THE CONTRIBUTION OF SIGNALLING DEVICES TO COMPREHENSION IN ENGLISH AS A FOREIGN LANGUAGE

Lahuerta Martínez, Ana Cristina

Profesora Titular de Universidad
Departamento de Filología Anglogermánica y Francesa
Facultad de Filología
Universidad de Oviedo
Campus el Milan
C/ Teniente Alfonso Martínez s/n   33011 Oviedo Asturias
Tfno: (+34) 985104537; Fax: (+34) 985 104555
e-mail: lahuerta@correo.uniovi.es

Resumen

El objetivo de este trabajo es analizar cómo los lectores españoles reaccionan ante los marcadores discursivos en un texto. Llevamos a cabo un estudio empírico con 133 estudiantes universitarios españoles de inglés como lengua extranjera para analizar:

(a)   si hay alguna relación entre la presencia o la ausencia de marcadores del discurso y la comprensión escrita en inglés como lengua extranjera,

(b)   si hay alguna relación entre la competencia de los lectores en inglés y el efecto de la presencia o la ausencia de marcadores del discurso en la comprensión escrita,

(c)   si hay alguna relación entre la edad, sexo, competencia de los sujetos como aprendices y como aprendices de inglés, y el efecto de la presencia o ausencia de marcadores del discurso en la comprensión escrita.

Los resultados obtenidos muestran que los marcadores del discurso favorecen la comprensión en la lectura en una lengua extranjera, y que los estudiantes más competentes tienden a usar marcadores del discurso como ayudas en la comprensión.

Palabras clave: marcadores del discurso, comprensión escrita, lectura en una lengua extranjera, señales, proceso interpretativo.

Abstract

The aim of this work is to analyse how Spanish readers react to English discourse markers in a text. We carry out an empirical study with 133 Spanish university students of English as a foreign language in order to analyse:

(a)   if there is any relationship between presence or absence of discourse markers and reading comprehension in English as a foreign language

(b)   if there is any relationship between the readers' proficiency in English and the effect of the presence or absence of discourse markers on reading comprehension and,

(c)   if there is any relationship between the readers' age, sex, competence as learners and as learners of English, and the effect of the presence or absence of discourse markers on reading comprehension.

The results obtained show that discourse markers enhance reading comprehension in foreign language reading, and that the more successful students tend to use discourse markers as aids to help their reading comprehension.

Key words: discourse markers, reading comprehension, foreign language reading, signals, interpretative process.

Résumé

L'objectif de ce travail est d'analyser la réaction des lecteurs espagnols devant les marqueurs du discours dans un texte. Pour notre analyse, nous avons réalisé une étude empirique avec un échantillon de 133 étudiants universitaires espagnols ayant l'anglais comme langue étrangère. L'analyse nous a permis de définir:

(a)   La relation entre la présence ou l'absence des marqueurs du discours et la compréhension écrite en anglais comme langue étrangère.

(b)   La relation entre la compétence des lecteurs en anglais et l'effet de la présence ou de l'absence des marqueurs du discours dans la compréhension écrite.

(c)   La relation entre l'âge, le sexe, la capacité des lecteurs comme apprentis en général ou comme apprentis de la langue anglaise en particulier et l'effet de la présence ou l'absence des marqueurs du discours dans la compréhension écrite

Les résultats obtenus montrent que les marqueurs du discours favorisent la compréhension dans l'écriture dans une langue étrangère, et que les étudiants compétents ont tendance á utiliser ces marqueurs comme outils d'aides á la compréhension.

Mots-clés : marqueurs du discours, compréhension écrite, lecture dans une langue étrangère, signaux, processus interprétatif.

1. Discourse markers

Discourse markers (hereafter DMs) are linguistic items such as *so*, *because*, etc. They are a set of clues which create cohesiveness, coherence and meaning in discourse. The characteristic figuring most prominently in definitions of DMs is their use to relate utterances or other discourse units (Schiffrin 1987; Fraser 1999; Redeker 1991).

Diane Blakemore (1987) puts forward an account of discourse markers (she calls them discourse connectives) based on relevance-theoretic assumptions about communication[1]. The relevantist perspective states that speakers interpret information searching for relevance. According to Blakemore (1987), connectives contribute essentially to the interpretation process. From this theoretical perspective, connectives are considered signals the speaker uses to guide cooperatively his hearer's interpretative process.

---

[1] Sperber and Wilson (1986/1995) have developed a theory, the Relevance Theory, based on Grice. This is a pragmatic model that attempts to explain how speakers interpret utterances. It is based on a hypothesis of a cognitive nature about how human beings process linguistic information. This hypothesis suggests that the mind's central processor is highly effective in handling the information because it is specifically oriented towards the search for relevance.

Usually a speaker has a specific interpretation of his utterance in mind and expects the hearer to arrive at that interpretation. To arrive at the intended interpretation of an utterance the hearer must process the utterance in the right, i.e. the intended context. The selection of context is governed by considerations of optimal relevance. The speaker may have reason to believe that the hearer will choose the appropriate contextual assumptions and draw the appropriate conclusions without any extra help from him, or he may decide to direct the hearer towards the intended interpretation by making a certain set of assumptions immediately accessible. DMs are one of the linguistic devices the speaker may use to that effect. Blakemore (especially 1987 and 1993) considers that the essential function of elements like *likewise, therefore, because*, etc. is to guide the hearer's interpretation process through the specification of certain properties of the context and the contextual effects; more specifically, these elements constrain the relevant context for the interpretation of an utterance, reinforcing some inferences or eliminating other possible ones and thus help process the information. On the relevance-theoretic approach they play a facilitating role[2].

2. Our study

This study involves the use of DMs by nonnative language readers. It is intended as a contribution to the study of how DMs are used by native speakers of Spanish. According to the Relevance theory, discourse markers constrain the relevant context for the interpretation of an utterance. Since DMs facilitate communication, it is logical to suppose that the lack of DMs in an L2, or their inappropriate use could, to a certain degree, hinder successful comprehension or lead to misunderstanding. It is plausible to suppose that those nonnative speakers who are competent in the use of the DMs of the L2 will be more successful in reading comprehension than those who are not.

In order to help us design our own study, we have first reviewed the literature on this topic. Research is more abundant in a native language. We have found early studies that consider the effects of signals on L1 reading comprehension. Kintsch & Yarbrough (1982) found significant effects for signals (structural cues and pointer words) and for good rhetorical form in reading comprehension with college readers. However, because they varied both form and signals simultaneously, it is impossible to know whether the form or the signals created the effect. Loman & Mayer (1983) in their study of three signal types in combination (previews, headings and logical connectives), used with 10th-grade good and poor comprehenders, found significant effects with both groups in a problem-solving test. Loman & Mayer maintained that signals helped the good comprehenders use their meaningful reading strategy more effectively than usual, and helped poor comprehenders use a meaningful strategy instead of a rote reading strategy. What is interesting and new in their investigation at

---

[2] DMs are characterised as aids or instructions for interpretation – specifically, the facilitation of inferences- and, therefore, they are considered elements with procedural meaning. In Blakemore's view, DMs do not contribute to the proposition expressed by an utterance or to any other conceptual representation the utterance may communicate; rather they point the hearer to the context in which he is expected to process the utterance and the conclusions he should be drawing from it.

the moment of research is that these authors approached signalling from a qualitative consideration of the effects of signalling that shows how signals tend to direct attention towards conceptual information, and in this way they extended earlier studies of signalling. Spyridakis and Standal (1987) analyse the effects of three signal types (headings, previews and logical connectives) on readers' comprehension of technical expository prose. The authors conclude from the results that all three signal types can enhance comprehension, but such facilitation depends on passage length and difficulty. In this study, the passage that was most appropriately challenging for the readers, neither too easy not too difficult, produced the clearest effect for signals.

Some studies (e.g. Kletzien 1991) show that signalling variables function differently at different levels of familiarity of the text. It seems that they facilitate reading performance in situations where the content of the text is relatively unfamiliar to the reader. According to Roller (1990) because signalling variables highlight or make explicit the relations between ideas in the text, they exert their influence in moderately unfamiliar text. Other research works (e.g. Mckeown et al. 1992) also indicate that moderate knowledge of the topic is better together with a text coherent enough to allow the reader to see the connections between the text information and previous knowledge so that the knowledge can be combined with the text information to create a meaningful representation.

A more recent study focuses on the use of discourse markers by students of English as a second language. The study by Demirci & Kleiner (1997) focuses on the use of discourse markers by advanced Turkish learners of English. They conduct a pilot study to answer the question of whether nonnative speakers use discourse markers, whether they use some markers and not others and whether there are nonnative uses of certain markers. They set out to answer these questions by collecting natural language data from interviews to four subjects that had resided in the United States as students for at least three years. The data revealed that discourse markers were used extensively by participants. However, the participants differed from each other in several respects. Although all participants used some discourse markers, some participants employed a wider range of markers than others. Some learners used certain markers extensively, while others used the same markers rarely if at all. Besides, the results suggest that those markers and those markers' functions in the L2 which are also available in the first language will be acquired first with relative ease.

Among the studies on foreign language reading, Lahuerta (2002) analyses the relationship between use of the rhetorical organisation that a text employs, and the comprehension and the reproduction of information of the text by Spanish students of English as a foreign language. This study compares the comprehension and reproduction of a text with no organisation to the same text written with explicit signals of several semantic relations that give different organisations to the text (temporal chronological sequence, causative, comparison and problem-solution). This study shows that foreign language readers' recognition and use of the rhetorical organisation of the text has a positive effect on their understanding and reproduction of the information of the text.

All these studies point to the importance of signals in general and discourse markers in particular, in L1 and L2 reading comprehension. They tend to show that discourse markers

could be effectively considered aids in reading comprehension. At the same time, they show the need for more research works on the effect of these elements on foreign language reading. Thus, the aim of the present work is to carry out a large scale study on the effect of discourse markers on the reading comprehension of Spanish students of English as a foreign language.

2.1. Hypothesis

As we have said, we consider DMs signals the writer uses to guide cooperatively his reader's interpretative process. Our hypothesis is that discourse markers would enhance reading comprehension in foreign language reading. We compared the comprehension of a text with no discourse markers to the same text written with explicit discourse markers. We constructed a text with no discourse markers because we wanted to compare the effect of the presence or absence of discourse markers on comprehension. We hypothesized that efficient readers would use the discourse markers in the text to help their reading performance.

For this experiment we asked the following research question: Is there any relationship between presence of discourse markers or absence of discourse markers and reading comprehension in English as a foreign language?

We decided to consider the factor of the subjects' proficiency in the language in our study. Some studies have been carried on this factor but there are no studies to our knowledge that specifically approach the possible interrelation between the subjects' proficiency and the effect of discourse markers on comprehension. For this reason we decided to include such interrelation as part of our experimental study. The subjects' proficiency was measured by means of a proficiency test consisting of 40 items[3]. We asked the following research question:

Is there any relationship between the readers' proficiency in English (measured by the results of a proficiency test) and the effect of the presence or absence of discourse markers on reading comprehension?

Many demographic factors affect language learning. Two of these, gender and sex, stand out as particularly important[4]. But there are others also important that refer to the competence of subjects as learners. We intend to know more about the interrelation of these factors and reading. Thus, as part of our study, we also analysed the possible correlation of the variables age, sex, score in University entrance examination and score in English in University entrance examination and the effect of presence of discourse markers on reading comprehension.

---

[3] This is the test the Department of English uses for testing the level of English of the students who enter some English courses at the University of Oviedo.
[4] With respect to gender, see Bacon (1992), Green and Oxford (1995) and Saleh (1997). With respect to age, see, for example, Singleton and Lengyel (1995) and Scarcella and Oxford (1992).

Our third research question is formulated as follows: Is there any relationship between the readers' age, sex, score in University entrance examination and score in English in University entrance examination and the effect of the presence or absence of discourse markers on reading comprehension?

2.2. The research design of the experiment: experimental research data procedures

2.2.1. Subjects

For this experiment we recruited a group of 133 Spanish students of English as a foreign language all students of the first year of English for Chemistry at the Faculty of Chemistry of the University of Oviedo.

2.2.2. Materials

The materials consisted of two expository passages on a technical topic. For each passage we used the original passage as the version without discourse markers and a version with discourse markers (see Appendix for sample passages). The passages were "Nitrates and Nitrites" and "Guinea Pigs in biomedical research". The first one was excerpted from a Federal Drug Administration Consumer memo (undated) and the second one from a U.S. Air Force School of Aerospace Medicine Publication (Obeck 1974). The passages varied in length and difficulty. The nonsignaled version was shorter than the signaled version. The "Nitrates" passage was shorter (574 words) than the biomedical passage (640 words). Difficulty level, presented as a function of grade level, was ascertained through the use of the Berta-Max Reading Level Analysis Program. The difficulty grade of the "Nitrates" passage was 9 and of the "Biomedical" passage 16.

For each nonsignaled version, we constructed one signaled version without significantly changing the syntactic complexity of the nonsignaled texts. We added discourse markers. We did a pilot analysis to identify those areas that needed discourse markers to make the relations between ideas clearer. For this we gave the texts to twenty native speakers of English who were studying Spanish at the University of Oviedo and asked them to identify those parts of the text where they would introduce a discourse marker to make the sense clearer to the reader. From their indications 10 discourse markers were added in the "Nitrates" passage and 7 in the "Biomedical" passage. We also constructed a 8-question comprehension test consisting of 4 detail and 4 inference questions. This test was intended to examine how well students were able to see the relations between ideas with/without the discourse markers. The comprehension test was scored giving one point for each correct answer.

The passages were accompanied by an initial section where students had to provide their name, age, sex, score in their University entrance examination and score in English language in their University entrance examination.

2.2.3. Procedure

The experiment was run as follows. In the first session[5] students were given a proficiency test to test their proficiency in the target language. In the second session[6], the students had to read the passages and answer the comprehension questions. We gave each of the four passages (Biomedical passage with discourse markers, Biomedical passage without discourse markers, Nitrates passage with discourse markers, Nitrates passage without discourse markers) to all the students.

We analysed the data with SPSS statistical software. Specifically, we used a SPSS program version 10.0 for Windows.

2.3. Results

In order to answer our first research question, namely, if there is any relationship between presence of discourse markers and absence of discourse markers and reading comprehension, we first compared the scores of, respectively, Text 1A ("Biomedical" text with discourse markers) and Text 1B ("Biomedical" text without discourse markers) by means of a chi-square test[7]. We first calculated the mean score of both texts. The mean score of Text 1A is 5.3578 and that of Text 1B is 4.8952. Thus, Text 1A has a higher score and is consequently better understood than Text 1B.

This difference in score is significant at a 0.000 level, as table 1 shows. That is, the difference found between the global scores of both texts is statistically significant.

	Global score of Text 1A	Global score of Text 1B
Chi-square a,b	87.798	73.903
gl	18	14
Sig	.000	.000

Table 1. Interrelation discourse markers and comprehension (Text 1A and Text 1B).

We can then say that the text with discourse markers (Text 1A) is understood better than the text without discourse markers (Text 1B), and the difference in score between both texts is statistically significant at a 0.000 level.

In the second place, we compared Text 2A ("Nitrates" text with discourse markers) and Text 2B ("Nitrates" text without discourse markers) by means of a chi-square test. The mean

---

[5] This session took place on the first day of class of the 2002-2003 academic year.

[6] This session took place on the second day of class of the 2002-2003 academic year.

[7] This is a test for the statistical analysis of one variable with respect to another. It is a method for the comparison of groups of data and detection of significant differences among them. It is based on the representativeness of the data chosen within the total data of a whole sample. By means of chi-square we can know if there exists a big difference between the observed and expected frequencies.

score of Text 2A is 4.6799 and that of Text 2B is 4.2545. We can observe that Text 2A has a higher score and is consequently better understood than Text 2B.

As table 2 shows, this difference is score is significant at a 0.000 level. That is, the difference between the global scores of both texts is statistically significant.

	Global score of Text	2A Global score of Text 2B
Chi-square a,b	114.286	112.055
gl	21	22
Sig	.000	.000

Table 2. Interrelation discourse markers and comprehension (Text 2A and Text 2B).

The text with discourse markers (Text 2A) is understood better than the text without discourse markers (Text 2B), and the difference between both texts is statistically significant at a 0.000 level.

We can conclude from the results of the two empirical studies carried out above that that there is a significant correlation between presence of discourse markers and reading comprehension. The difference in comprehension between the texts with discourse markers and those without discourse markers was statistically significant.

We hypothesized that discourse markers would enhance reading comprehension. In order to prove this hypothesis we formulated our first research question intended to provide an answer to the question of whether there is any relationship between presence of discourse markers and absence of discourse markers and reading comprehension. From the results obtained so far we can answer this question affirmatively and confirm our hypothesis since the difference in comprehension of the text with explicit discourse markers and the same text with no discourse markers is statistically significant. Our results seem to indicate that efficient readers use the discourse markers in the text to help their reading performance.

The results of the previous research questions also show an interesting finding, namely that the mean score of Text 1A ("Biomedical" text with discourse markers) is higher than that of Text 2A ("Nitrates" text with discourse markers), which indicates that the former passage was better understood by the subjects.

Faced with this result, we decided to compare the difference in score between both texts and we found that this difference was significant at a 0.000 level, as Table 3 shows.

	Global score of Text 2A	Global score of Text 1A
Chi-square a,b	114.286	87.798
gl	21	18
Sig	.000	.000

Table 3. Comparison of global scores of Text 1A and 2A.

Text 1A is a longer and more difficult text than Text 2A, as we indicated above in the paper, thus this result is quite surprising. This result contradicts Spyridakis and Standal's (1987) finding in L1 reading that the passage that is most appropriately challenging for the readers, neither too easy not too difficult, produces the clearest effect for signals. In our study it is the most difficult passage the one that produces the clearest effect for discourse markers.

We think that this result may be related to the readers' familiarity with the content of the text. Text 1A is about the use of guinea pigs in biomedical research. This is a topic our chemistry students are not very familiar with. Text 2A is about a topic subjects are familiar with (nitrates and nitrites). We think that the unfamiliarity of the "Biomedical" text may have influenced the readers' use of discourse markers and their comprehension. This result is in agreement with Kletzien's 1991 and Mckeown et al.'s 1992 studies in L1 reading that show that signalling variables function differently at different levels of familiarity of the text. It seems that they facilitate reading performance in situations where the content of the text is relatively unfamiliar to the reader. In the case of Text 1A the discourse markers made explicit the relations between ideas in the text. Readers knew enough about the topic to use them to construct the relations between those concepts. In the case of the text about nitrates and nitrites, as it covered a familiar topic, the structural cues became redundant, because readers already understood the relations between concepts. This conclusion, however, needs further investigation. It is necessary to carry out a study on the effect of discourse markers on reading comprehension using several texts selected according to how familiar their topic is to the readers.

With respect to the next research question, namely, if there is any relationship between the readers' proficiency in English (measured by the results of a proficiency test) and the effect of the presence or absence of discourse markers on reading comprehension, we compared Text 1A and Text 2A, the two texts with discourse markers, in terms of the effect of the presence of discourse markers on reading comprehension. We used for this purpose the Mann-Whitney test[8].

We decided to group our subjects into two groups according to their score in the proficiency test. With this purpose we calculated the median, which was taken as reference for the division. Thus, according to the median (20 answers correct in the proficiency test) our two groups are: up to 20 answers correct, group 0; +21 answers correct, group 1.

Then, we calculated the mean score for each text. In the case of Text 1A, the mean score is 5.25 for group 0 and 5.433 for group 1. In the case of Tex 2A, the mean score is 4.583 for group 0 and 4.8478 for group 1. The analysis of the relationship between the readers' proficiency in English and the effect of the presence of discourse markers on reading comprehension showed that this was significant in Text 2A, but not in Text 1A, as table 4 shows.

---

[8] This test will allow us to determine if the independent samples were extracted from the same population or from different populations that possess the same distribution.

	Global score of Text 1A	Global score of Text 2A
U of Mann-Whitney	986.00	754.00
W of Wilcoxon	2471.00	2029.00
Z	-1.278	-2.177
Sig (bilateral)	.201	.029

Table 4. Interrelation readers' proficiency in English and effect of discourse markers on comprehension

From the results obtained we can say that in the case of Text 2A the higher the competence in the English language, the higher the effect of discourse markers on reading comprehension. We can then refer to a significant correlation between the readers' proficiency in English and the effect of the presence of discourse markers on reading comprehension but only in Text 2A.

There is no significant correlation between proficiency in the target language and the effect of the presence of discourse markers on comprehension in Text 1A. As we know, this text was better understood by subjects than Text 2A in spite of being longer and more difficult, the difference in scores between both texts being significant (see above). We attributed this result to the readers' unfamiliarity with the content of the text. Readers knew enough about the topic to use discourse markers to construct the relations between those concepts. Now, faced with the result that there is a significant correlation between the readers' proficiency in English and the effect of the presence of discourse markers on reading comprehension but only in Text 2A, we confirm our previous conclusion. We can affirm that relative unfamiliarity of the topic seems to make readers use discourse markers as an aid in their comprehension. As a result, the text is better understood. This, we guess, prevents other variables, like, readers' proficiency in English from interacting with the effect of the presence of discourse markers on reading comprehension

As part of our experimental study, we also analysed the possible correlations between other variables (sex, age, score in University entrance examination, score in English in University entrance examination) and the effect of the presence of discourse markers on reading comprehension. As we explained in the theoretical section of this paper the literature shows that factors like gender and sex affect language learning. We wanted to analyse these variables with respect to the effect of the use of discourse markers on reading comprehension, and also study factors that refer to the subjects' competence as learners and as learners of the target language (score in University entrance examination , score in English in University entrance examination).

We applied a Pearson correlation test[9]. There are no significant correlations for Text 1A for any of the variables analysed. For Text 2A, we observe significant correlations for: (a) subject's age (-0.236). This correlation is significant at 0.05. Thus, the older the subject, the

---

[9] This is a test that explains relationships among variables.

effect of discourse markers on comprehension is lower; (b) score in University entrance examination (0.237). This correlation is significant at 0.05. The higher the score, the higher the effect of discourse markers on comprehension of Text 2A; and (c) score in English in University entrance examination (0.257). This correlation is significant at 0.01. We can say that the higher the score, the higher the effect of discourse markers on comprehension of Text 2A. This is shown in Table 5.

	Age	Score in University entrance examination	Score in English in University entrance examination
TEXT 2A	-0.236*	0.237*	0.257**

**The correlation is significant at 0.01 level (bilateral)
* The correlation is significant at 0.05 level (bilateral)

Table 5. Interrelation readers' age and competence and effect of discourse markers on comprehension

Thus, we observe that there are significant correlations in the case of three factors in Text 2A: score in University entrance examination, score in English in University entrance examination and age, being score in English in University entrance examination the most significant correlation (the correlation is significant at a 0.01 level). The first two are factors that refer to the subjects' success as learners reflected in their better scores in their University entrance examination and in English in their University entrance examination. The results show that those students who are more successful students and so have better scores in their University entrance examination and in English in their University entrance examination in particular tend to use discourse markers as aids in their reading. With respect to the factor of the students' age, we observe that the older the students, the effect of discourse markers on comprehension is lower. This result confirms the previous findings since within the Spanish educational system, older students are generally people who are behind in their studies, and thus less successful students. Thus we can conclude that it seems that successful students tend to use discourse markers as aids in their reading comprehension.

As we have indicated, these correlations are again only significant in the case of Text 2A. This confirms our previous conclusions. We stated above that Text 1A was easier for students to understand (the differences in score between Text 1A and 2A were statistically significant), due to the unfamiliarity of its content which made students use discourse markers as a comprehension aid. This prevented a significant correlation between the variable of proficiency and the effect of discourse markers on its comprehension (see second research question). We think that this also prevents a significant correlation between the variables of score in University entrance examination, score in English in University entrance examination and age, and the effect of discourse markers on comprehension, unlike in Text 2A.

We can conclude that there is something in Text 1A which facilitates its comprehension and makes other variables not be significant. We think that it is the unfamiliarity of the topic of the text. More research work needs to be carried out to confirm this conclusion though, something we intend to do in future research works.

2.4. Discussion

We have shown in this paper that discourse markers enhance reading comprehension in foreign language reading, thus confirming our hypothesis. We have found a significant correlation between presence of discourse markers in the text and reading comprehension. As we made clear in the theoretical section of this paper, we consider discourse markers signals the writer uses to guide cooperatively his reader's interpretative process, we see them as elements that play a facilitating role within an interactive reading process. From the results obtained we can say that discourse markers facilitate comprehension, readers use them to help their reading performance.

We can also refer to a significant correlation between the readers' proficiency in English and the effect of the presence of discourse markers on reading comprehension. The higher their score in the proficiency test, the higher the effect of discourse markers on reading comprehension. This correlation is nevertheless significant only in Text 2A

We also observe that there are significant correlations between a series of factor that refer to the subjects' competence as learners and the effect of discourse markers on reading comprehension in Text 2A. Thus, the higher the subjects' scores in University entrance examination and in English in University entrance examination, the effect of discourse markers on comprehension is higher. As we can observe, these last two findings from research questions two and three are in agreement. We can conclude that it seems that the more successful students tend to use discourse markers as aids to help their reading comprehension.

Of the two texts with discourse markers (Text 1A and Text 2A) it is Text 1A the one which produces the clearest effect for discourse markers. Moreover, there is no significant correlation in this text between any of the factors above (proficiency and competence as a learner), and the effect of discourse markers on reading comprehension. We conclude that the unfamiliarity of text 1A produces a higher effect for discourse markers, which makes this text easier to understand by subjects. This prevents other factors from interacting with the effect of discourse markers on its comprehension.

The results of our second and third research questions are limited by the possible effect of the readers' familiarity with the topic of the text. We therefore need to analyse this factor through further research work in order to be able to confirm our conclusions.

Finally, we observe in our study that the correlations concerning the factors about the students' competence as learners are not very high. This may be due to the fact that there are other factors interacting as well. We are of the opinion that one of these factors may refer to the subjects' reading capacity in their mother tongue and their use of discourse markers in

that language. These factors need to be tackled as well in other research works. All these studies will ultimately help us know more about our readers' reading ability and the use they make of elements like discourse markers in their reading comprehension performance.

3. References

BACON, S.M. (1992), "The relationship between gender, comprehension, processing strategies, and cognitive and affective response in foreign language listening", The Modern Language Journal 76, 160-178.

BLAKEMORE, D. 1987, Semantic Constraints on Relevance, Oxford, Blackwell.

BLAKEMORE, D. (1993), "The relevance of reformulation", Language and Literature 2-2, 101-220

DEMIRCI, M. and B. KLEINER (1997), "Discourse markers in second language research", Journal of Intensive English Studies 11, 131-142.

FRASER, B. (1999), "What are discourse markers?", Journal of Pragmatics 31, 931-952.

GREEN, J.M. and R.L. OXFORD (1995), "A closer look at learning strategies, L2 proficiency, and gender", TESOL Quaterly 29, 263-297.

KINTSCH, W. and J.C. YARBROUGH (1982), "Role of rhetorical structure in text comprehension", Journal of Educational Psychology 74 -6 ,828-834.

KLETZIEN, S.B. (1991), "Strategy used by good and poor comprehenders reading expository text of different levels", Reading Research Quaterly, XXVI –1, 67-86.

LAHUERTA, A.C. (2002), "Empirical examination of EFL readers' use of rhetorical information", English for Specific Purposes: An International Research Journal 21-1, 81-98.

LOMAN, N.L. and R.E. MAYER (1983), "Signalling techniques that increase the understanding of expository prose", Journal of Educational Psychology 75-3, 402-412.

MCKEOWN, M.G., I.I. BECK., G.M. SINATRA and J.A. LOXTERMAN (1992), "The contribution of prior knowledge and coherent text to comprehension", Reading Research Quaterly 27-1,79-99.

REDEKER, G. (1991), "Review article: Linguistic markers of discourse structure", Linguistics 29-6, 1139-1172.

ROLLER, C.M. (1990), "The Interaction between knowledge structure variables in the processing of expository prose", Reading Research Quaterly XXV-2,: 79-89.

SALEH, A. (1997), The nexus of brain hemisphericity, personality types, temperaments, learning styles, learning strategies, gender, majors, and cultures. Ph.D. diss., University of Alabama, Tuscaloosa.

SCARCELLA, R. and R. OXFORD (1992), The Tapestry of Language Learning, Boston.

SCHIFFRIN, D. (1987), Discourse Markers, Cambridge.

SINGLETON, D. and Z. LENGYEL (1995), The Age Factor in Second Language Acquisition: A Critical Look at the Critical Period Hypothesis, UK, Clevedon, Avon.

SPERBER, D. and D. WILSON (1986), Relevance: Communication and Cognition, Oxford, Blackwell.

SPERBER, D. and D. WILSON (1995), "Postface" en Sperber, D. & D. Wilson (eds.), Relevance: Communication and Cognition, Oxford, Blackwell, 255-279

SPYRIDAKIS, J.H. and T.C. STANDAL (1987), "Signals in expository prose effects on reading comprehension", Reading Research Quaterly, XXII-3, 285-298.

4. APPENDIX

Guinea Pigs in Biomedical Research

Although the number of guinea pigs used in research does not approach the numbers of rats and mice used, the cavy plays an important role in biomedical research. In 1981, there were 646,322 guinea pigs used.

Immunological Research

Guinea pigs are used for the production of complement, a substance found in normal blood serum that destroys pathogenic bacteria, which is *also* used for a multitude of other immunological tests and investigations.

Besides, guinea pigs are used in studies on anaphylaxis and other allergic manifestations. Catty used the guinea pig to study the immunology of trichinosis. He found that resistance was dose-dependent, long-lasting and acquired only by infection. A strong anaphylactic involvement in the immune mechanism was indicated. A long-term, sensitizing antibody with biological and physiochemical properties analogous to reagin of humans demonstrated in the serum of animals infected with the parasite but not in those immunized with worm extracts. Sensitized guinea pig uterus is frequently used to measure reaction to foreign protein by smooth muscle contractions due to histamine release. Guinea pigs are particularly useful where information is needed on delayed contact sensitisation. Briccetti et al. and Cohen and Sherahama have used guinea pigs in studying both spontaneous and induced amyloidosis.

Nutritional Research

Before the advent of chemical analysis for vitamin C, the guinea pig was one of the major tools in research in that area. *Since they* [They] are extremely sensitive to low levels of vitamin C, [when] used as a bioassay tool they can show deficiency symptoms in 14 to 18 days. *Additionally, unusually* [Unusually] high dietary requirements for folic acid and potassium have prompted their use in these areas of investigation.

Anatomical Research

Much work has been done utilizing the cochlea of the inner ear and the external ear as an experimental model of studies of otitis externa in humans *because the* [.The] clinical appearance of the diseased canal is very similar to that in man.

An added benefit for many types of studies is to have an animal that delivers such precocious young. The young are more completely developed than any other commonly used laboratory animal, and they may be weaned as early as 4 or 5 days of age. Oberg stated that the mandibular joint can be the seat of most pathological conditions seen in articulations in general and that the guinea pig mandibular joint was anatomically larger, histologically more differentiated, and more accessible than those of the mouse, rat and hamster.

Moreover, studies [Studies] on the systemic arterial pattern of the guinea pig versus that of mammals showed guinea pig' deviations from normal mammal patterns: a) the origin of the vertebral artery has two rami; b) there is a large dorsoscapular artery as a fifth branch of the subclavian artery; c) the bronchoesophageal artery arises from the right internal thoracic artery or the costocervical trunk instead of from the aorta; d) there is a celiomesenteric trunk instead of separate celiac and cranial mesenteric arteries; and e) the renal arteries frequently have a double origin.

Disease Research

The guinea pig is very susceptible to mycobacterium tuberculosis, both the human and bovine strains. The course of infection generally resembles that of a primary progressive infection in man. However, the rapidity with which characteristic lesions develop may vary with the strains used. It is the chief animal used for the study of brucellosis, diphtheria and endemic typhus.

Opler's studies indicated a remarkable similarity in the evolution of the acute leukemia in his colony to that observed in humans. The leukemia seen in the guinea pigs is an acute lymphatic leukemia and resembles the striking, rapidly fatal disease of children and young adults. Recently much research has been conducted in the toxicity of aflatoxins. The guinea pig, with the dog and rabbit, has been shown to be almost as susceptible as ducklings to aflatoxin B.

Note: original text that was adjusted for discourse marker addition appears in brackets.

Nitrates and Nitrites

Recently there have been several items in the newspapers about the use of nitrites in processed foods. Some of the reports have been confusing. Nitrates and nitrites are not man-made substances, but natural compounds that are found in many foods, primarily in vegetables. Federal Drinking Water Standards limit the amount of nitrate in water to 45 parts per million while the [. The] normal nitrite level in human saliva is about 6 parts per million.

Benefits and uses of Nitrates and Nitrites

Nitrates and nitrites have been used widely in the curing and processing of foods. *For example, nitrites* [Nitrites] prevent red meat from turning brown and give the familiar red color to such meats as ham, bacon, sausage, and hot dogs. Without nitrite, bacon is salt pork, frankfurters are bratwurst, and ham is tough roast pork.

They are added to foods to prevent botulism, a form of food poisoning which is often fatal. There have been no outbreaks of botulism that were known to be caused by processed foods that were treated with nitrates/nitrites. *But a* [A] number of deaths have been caused by foods not treated with nitrates/nitrites. The Food and Drug Administration (FDA) *therefore* believes it is necessary for manufacturers to use these additives to prevent the growth of poisonous substances in canned meat products.

The Risks

Under certain conditions, nitrites and amines, which are the natural breakdown products of proteins, can combine to form chemicals called nitrosamines. Experiments have shown that nitrosamines can cause cancer in animals. There is no evidence, *however*, to indicate what effects nitrosamines have in humans. We do not know at the present time, whether the low amount of nitrates and nitrites now permitted by regulations actually combine with amines in the stomach to form nitrosamines or to what extent nitrosamines are formed in cured meat and fish.

The U.S. Department of Agriculture (USDA) investigated 48 samples of processed meats, and found that 45 showed no nitrosamines. The USDA *also* sampled cooked sausage which had been purchased at retail stores. Of 50 samples, 3 showed trace amounts of nitrosamines; the other 47 showed no nitrosamines. In tests by the FDA, nitrosamines were found in one out of 60 hams tested. *Additionally, the* [The] FDA found that the process of cooking bacon resulted in the formulation of nitrosamines in the bacon.

The levels of nitrosamines found in these samplings were much lower than the levels that would have to be present to cause cancer in experimental animals. *However, extensive* [Extensive] studies are being conducted to determine how nitrates and nitrites can be used to preserve meats and yet pose no problem for human consumption.

The Tradeoff

Further, research [Research] being conducted by the meat industry in cooperation with FDA is aimed at determining the lowest levels of nitrite and/or nitrate needed in foods to prevent the growth of organisms which cause poisoning, and to determine whether nitrosamines are formed when these low levels are used in processed foods.

Consumers do have some protection though. After studies revealed that nitrites were being used in some products only to fix color, the FDA initiated formal action to ban such unnecessary use. This action, when final, will stop the use of sodium nitrate in smoked cured sable-fish, and shad; sodium nitrite in smoked tunafish products; and potassium nitrate in cod roe. *Also, the* [The] Federal Food, Drug and Cosmetic Act requires food products which use nitrates and nitrites to show this information on the label.

Note: original text that was adjusted for discourse marker addition appears in brackets.