal-Wallis 1-way ANOVA analyses showed that their perception of available information had a significant relationship with their scores obtained under both the conditions. Along the same lines, information collected on the familiarity of concepts embedded in the tasks along a 1-3 scale indicated that the subjects' perception of whether the content was very familiar or not also had a significant relationship with their performances in both the conditions.

With regard to the effect of unknown words on the subjects' performances, the checklists indicated that the cumulative frequency for unknown words came to 433 words, an average of 14.43 words for each subject. There was -0.635 correlation between the number of words a subject did not know and his/her performance in time restricted conditions. The lambda was 0.679 suggesting that there was adequate statistical support for a claim that larger the number of words the subjects did not know, the worse their performance tended to become.

Interpretation

Performance Differences Among the Subjects

Of the 30 nonnative subjects, only 2 subjects did not significantly improve their scores when required to work with no time constraint. Also, they took significantly less time under time unrestricted condition and their perception of the adequacy of information also remained the same.

Of the remaining 28 subjects, there were 13 subjects who were helped by the additional time factor. They took significant additional time to process the tasks in the time unrestricted condition and significantly improved their scores also. The additional time helped them perceive significant additional information.

Of the remaining 15 subjects, 5 subjects took about the same time, 1 subject significantly less time, and 9 subjects significantly additional time when required to work with no time constraint

whatsoever. All these subjects had failed to improve their scores even with the unlimited time given. In my interpretation, reluctance to spend additional time to process the tasks accounted for the unimproved performance of those subjects who took about the same time (5) or significantly less time (1). Their answers to the feedback questions indicated that they did not perceive that the available information was sufficient to infer the meanings of the target words even under the time unrestricted condition. Also, their scores were much below the average scores of the nonnative subjects. They had also checked a higher number of unknown words which could be said to be an index of their lack of appropriate level of proficiency in the language.

With regard to the remaining 9 subjects who had taken significant additional time to process the tasks under time unrestricted conditions, their lack of appropriate level of second language proficiency could be said to have contributed to their nonaccurate level of performance. This was evident because although they had indicated that they could perceive significant additional information in time unrestricted settings, they somehow failed to integrate the contextual cues and could not provide improved definitions, a trait characteristic of low to intermediate level readers.

The results and interpretations of the data clearly suggested that the reading processes of the nonnative subjects, due to their varied proficiency levels in the language, had a wide range. Most importantly, the data indicated that their reading processes could get affected by various factors such as familiarity of information, perception of time available, and whether or not they have ample time to process the tasks.

Conclusion

It is clear from the results that the nonnative subjects were a heterogeneous group and their reading skills had a wide range, probably from controlled and nonaccurate to automatic and accurate in the developmental continuum. That additional time immediately benefited 13 of the 30 subjects is an indication that time is an important factor in the development of reading skills. Also, note the finding that the significant improvements in their definitions were not additive but due to subject-by-time interaction. This provides strong evidence that additional time benefited these nonnative subjects in a significant manner because it provided them with opportunities to use divide and conquer strategy and also backtrack if needed. However, the results also indicated that if the reading passages happened to contain a large number of unknown words, then the provision of additional time would not benefit certain low level nonnative subjects. The wide variation in nonnative scores as reflected in the wide standard deviations as well as in positive and negative correlations between the two scores suggested that the nonnative group as a whole was a heterogeneous group.

Also note that there is a significant difference between the nonnative subjects' perceptions of the available information in the passages between the two conditions. This could be actually due to their lack of adequate time to process the tasks under time controlled conditions. They were able to

see, however, significant additional information in the time unrestricted settings.

In conclusion, based on the findings of the study, it can be claimed that time does indeed play a crucial role in nonnative reading comprehension as otherwise the subjects under study could not have significantly improved the quality of their definitions.

Implications of the study

The first major finding of the study is that allowance of time may be an important factor in the development of reading proficiency. Teachers must aim to increase the accuracy level of the learners initially by allowing as much time as needed by them, and then only encourage them to attain fluency. Secondly, the findings question whether the current definitions of language proficiency include the time dimension also. Cognitive and neuro psychologists suggest that there may be two types of memory: declarative memory and procedural memory. Time as a variable is connected to procedural memory. Proficiency definitions are generally based on knowledge. The findings suggest that the nonnative speaker may have the necessary grammatical knowledge (declarative knowledge) but may fail the exam due to insufficient time to proceduralize that knowledge. The data and findings, in general, show that one's proficiency in a second language is an interaction of many factors; of them, verbal ability, available time, perception of relevant information, and knowledge of crucial vocabulary are some of the most important ones. Communicative competence is then putting knowledge into action in real time. I prefer to call this ability 'procedural competence' and in my opinion, it is necessary to include this ability as a fifth component of communicative competence.

The Merits and the Limitations of the Study

The focus of this research study is an application of the form of psycholinguistic theories to account for differences among nonnative subjects in their reading processes. The study is encouraging because the cognitive processes tapped by the tasks used in the experiment seemed to be sensitive to the same kinds of variables as are naturalistic reading comprehension processes.

This research experiment, however, had several limitations which became evident while conducting the experiment. First of all, there was no control over the behavior of the nonnative subjects during the experiment. Secondly, all nonnative subjects unanimously said in the informal taped interviews after the experiment that they found it difficult to perform the metacognitive tasks (secondary tasks) such as evaluating the familiarity level of the concepts, adequacy of the available information, and so on. However, I cannot think of a better way to measure these aspects right now. Thirdly, the experiment needs a larger number of subjects in order to be able to do statistical analyses like factor analysis with information about the nonnative subjects' length of stay in the USA and their placement scores. With limited number of subjects, I was not able to do these statistical studies. In spite of these limitations, the study is encouraging that the cognitive processes tapped by

these tasks seemed to be sensitive to the same kinds of variables as are in naturalistic online reading processes. In this respect, the study can be claimed to have set new trends for second language reading research designs.

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