

The Role of the First Language in Second Language Reading Comprehension - Some Experimental Evidence

J.M. Ulijn

G.A.M. Kempen

This paper starts with a global analysis of the cognitive skills required for reading comprehension, both in the mother tongue (L1) and in a foreign language (L2). It proceeds by enumerating four aspects of the process of learning a contrasting linguistic structure of L2. The conclusion is drawn that linguistic contrasts between L1 and L2 present much less of a problem for perceptive (e.g. reading) skills than for productive ones. Moreover, among the various types of contrasts that can be distinguished, only one seems to be a potential source of L2 reading errors. These analyses are given empirical support in an experiment on reading comprehension of a French text by Dutch and French speaking subjects. A second experiment investigates a prediction on the relation between linguistic contrasts and L2-to-L1 translation.

1. Reading comprehension: a cognitive analysis

It is a commonplace observation that reading texts in a foreign language or in the mother tongue does not require a thorough syntactic analysis of the individual sentences. The mechanism in the reader that enables him to understand the meaning of the text seems to rely on his knowledge of the text's subject area rather than on the syntactic clues offered by the written sentences. This is in sharp contrast to writing or speaking in L1 or L2 where the syntactic structure of the utterances which are to be constructed, has to be planned carefully. Stated briefly, the role of syntax is much less important in perceptive than in productive language skills.

The non-syntactic knowledge that is involved in comprehending texts we shall call "conceptual knowledge" along with Schank (1972, 1975). He and his collaborators have developed a sentence interpretation system ("parser") that is largely controlled by conceptual information. The task of the parser is to build a structure of concepts that represents the meaning of each input sentence, that is, the "conceptualisation" underlying each sentence of the text. To this end, the parser applies a superficial and incomplete syntactic analysis to the input: only the surface subject noun and the main verb of the sentence are located. Then the dictionary is consulted in order to make available the conceptual information listed in the entries for main verb and subject noun. On the basis of this conceptual information, the parser generates expectations about the identity of further constituents that will occur in the input sentence. Thus, the parsing process is controlled by conceptual knowledge rather than by the application of syntactic rules.

There is a second aspect of conceptual knowledge that is needed for reading comprehension. Understanding a text requires a process of *inference*. Let us assume for the moment that the meaning content of a text can be described as a sequence of conceptualisations which are connected by causal, temporal and possibly other links. The conceptualisations that underlie the individual sentences of the text do not fully express the whole sequence. Usually, a text leaves many conceptualisations unexpressed, so that the reader has to infer them from his conceptual knowledge. The first to provide a (partial) model for this process of conceptual inference was Charniak (1972). For recent proposals see Abelson and Schank (1975).

In short, we have distinguished between two processes in reading comprehension:

- 1) *parsing*, that is, building a conceptualisation which represents the meaning of each individual sentence of the text, and
- 2) *inference*, that is the reconstruction of the complete sequence of conceptualisations that the writer tries to convey to the mind of the reader from the partial sequence offered by the text.

Both processes draw heavily upon conceptual knowledge; knowledge of syntactic rules seems to play only a minor role.

Sometimes a text refers to non-verbal information outside the text: an illustration of some object or the object itself. If the reader is not familiar with that object or illustration, or has no access to it, then he is barred from understanding the text completely. "Instructions for use" are a case in point: the reader will not comprehend them if he has no idea of the apparatus or machine whose workings are being described (compare section 4).

What happens if the reader lacks essential conceptual or other information? He is forced to capitalize on his syntactic knowledge and to utilize all the syntactic clues the individual sentences offer. This method, however, is cumbersome and leads to success only in those cases where the syntax of the sentences is simple and the text requires few, if any, inferences to be made.

2. *Acquiring skill in using contrasting linguistic structures*

What is involved in learning contrasting linguistic structures up to some level of skilled performance? We shall list here four aspects of the learning process.

a. *Acquiring a new syntactic pattern.* For instance, a Dutch speaking student learning French is confronted with nominal groups of a different pattern than he is

used to: in French, adjectives frequently follow the head noun; in Dutch, adjectives usually take prenominal position.

b. *Establishing associations between conceptual patterns and new syntactic patterns.* A certain pattern of conceptual relations can be linguistically expressed in the syntactic pattern of a nominal group. A fluent speaker of Dutch might be said to avail of a strong association between this conceptual pattern and the Dutch nominal group syntactic pattern. While learning French, he will have to establish a readily accessible association between the conceptual pattern and the new French nominal group. (The term "association" is less apt, perhaps, but it serves to indicate what we mean. See Kempen 1976, however.)

c. *Overcoming confusions between conceptual patterns.* Some linguistic contrasts do not involve any new syntactic pattern but rather a reordering of associations between conceptual and syntactic patterns. For instance, both French and Dutch have patterns of the type Possessive Pronoun + Nominal Group. In French, however, gender and number of the possessive pronoun are determined by the possession, in Dutch by the possessor. Such cases add extra difficulties to the learning of associations between conceptual and syntactic patterns (see b). Suppose a Dutch speaking student of French has mastered the French nominal group pattern (learning process a). The next task he faces is to associate this syntactic pattern with the right conceptual pattern. Fluent performance in French ultimately requires this association to be very strong and reliable, but even when it is still weak our student is not likely to make errors. For if he hesitates between the Dutch-style or the French-style nominal group he has an easy decision criterion: one of the syntactic patterns belongs to L1, so this cannot be the required pattern. However, for the reordering contrasts that are at issue in the present section this criterion fails. As a consequence, fault-

less performance here requires the associations to be very reliable and easily accessible. Any hesitation or confusion about "which conceptual pattern goes with which syntactic pattern?" is bound to lead to errors. (Still other factors might cause confusions: see the verbal learning literature on transfer and interference; for example the survey by Postman 1971).

d. *Learning new conceptual distinctions.* In French, a certain conceptual pattern is expressed by verbs in the conjunctive mood whereas the indicative mood applies to another conceptual pattern. Dutch nearly always uses the indicative mood. Ulijn (forthcoming) discusses this type of contrast in detail.

Notice that we have distinguished between 3 types of linguistic contrasts. We will refer to them by the letters a, c and d. .

3. *Linguistic contrasts and reading comprehension*

In section 1 we stated that under normal conditions reading comprehension is little dependent on a syntactic analysis of the text's sentences. It follows that L2 reading comprehension is possible without mastery of the contrasting parts of L2's syntax. Usually, the reader's conceptual knowledge will compensate for the lack of knowledge about linguistic contrasts between L1 and L2.

Of the four learning tasks mentioned in section 2, only task c seems to be really important for attaining reading skill in L2. If the readers's knowledge and skill with regard to the reordering contrasts is incomplete, he will often use the wrong concepts while trying to fabricate an interpretation of the text. The Dutch student beginning to learn French who reads *sa bicyclette* will look for a female possessor before realizing that *sa* refers to the lexical gender of *bicyclette*.

If he reads the expression *à moins que* he will be led up the garden path in following way: via *moins* = *less* he will associate it with the concept of quantity instead of condition. The Dutch equivalent of *à moins que* is *tenzij* and has no connections with the Dutch equivalent of *moins* (*minder*), unlike the English *unless*.

Only linguistic contrasts which, if insufficiently mastered, put the reader on the wrong conceptual track, are harmful to reading comprehension. Except for the reordering contrasts, none of the contrast types mentioned in section 2 seem to have this property.

4. Empirical evidence

The above theory on reading comprehension in a foreign language and the role of L2 - L1 contrasts is put to test in four empirical studies. Three of them are part of an extensive reading comprehension experiment described elsewhere (Ulijn 1974, 1975 and forthcoming). In this experiment reading comprehension was assessed in terms of the level of success subjects attained in handling a special apparatus (nick-named SHADOK) in the manner prescribed by the L2-text. The fourth study is an independent experiment on L2-to-L1 translation.

4.1 Experiment I

The role of linguistic contrasts in language *production* processes has been studied in various experiments, but the results are not conclusive (Politzer 1968, Banathy 1969, Juhasz 1971, Whitman and Jackson 1972). To our knowledge, the contrastive analysis hypothesis (L2 errors can be explained by L2 - L1 contrasts) has never been investigated for L2 reading comprehension. The first study allowed us to do so with regard to contrasts of type a: do contrasting structures of this type cause more reading difficulties than parallel ones?

French instructions for handling the SHADOK apparatus were read and carried out by French (L1) and Dutch (L2) electrical engineering students. Thirteen sentences expressed the following three conceptual patterns (we use the traditional terminology of French grammar): *temporelle*, *relative* and *consécutive*. Some of the sentences expressed the conceptual pattern in a contrastive way, other ones in a parallel way. The Dutch speaking subjects were found to process the contrasting *relative* construction significantly more easily than the parallel construction.

For the *temporelle* and *consécutive* constructions a significant reverse effect was observed. However, not only the Dutch but also the French subjects showed this pattern of reading difficulty. Thus, this study did not provide any support for the contrastive analysis hypothesis; the L2-readers were not handicapped by interlingual contrasts of type a. Apparently, trying to understand an instruction for use that is formulated in a foreign language is mainly a matter of conceptual effort and not dependent upon first having figured out the syntax of the sentences in the text.

The two other studies of the data of this experiment support the same conclusion. The second study demonstrated that the level of technical knowledge of the subjects, that is, a *conceptual* factor, contributed significantly to reading comprehension of a foreign technical text. In the third study we analysed reading difficulties in relation to erroneous technical manipulations. Only a minority of the manipulation errors were caused by misinterpretation of syntactic constructions. Most errors could be traced back to misinterpretation of single lexical items. Of these errors 78 percent had to do with content words, and the remaining 22 percent with function words, notwithstanding the fact that only 69 percent of the words in the text were content words. Since content words are the prime keys to the conceptual information the text conveys these data prove that conceptual

rather than syntactic factors are responsible for comprehension errors.

4.2 *Experiment II*

So far we have failed to find any effect upon reading comprehension of type a contrasts. We have interpreted this in favor of the theory of section 1. But perhaps such a step is premature. The possibility remains that the experimental procedure was not sensitive enough to detect the differences in L2 skill that are predicted by the contrastive analysis hypothesis. Indeed, even in the case of *productive* L2 skills, this hypothesis has not met with unchallenged success.

This argument can be invalidated if we are able to obtain positive comprehension differences between contrastive and parallel structures in a situation indicated by the theory of section 1. As a matter of fact, the theory predicts that if confronted with insufficient conceptual knowledge the subjects will revert to a syntactic reading strategy and be forced to scrutinize the syntactic structure of each sentence. In such a situation, type a linguistic contrasts can be predicted to hamper comprehension of the text.

Creating a situation of insufficient conceptual information was not difficult. We had the subjects read the instructions for use without showing them the SHADOK apparatus (compare the end of section 1). Since the subjects were no longer able to actually carry out the instructions we resorted to another comprehension index: translating the L2-text into the mother tongue.

The complete instruction for use consisted of 29 steps, each step was expressed in one sentence. For 15 steps we formulated two sentence versions. One version contained a contrastive structure, the other one a parallel structure. In total, there were 7 syntactic structures: *temporelle, relative, etc.*, as listed in Table 1.

Out of the 15 paraphrase pairs and the 14 remaining sentences we prepared two texts. Each text contained the latter 14 sentences and one member of every paraphrase pair. One text contained 7 parallel and 8 contrastive sentences; the remaining members of the paraphrase pairs went into the other text.

Forty-three Dutch second-year students of psychology were randomly divided into two groups, one group for each text. Each student produced a Dutch translation of 29 French sentences. The translations of the 15 paraphrase pairs were independently judged by two linguists. Since they attained a high level of inter-rater reliability, we shall present here translation scores based upon one linguist's judgements only.

Table 1 shows that for 14 out of 15 paraphrase pairs the highest percentage of errors was produced by the contrastive version. This result is highly significant ($p < .001$, sign test) and confirms the hypothesis.

One subsidiary result is worth noticing. For most of the paraphrase pairs a majority of the subjects managed to produce correct translations. There is one striking exception: *à moins que* (parallel) and *à moins de* (contrastive) hardly received any correct interpretation (15 and 0 percent; Table 1). This illustrates the special status of the reordering contrasts of type c (compare section 3).

5. Discussion

The main implication of the theory of section 1 and the empirical support it gained is to de-emphasize the importance of linguistic contrasts in perceptive foreign language skills, with the exception, of course, of the

reordering contrasts. Furthermore, a few practical conclusions seem to be justified by the results:

1. Reading comprehension tests involving the performance of tasks à la SHADOK are suitable as tools for assessing foreign language ability only if they have been constructed in such a way that foreign language skills and not merely conceptual skills are required for solving the test items.
2. L2-to-L1 translation seems to become an adequate way of testing foreign language ability only after the conceptual content of the text has been made very difficult. Only then the subjects will switch over from their habitual conceptual reading strategy (provided that they did not translate too much at school!) to a syntactic strategy (section 3), and only then linguistic factors will overrule conceptual factors. (Is this the reason why, in former days, secondary school teachers tended to select conceptually very difficult texts as translation exercises?)
3. Reading comprehension tests involving the performance of tasks and translations supply complementary information on someone's foreign language comprehension. A good translation does not automatically imply a good comprehension level. If the conceptual content is too difficult, the reader confines himself to a direct transposition of syntactic structures and lexical items, which means that he comprehends the text only on a formal linguistic level.
4. Foreign language instruction aiming at promoting reading skill in the students should concentrate on vocabulary (content words are the salient carriers of the conceptual information in the text) and on re-ordering contrasts. Treatment of all sorts of syntactic details is less important to this purpose.

*Table 1**Percentage of correct interpretations
for parallel and contrastive versions of
15 French sentences distributed over
7 syntactic structures*

syntactic structure	sentence number	parallel version	contrastive version
1. Temporelle	0.3	100	91
	2.2	74	70
	5.1	78	65
	15.3	95	43
2. Relative	1.1	91	95
	4.2	90	87
3. Consécutive	2.3	70	20
	3.3	83	40
4. Opposition	17.2	15	0
5. Impératif	0.2	95	65
	16.1	91	80
	17.5	100	91
6. Voix passive	5.2	71	70
	17.4	80	39
7. Nécessité	15.1	95	83

Bibliography

- Abelson, R.P. and R.C. Schank. 1975. "Scripts, Plans and Knowledge." Paper for the 4th International Joint Conference on Artificial Intelligence, 1975.
- Banathy, B.H. and P.H. Madarasz. 1969. "Contrastive Analysis and Error Analysis." *Journal of English as a Second Language* 4, 77-92.
- Charniak, E. 1972. *Towards a Model of Children's Story Comprehension*. Report AI-TR266. Artificial Intelligence Laboratory. Cambridge, Mass.: MIT.
- Juhasz, J. 1970. *Probleme der Interferenz*. München: Hueber Verlag.
- Kempen, G. 1976. *De taalgebruiker in de mens*. Groningen: Tjeenk Willink.
- Politzer, R.L. 1968. "An Experiment in the Presentation of Parallel and Contrasting Structures." *Language Learning* 18, 35-43.
- Postman, L. 1971. "Transfer, Interference and Forgetting." In: Kling, J.W. and L.A. Riggs (eds.) *Woodworth & Schlossberg's Experimental Psychology*. Third Edition. New York: Holt, 1019-1132.
- Schank, R.W. 1971. "Conceptual Dependency: A Theory of Natural Language Understanding." *Cognitive Psychology* 3, 552-631.
- 1975. *Conceptual Information Processing*. Amsterdam: North-Holland.
- Ulijn, J.M. 1974. "Contrastive Analysis and Reading Comprehension in a Foreign Language." Paper contributed to the first ANELA-Journée d'Etudes, march 1974, Amsterdam.
- 1975. "Analyse d'erreurs et compréhension écrite d'une langue seconde à buts vocationnels." *ITL* 28, 1-17.
- Forthcoming. *Second Language Reading Comprehension in Scientific-Technical Education*. Nijmegen.

Whitman, R.L. and K.L. Jackson. 1972. "The Unpredictability of Contrastive Analysis." *Language Learning* 22, 29-41.