Contents

Contents i

1 The qualificational nature of demonstrative noun anaphors 1
1.1 Introduction 1
1.2 Focus of the present study 4

2 The selection of subordinate/superordinate pairs for the experiments 5
2.1 Introduction 5
2.2 Materials experiment 6

3 Continuation experiments 11
3.1 Pilot experiment 11
3.2 Experiment 1 15
3.3 Experiment 2 18

4 Rating: Experiment 3 22
4.1 Method 23
4.2 Results 24
4.3 Discussion 26

5 Reading: Experiment 4 27
5.1 Method 27
5.2 Results and discussion 28

6 Lexical decision: Experiment 5 30
6.1 Method 30
6.2 Results and conclusion 31

7 Concluding remarks 33

References 34

1 The qualificational nature of demonstrative noun anaphors

1.1 Introduction

The main function of the noun phrase anaphor, as was already argued in Deliverable R1.4.1, is identificational. This means that the anaphoric expression mainly functions on the level of establishment and maintenance of reference in discourse. It was set forth that the lexical form of the anaphoric expression, in particular the degree of lexical specificity, reflects the accessibility of its referent. Accessibility was discussed to decrease in the presence of competing candidates (Ariel, 1988; Brown, 1983; Clancy, 1980; Givón, 1983), and with increasing distance towards the antecedent (Ariel, 1988; Brown, 1983; Clancy, 1980; Givón, 1983, 1987). In addition, it was argued that the topical status or the role of the referent in the text affects the selection of expression type (Ariel, 1988; Chafe, 1976; Clancy, 1980; Frederiksen, 1981; Garrod & Sanford, 1982, Karmiloff-Smith, 1986; Marslen-Wilson, Levy & Tyler, 1982).

The identificational function of a *demonstrative noun anaphor* is basically deictic. The deictic function is commonly observed in interactive language use. In the literature, demonstrative anaphors are discussed to be a stronger identificational device than a definite anaphor (Corblin, 1983; Hawkins, 1978), to alter the focus of attention (Cornish, 1986; Ehlich, 1982; Linde, 1979), and to occur in a context with competing other referents (Ariel, 1988; 1990; Fletcher, 1984; Linde, 1979).

In Deliverable R1.4.1, a merely 'identificational view' of noun anaphors was challenged by observations in the literature. An overview was given, providing indications that the lexical form of anaphors can have more than just an identificational function. For instance, overspecification can have a discourse structuring function (Bates, Kintsch, Fletcher & Giuliani, 1980; Fletcher, 1984; Hinds, 1977; Stark, 1988). Indefinite NP's were observed to have a perspectival effect (Ushie, 1986). In addition, empirical corroboration for the additional functions of anaphors was provided by experimental investigation (definite noun anaphors) and text-analytic research (indefinite anaphors and demonstrative anaphors) (Hustinx, in prep.; Maes, 1991; Maes & Noordman, 1995; Schouten & Vonk, in prep.; Vonk, Hustinx, & Simons, 1992).

For demonstrative anaphors, Maes (1991) developed a proposal in which he claimed that the additional function of demonstratives is to activate a non-default interpretation of the referent. This non-default function of the demonstrative is the focus of the present study. Maes' proposal is based on the analysis of a large number of demonstrative noun anaphors in a corpus of Dutch written texts, which consists of different text types. Most of the occurrences of demonstrative noun anaphors cannot be accounted for in terms of identificational purposes alone. Maes starts from the basic intuition that a demonstrative noun anaphor not just accesses a referent, but also modifies its semantic representation, thus producing a kind of informational development in discourse. The definite variant of a demonstrative noun anaphor results in a simple identify relation between antecedent and anaphor. The non-default interpretation evoked by the demonstrative version results in an interpretation which is more than just an identify-relation. It constitutes a more complex coherence relation underlying the anaphor.

Maes expressed the modificational effect of the demonstrative noun anaphors in an interpretation rule and an interpretation strategy. The three prototypical demonstrative noun anaphor types define three semantic modification types.

> Interpretation rule: the modification of demonstratives
> The additional function of demonstratives in anaphoric demonstrative NPs is a *modification in the semantic representation* of the underlying discourse referent by activating a *non-default interpretation of the NP* involved.
>
> Interpretation strategy
> Readers rely on the formal-lexical relationship between antecedent and demonstrative noun anaphors as the initial trigger, which provides them with the following types of semantic modification, each of which implies the processing of a particular type of coherence relation vis à vis the definite-NP-version:

Demonstrative noun anaphors with attributive modifiers	-->	attributing information to the referent
partially repeated demonstrative noun anaphors	-->	contextualizing the referent
superordinate demonstrative noun anaphors	-->	classifying the referent

Attributing information to the referent

A first prototype is constituted by demonstrative noun anaphors containing extra attributive information vis-à-vis the antecedent, predominantly realized by attributive pre- or postmodifiers. In the attribute-type, the referent is modified with all possible contextually relevant attributive information on the referent, as can be seen in example (1):

(1) This morning, the London Times publishes extracts from the government *report* on the salmonella infection in British eggs. *The / This confidential report* ...

In this example the definite NP *The confidential report* refers to 'the government report'. The definite determiner implies that the adjective 'confidential' in the NP is presupposed. The demonstrative, on the other hand, does not imply such a presupposition. Instead, the additional information (namely that the report is confidential) is predicated (attributed) to the referent.

According to Maes' proposal, the difference between the definite and demonstrative versions can be expressed as a difference between an *identify*-relation for definite noun anaphors and an *attribute*-relation for demonstrative noun anaphors. The demonstrative determiner in these cases is a signal to

interpret the lexical content of the NP not in the referential default, but in the attributing non-default.

Contextualising the referent

The second modificational type of demonstrative noun anaphors is constituted by anaphors that literally or partially repeat their antecedent, as in the following example:

(2) In the big cities, *air pollution* is increasing. *The / This pollution* is a result of bad policy.

The definite NP refers to 'air pollution'. Contextualising demonstrative noun anaphors activate a non-default interpretation of the anaphoric NP: the demonstrative is an explicit signal for the reader to activate a non-default-interpretation of that NP provided by the contextual information in the antecedent sentence. In this example, the demonstrative NP refers to 'the air pollution' as it is presented in the context, namely 'air pollution in the big cities'.

Classifying the referent

The third modificational type is constituted by anaphors, which are superordinates of their antecedent, as is illustrated in (3):

(3) *Bush* has decided to raise taxes after all. It is the first time *the / this president* has dared to do so.

The default interpretation of the definite noun anaphor (*the president*) is the simple identificational reading with the antecedent NP (*Bush*). The demonstrative anaphor *this president*, which is a superordinate of the subordinate *Bush*, evokes an implicit coherence relation that is linked to the antecedent, the so called 'classify relation'. *This president* does not only identify the antecedent *Bush*, but also evokes a class membership property, illustrated in 3'.

(3') It is the first time *this president* (in contrast with *other presidents*, for instance, *Reagan, Nixon, Carter, Kennedy*) has dared to do so.

The demonstrative determiner thus adds a classify interpretation to the simple identificational reading of the corresponding definite noun anaphor[1].

[1] The classify interpretation does not hinge on contrastive stress. The classify DemNa does not have contrastive stress on the demonstrative determiner. If a demonstrative determiner in a demonstrative superordinate noun anaphor does get contrastive stress than a co-subordinate member or co-subordinate members must be mentioned explicitly in the subsequent discourse.

1.2 Focus of the present study

For this study of the qualificational nature of demonstrative anaphors, we have selected the *classify* function as the object of our experimental investigations. The major reason for this choice was a methodological one: For demonstrative anaphors that classify a referent, the non-default interpretation can be assumed to have various observable consequences for the reader's behavior and judgements, which can be tested experimentally. Only for the classify type of anaphors is the modificational information (e.g., *in contrast with other presidents, for instance, Reagan, Nixon, Carter, Kennedy* in example 3') not explicitly contained in the text. The lexical information has to be derived from the superordinate class (e.g., *president* in example 3). A classify interpretation can be demonstrated experimentally by measuring activation of the additional information. For the attribute and contextualize types of demonstrative anaphors, such a test is more difficult, as the additional information is already contained in the text (e.g., *confidential* in example 1, and *in the big cities* in example 2) and will therefore be activated already before the anaphor is encountered.

This deliverable presents the results from a series of experiments in which we have used continuation tasks, ratings, reading time measures, and a lexical decision task to obtain evidence that readers indeed construct the non-default classify interpretation of demonstrative anaphors.

2 The selection of subordinate/superordinate pairs for the experiments

2.1 Introduction

In the study of Maes (1991), the interpretation of the analyst was taken as the basis for the theoretical considerations. In our investigation, these observations were investigated experimentally. This investigation will not concentrate on conscious reflections about a certain linguistic phenomenon, but will exploit reactions of readers, who are confronted with this phenomenon in the context of extended texts. Investigating a linguistic phenomenon within a context of not just two sentences carries the danger that the effect (if any) is unnoticeable just because of the (complicating) context. If an effect can be obtained, however, this can be interpreted as strong evidence for the assumed effect in question.

The classify interpretation of a demonstrative anaphor of the classify type was investigated in the following way. The experimental subjects (readers) were presented with texts on various topics, each containing a subordinate entity (e.g., 'Beethoven') that belongs to a well-known superordinate class (e.g., 'composer'). In one critical sentence of each text, the subordinate was referred to with the superordinate term using a demonstrative noun phrase (e.g., 'this composer') or a definite noun phrase (e.g., 'the composer'). Co-subordinate class members (e.g., 'Mozart') should be activated after the demonstrative version but not after the definite version of the critical sentence. The effects of this classify interpretation of the demonstrative anaphors should become apparent in readers' production and judgments of text continuations and in their reading times, and in lexical decision times to test words consisting of co-subordinate class members.

In two experiments, subjects had to produce an appropriate continuation sentence for each text fragment. The fragments themselves ended with a sentence that contained either a demonstrative or a definite superordinate noun anaphor. If the demonstrative anaphors evoke a classify interpretation, the continuations should contain more references to co-subordinate class members in the demonstrative than in the definite text versions.

In three subsequent experiments, a classify interpretation was already provided in the texts. Subjects' reactions to this interpretation were measured in two ways. First, judgements about theme continuity of a sentence that contained a co-subordinate class member were elicited in an off-line task (which does not tap into comprehension processes during reading). Second, reading times of the critical sentence, in which the classify interpretation was provided, were registered in an on-line task (aimed at comprehension processes during reading). A lexical decision task to measure activation of co-subordinate class members more directly was used to complete this investigation.

The experiments rely on the subjects' knowledge of the subordinate/superordinate pairs used and on their familiarity with other members of the superordinate class. A large number of candidate pairs were tested in a materials experiment in which subjects had to write down what they considered the superordinate class of the subordinate class members they were presented with and what co-

subordinate class members they could think of.

2.2 Materials experiment

Three criteria had to be observed in selecting suitable subordinate/superordinate pairs for the envisaged experiments.

First, it must be ascertained that readers know which noun is the superordinate term of another noun. For instance, the subordinate/superordinate pair 'Van Gogh / painter' is a familiar one, but 'Baselitz / painter' is probably less familiar, and, therefore, less suitable as a referent-anaphor pair in the experimental texts.

Second, the distance between the superordinate and the class member must not be too large. For instance the distance between the members of the pair 'sparrow / animal' is larger than the distance between 'sparrow / bird'. The superordinates are on different levels of abstraction. In this study, a word on the one level (superordinate) must activate as fast as possible words on another level (subordinates). It has been demonstrated that the more the levels of abstraction differ, the longer it takes to activate another word (Noordman-Vonk, 1979). In addition, it is important to select 'basic level categories' (generic names, like 'sparrow', 'blackbird' 'dove').

Finally, the reader must also be familiar with *other* members of the superordinate class. For instance, even if one knows that a superordinate of Bob Marly is, for instance, 'reggae singer', it can still be difficult to come up with names of other reggae singers.

In order to collect familiar superordinates at an appropriate distance of the subordinates, subordinate words were presented to subjects. The subjects had to write down the superordinate nouns. In order to assess whether the generated superordinates represent a class with familiar subordinates, subjects also had to generate three other subordinates of the superordinate they had indicated.

The outcome of the materials experiment provides two sources of information. First, if the presented subordinate evokes identical superordinate terms for different subjects, the generated superordinate term can be established as *the* superordinate of the subordinate class member. If not, the subordinate entity cannot unequivocally be referred to by one superordinate term. Second, if a relatively high number of other subordinates are generated, it can be concluded that the superordinate represents a class with subordinates that subjects are familiar with. If it would appear to be difficult to come up with three other members of the class, the number of familiar subordinates in the class can be considered too small.

In Maes (1991) two types of superordinate anaphors were distinguished: categorical and factual

superordinate anaphors.[2] The difference between these anaphors is based on the type of knowledge that is required to relate the anaphor to its antecedent: categorical anaphors are based on systematic relations between items in the lexicon (e.g., *bird*, referring to *sparrow*); factual anaphors require factual knowledge to identify the relation between the anaphor and its antecedent (e.g., *president* referring to *Clinton*). Reference of subordinates and superordinates can be represented in the following scheme:

	antecedent (subordinate)	anaphor (superordinate)
factual	Clinton	President
categorical	sparrow	bird

No theoretical differences between categorical and factual anaphor types can be expected on the basis of the Maes' (1991) study, but both categorical and factual superordinate/subordinate pairs were used as a controlled factor in the empirical investigation.

2.2.1 Method

Subjects

Fifty subjects participated in the experiment. They varied in age between 19 and 28 years, and were paid Hfl 10.- for their participation.

Materials

The subordinate nouns were contained in a carrier sentence of the form 'Een ..... is een ..... (bv. Een *mus* is een .....)[3] ('A ..... is a .....' , e.g., 'A *sparrow* is a .....'). In total 75 subordinate nouns, consisting of 36 categorical and 39 factual subordinate nouns were presented in a booklet. After each sentence, dashed lines were printed on which subjects had to fill in three other subordinates, belonging to the class they had just mentioned. A part of the booklet with an example of a categorical and a factual subordinate, the generated superordinate terms and three co-subordinates is presented in Table 1.

[2] In Maes (1991) these two types of superordinate anaphors are labeled 'semantic' and 'pragmatic' superordinates.

[3] The experimental materials were in Dutch. The subjects were native speakers of Dutch.

Table 1

Example of Materials Pretest (with Response of Typical Subject in Italics)

WORD	*CLASS*	*OTHER MEMBERS OF CLASS*		
Een mus is een	*vogel*	1 *merel*	2 *duif*	3 *spreeuw*
Beethoven was een	*componist*	1 *Mozart*	2 *Bach*	3 *Ravel*
Een diamant is een	.....	1	2	3 .....
Marilyn Monroe is een		1	2	3 .....
A sparrow is a	*bird*	1 *blackbird*	2 *pigeon*	3 *starling*
Beethoven was a	*composer*	1 *Mozart*	2 *Bach*	3 *Ravel*
A diamond is a	.....	1	2	3 .....
Marilyn Monroe is a	.....	1	2	3 .....

Design and procedure

The 75 nouns were quasi randomly ordered in a fixed list and were presented to the subject in the form of a booklet. Subjects were instructed to write down the class they thought the word belonged to. After that, they had to generate three other members belonging to the class they had mentioned before. Each subject received the same list.

2.2.2 Results

For each presented subordinate noun the number of identical superordinate terms was counted and an agreement percentage was calculated. The other subordinates that had been generated were also counted. For instance, 47 subjects considered Beethoven a composer, 3 subjects classified him as a musician. Thus, 94 % of the subjects agreed about one superordinate of this subordinate, i.e., 'composer'. As 'other member of the class', Mozart was mentioned 32 times, Bach 17 times and Ravel 4 times.

Some different superordinate nouns, consisting of compounds, were counted together. In fact, this concerned superordinates with a small distance to the subordinate. For instance, *brass instrument*, *musical instrument*, and *instrument* were mentioned as the superordinate of *saxophone*. If a compound superordinate (e.g., *brass instrument*) represented a subcategory of a more abstract supercategory (e.g., *instrument*), and the name of the more abstract category was contained in the compound (e.g., *instrument* in *brass instrument*), these superordinates were joined together under the term *instrument*. Some synomyms were also counted together as one superordinate (e.g., *stad / plaats* (*town / city*) as the superordinate of *Rotterdam*). The criterion for joining different superordinate terms was whether the other generated subordinates fitted well into the one superordinate lexical item.

Other nouns elicited different superordinate terms which could **not** correspond in meaning, such as the

superordinates of *Philips* which consisted of *factory*, *company*, *multinational*, *trademark*, *manufacturer of electronic products* and even *last name*.

The agreement among subjects about what they consider the superordinates of the presented subordinates was calculated. For two agreement levels inter subject agreement is presented in Table 2. (An agreement of 70% means that 35 out of 50 subjects (70%) wrote down the same superordinate for a subordinate noun. Table 2 shows that this is the case for 81 % (29 out of 36) of the categorical nouns, and for 72% (28 out of 39) of the factual nouns.

Table 2
Number of Superordinates (with Percentage in Italics)
for Two Different Agreement Levels

	TYPE OF ITEM			
AGREEMENT (percentages of subjects)	Categorical		Factual	
agreement of 70 %	29	*81*	28	*72*
agreement of 90 %	20	*56*	19	*49*

Only the superordinate nouns with high agreement were considered suitable for the experimental materials. Excluded from the material were several superordinates that were agreed on, but did not elicit sufficient other subordinate nouns (e.g., 84 % of the subjects mentioned 'volcano' as being the superordinate of *Vesuvius*, but almost no one could come up with other volcano's, apart from *Etna*).

Another constraint on the selection of subordinate/superordinate pairs for the experimental materials was that the superordinate noun could refer to the subordinate referent. This was not the case for a few subordinate/superordinate pairs that had been investigated in the materials experiment. For instance, 'baker' is not referred to by 'this occupation'.

Subordinate/superordinate pairs were considered useful for the experiments if at least 70 % of the subjects agreed upon one and the same superordinate, and if at least 70 % of the subjects could generate three subordinates. A total of 57 subordinate/superordinate pairs fulfilled these conditions.

2.2.3 Conclusion

From the materials experiment it appeared that subjects agree for a substantial number of subordinates about what nouns form their superordinates, and are able to produce a number of other subordinates for these superordinates. Subordinate/superordinate pairs on which such agreement was reached, and for which three ore more other subordinates were produced were considered suitable for the construction of experimental material.

3 Continuation experiments

The general method of the continuation experiment can be described as follows: Subjects are asked to continue with a sentence text fragments, of which the last sentence contains a demonstrative or a definite superordinate anaphor. For instance, the last sentence of a text fragment refers to a subordinate 'the sparrow' as follows (demonstrative anaphor printed in italic):

'*Deze vogel* overwintert dan ook zonder probleem in Nederland.'
'Therefore, *this bird* winters in The Netherlands without problems.'

or

'*De vogel* overwintert dan ook zonder probleem in Nederland.'
'Therefore, *the bird* winters in The Netherlands without problems.'

The continuation sentences of the subjects after the two types of sentences are analyzed with respect to the presence of co-subordinate class members and compared to each other. When presented with a demonstrative anaphor in the last sentence, subjects could be more inclined to mention another subordinate in their continuation, than they are when the last sentence contains a definite anaphor. However, if it appears that they do not mention other members, this does not necessarily mean that other members were not activated. It is possible that members are activated, but not produced for one or another reason.

3.1 Pilot experiment

Before conducting the main continuation experiments, a pretest was conducted. The purpose of this pretest was twofold: to test the experimental paradigm on the one hand, and to test the form of the critical sentence on the other hand. A number of texts were constructed, that were presented to subjects in a booklet. Subjects had to continue each text with one extra sentence.

3.1.1 Method

Subjects

A total of 12 students of the University of Brabant participated in the pilot experiment. They varied in age between 18 and 27 years and were not paid for their participation.

Materials

Text fragments were constructed about subordinate class members that were presented in the materials experiment. For instance the subordinates 'Beethoven', 'the sparrow', 'Marilyn Monroe' or 'tennis'. The texts were designed is such a way that during the text the subordinate remained the discourse topic. This subordinate was referred to with its superordinate in the last sentence of the text fragment.

Fourteen text fragments were constructed. Seven texts contained categorical subordinate/superordinate pairs, the other seven texts contained factual pairs. The texts consisted of six to eight sentences about

several aspects or actions of the subordinate class member. The last sentence of the fragment (hereafter the Experimental Sentence) contained a superordinate anaphor, that referred to the subordinate with a demonstrative article or a definite article (hereafter DemNa respectively DefNa condition) (see Table 3).

Table 3

Example Pre-experimental and Experimental Sentence of Text Fragment

---

In stad en land kom je ze tegen, vrolijk kwetterende mussen.
De mus schijnt zich aan elke omstandigheid te kunnen aanpassen.
Dit niet in de laatste plaats doordat hij een echte alleseter is.
Hij kan zijn nest op alle plaatsen bouwen, zelfs op de meest vreemde: in struiken, dakgoten en zelfs in rioleringsbuizen.

PEs De mus wordt beschermd tegen temperaturen onder het vriespunt door een verenpak.
Es De/Deze vogel overwintert dan ook zonder probleem in Nederland.
Cs .....

.....
.....
.....text.....
.....

PEs The sparrow is protected against temperatures below freezing point by a plumage.
Es Therefore the/this bird winters in The Netherlands without problems.
Cs .....

Note PEs : Pre-Experimental Sentence
Es : Experimental Sentence
Cs : Continuation Sentence

The content of the Experimental Sentence (Es) was thematically continuous with that of the preceding sentence. Theme continuity was linguistically realized with conjunctions indicating the coherence between the sentences, such as *dan ook* (*therefore*), *namelijk* (*namely*). In the sentence preceding the Experimental Sentence, the Pre-Experimental Sentence (PEs), the subordinate noun occurred in subject position, in its full form.

To avoid activation of co-subordinate class members already *before* the Experimental Sentence the superordinate noun was not contained in the text prior to the Experimental Sentence. For the same reason, the content of the text did not evoke comparison with co-subordinate class members.

As was discussed before, the subordinate/superordinate pairs were either categorical or factual. The subject of a text with a factual pair (e.g., ‘Beethoven’) is specific. ‘Beethoven’ refers to a specific

person. Categorical referents, on the other hand, could not be used in their specific meaning, because the superordinate can only activate other specific instantiations of a superordinate, which are (almost without exception) unknown. For instance, in a text about a specific saxophone (of a certain musician), the demonstrative superordinate 'this instrument' can only activate other specific saxophones. The class of specific saxophones, however, is unknown to the reader, let alone other specific saxophones. This holds for all cases of specific basic level categories (e.g., the 'sparrow', the 'oak', the 'pistol'). Therefore, if the subject of a text was a categorical subordinate, it was only used in a generic sense.

Design

Two different lists of texts were constructed. Each list contained the 14 texts in a fixed order. Each of the two anaphoric reference conditions of a text was assigned to a different list. Each list contained the same number of texts in each of the anaphoric reference conditions. The subjects were assigned to lists randomly, six to one of the lists, and the remaining six to the other list. In this way, texts and subjects were counterbalanced.

Procedure

Subjects received the text fragments in a booklet. After the Experimental Sentence a dotted line was presented. Subjects were instructed to read each text fragment and to write a continuation of the fragment on the dotted line following the text fragment. They were asked to write down one sentence that could be expected to come after the preceding sentence(s). To avoid expectancy about when to add the Continuation Sentence to the fragment, subjects had to read the text using an opaque piece of paper with which they had to uncover the text line by line. The experiment lasted about 25 minutes.

3.1.2. Results

An important question is how to assess whether activation of other members of the class has taken place. If co-members actually are mentioned, the activation is clear-cut, as illustrated with the sentence a subject continued the text fragment with in example 4 (the Continuation Sentence is printed in italics and the co-subordinate class member in bold).

(4) Wilhelmina is nooit werkelijk tot 'haar' volk gekomen.
Es Deze koningin gedroeg zich altijd erg vormelijk
Cs *Dit in tegenstelling tot **Beatrix**, die bekend staat om haar vriendelijkheid voor het volk.*
PEs Wilhelmina never really got close to 'her' people.
Es This queen always behaved in a formal way.
Cs *This in contrast with **Beatrix**, who is known for her kindness to the people.*

In a number of sentences, no specific co-subordinate class member was mentioned, but explicit mention was made of 'other class members'. This kind of explicit mention is illustrated in example 5.

(5) De mus wordt beschermd tegen temperaturen onder het vriespunt door een verenpak.

Es Deze vogel overwintert dan ook zonder probleem in Nederland.

Cs *Voor **andere vogels** is dit niet weggelegd en moeten ze naar warmere oorden vliegen.*

PEs The sparrow is protected against temperatures below freezing point by a plumage.

Es The/this bird winters in The Netherlands without problems.

Cs ***Other birds** are not that fortunate and must fly to warmer regions.*

Sentences of this kind, in which other members of the class are implied by mentioning the class itself in a comparing context, were also viewed as evidence for a classify reading. Mentions of class members and class member comparisons were counted together. The total number of mentioned class members and classes in the Continuation Sentence are presented in Table 4.

Table 4

Total Number of Mentioned Class Members or Classes
(with Percentages in Parentheses)
for both Anaphor Conditions in the Continuation Pilot

ANAPHOR TYPE	CLASS MEMBERS OR CLASSES
DefNA	2 (1)
DemNA	8 (5)

As can be seen in Table 4, there were not many mentions, but there were more mentions of other classes and class members when the Experimental Sentence was in the DemNa condition than in the DefNA condition. Wilcoxon matched-pairs signed rank tests, one over the subject means, and one over the text means, showed that the difference between the two anaphor types was significant in the stimulus analysis ($p < .05$ (one-tailed), and marginally significant in the subject analysis ($p < .10$ (one-tailed).

3.1.3 Conclusion and Discussion

The small difference between the definite and the demonstrative condition did reach significance (albeit marginal in the subject analysis). However, the number of mentioned classes and class members is very small.

One of the reasons subjects generated very few co-subordinate terms may be that the content of a number of Experimental Sentences could not easily be continued with another subordinate. This was the case when the Experimental Sentence seemed to close the discourse topic (evoked by the conjunctions), or when almost nothing more could be said about the topic. For instance, the Experimental Sentence about alcoholism ‘‘This addiction is difficult to be cured at home’’ is not inviting to continue with another class member because no other addiction, except for smoking, can

be cured at home.

The content of several of the Experimental Sentences was changed in such a way that it could evoke a continuation that contradicts the Experimental Sentence, or that states the opposite. For instance, the content of the example sentence above was altered into: ‘‘This addiction is relatively cheap,’’ which indeed can evoke a sentence as ‘‘addiction X (gambling, heroine) is much more expensive.’’

Because the conjunctions ‘dan ook’ (therefore) or ‘namelijk’ (namely) are possible signals for closing the discourse topic, these conjunctions were removed from the Experimental Sentences for the next experiment.

Besides the analysis of co-subordinate mentions, the contents of the Continuation Sentences were examined more thoroughly with respect to other phenomena. Based on the consideration that the comparing context of a classify reading may evoke contrast words, the Continuation Sentence was also analyzed on the occurrence of contrast words. In addition, based on the thought that a demonstrative anaphor may evoke a change of content of the sentence, the continuity and discontinuity of the content of the sentence was also examined. With respect to the continuity of the subject, no difference was found between both anaphor conditions. As for the contrast words, it appeared that contrast words (such as *but*, *however*, *in contrast with*) were explicitly present in more sentences after a demonstrative than after a definite condition. In total 9 contrastive conjunctions were used after a definite anaphor, while 24 were used after a demonstrative anaphor. In addition, most co-subordinate and class mentions were accompanied by a contrast word. This could suggest that contrast words are in one way or another related to the classify effect. It may be the case that if subjects in a continuation task were obliged to use a contrast word in their continuations, a classify reading would be enhanced.

3.2 Experiment 1

The task in experiment 1 was, as in the pilot experiment, to continue a text fragment with one sentence. The text fragments from the pilot experiment were adapted and additional text fragments were constructed. As in the pilot experiment, each text contained an Experimental Sentence in either the definite noun anaphor condition or in the demonstrative noun anaphor condition.

Because the pilot experiment had shown that contrast words co-occurred with mentions of co-subordinate class members and that contrast words predominantly occurred in the demonstrative anaphor condition, subjects were instructed to use a contrast word in the continuations. Subjects were asked to use the contrast words *echter* (*however*) or *daarentegen* (*on the other hand, conversely*).

3.2.1 Method

Subjects

Sixteen 16 students of the University of Brabant participated in the experiment. They varied in age between 20 and 25 years, and were not paid for their participation.

Materials

The 14 text fragments of the continuation pilot experiment were adapted for the experiment and 10 other text fragments were constructed, according to the same criteria as in the pilot experiment. In total the materials consisted of 12 categorical and 12 factual text fragments.

As in the text fragments of the pilot experiment, the pre-Experimental Sentence contained a subordinate class member, and the Experimental Sentence contained a its superordinate anaphor. Each text fragment occurred in one of the two anaphor type conditions, the DefNA and the DemNA condition. The content of the Experimental Sentence was thematically continuous with that of the pre-Experimental Sentence, but could easily be continued with a sentence with an opposite content. The conjunctions *dan ook* (*therefore*) and *namelijk* (*namely*) were not contained in the Experimental Sentence. In all other respects the text fragments were the same as or similar to the texts in the pilot experiment.

Design

Two different lists of texts were constructed. Each list contained 24 texts in a fixed order, 12 about a factual and 12 about a categorical subordinate. Each of the two anaphoric reference conditions was allotted to a different list. Each list contained the same number of texts in each of the two anaphoric conditions. The subjects were assigned to lists randomly, each list was assigned to an equal number of subjects. In this way, texts and subjects were counterbalanced.

Procedure

Subjects were asked to read each text fragment, while using an opaque piece of paper to uncover the text line by line, and to write a sentence in continuation to the fragment on the dotted line following the text fragment. They were told to write down a sentence that could be expected to follow the preceding sentence(s). The continuation was restricted in the sense that subjects had to include one of the conjunctions ‘echter’ (however) or ‘daarentegen’ (on the other hand) in the sentence. An example text was provided, with a number of continuation examples. The experiment lasted about 45 minutes.

3.2.2 Results

The same criteria as for the pilot experiment were used to analyze the Continuation Sentences on the presence of class members and class comparisons. The analysis was carried out independently by three analysts. The total number of mentioned sub- and superordinate nouns in the Continuation Sentence are presented in Table 5.

Table 5

Total Number of Mentioned Class Members or Classes
(with Percentages in Parentheses)
for both Anaphor Conditions in Experiment 1

ANAPHOR TYPE	CLASS MEMBERS OR CLASSES
DefNA	64 (33)
DemNA	68 (35)

There was no difference between the two anaphor conditions: Wilcoxon matched-pairs signed rank tests (two-tailed) showed no difference between the anaphor types, not in the stimulus analysis ($p > .10$), nor in the subject analysis ($p > .10$). As can be seen from Table 5, together with Table 4, the number of mentioned class members and classes increased considerably. Three quarters (75%) of the occurrences of classes and class members appeared to be combined with the conjunction *daarentegen* (*on the other hand*), one quarter (25%) occurred in combination with *echter* (*however*).

3.2.3 Discussion

Contrary to the expectation, the results of the Continuation Sentence do not show a difference between the two anaphor conditions. However, it appeared that the use of a contrastive conjunction drastically increased the number of class members and classes, compared to the pilot experiment (from a mean of 2.5% in the pilot experiment to a mean of 34% in experiment 1). Most occurrences of these mentions were associated with the conjunction *daarentegen* (*on the other hand*).

It seems that the effect of the experimental manipulation of anaphor type is masked by having to use a contrast word in the Continuation Sentence. The comparative context evoked by the contrastive conjunction is so strong that it does not need the support of a demonstrative anaphor.

Therefore, another continuation experiment was conducted without the instruction to use a contrast word in the Continuation Sentence. The procedure was the same as in the pilot experiment. It was expected that differences would be found between the anaphoric reference conditions, but that the total number of mentions of class members and classes would decrease again.

3.3 Experiment 2

Experiment 1 showed that the instruction to use a contrastive conjunction did trigger the production of other subordinates, but this instruction did not lead to a differentiation between the two anaphoric conditions. In continuation experiment 2, subjects were not instructed to use contrast words in their continuations. It was expected that this would cause the number of class members and class comparisons to decrease substantially, but the experimental manipulation to function as expected: It should result in more mentions of co-subordinate class members or classes in subjects' continuations in the DemNa condition than in the DefNa condition.

3.3.1 Method

Subjects

Sixteen students of the University of Brabant participated in the experiment. They varied in age between 19 and 25 years, and were not paid for their participation.

Materials and design

Materials and design were identical to experiment 1.

Procedure

The instruction to the subjects was the same as in Experiment 1, except for the instruction to use a contrastive conjunction. In the present experiment the subjects were not instructed to use a contrastive conjunction in their Continuation Sentence. They were asked to write down a sentence that could be expected to come after the preceding sentence(s) without restrictions. The experiment lasted about 45 minutes.

3.3.2 Results

The Continuation Sentences were analyzed with respect to the presence of co-subordinate class members and classes, according to the same criteria as were used in Experiment 1. The analysis was carried out independently by two analysts. The number of mentioned subordinate and superordinate nouns in the Continuation Sentence are presented in Table 6.

Table 6

Total Number of Mentioned Class Members or Classes
(with Percentages in Parentheses)
for both Anaphor Conditions in Experiment 2

ANAPHOR TYPE	CLASS MEMBERS OR CLASSES
DefNA	7 (4)
DemNA	21 (11)

A Wilcoxon matched-pairs signed rank test (two-tailed) showed a significant difference between both anaphor types in the stimulus analysis ($p = .01$) as well as in the subject analysis ($p < .01$). More other subordinates were contained in the Continuation Sentence following a superordinate DemNA than following a superordinate DefNA.

As can be seen in Table 6, the total number of mentions of class members and classes is much smaller than in experiment 1. But the number of mentioned class members and classes does show a difference between the two anaphor conditions.

3.3.3 Discussion

The results of Experiment 2 show that a demonstrative superordinate anaphor activates a classify interpretation towards its antecedent. Because the continuation method did not bias the subjects in any direction, this result can be seen as a strong indication that a classify interpretation has been made.

One could oppose that this conclusion is based on a small number of observations. The total percentage of mentions of co-subordinate class members was indeed not very high. Three issues must be taken into account.

First, whether or not a noun could be considered a class comparison was sometimes unclear. When strictly applying the criteria, a number of sentences were not counted as class comparisons, although they did show a kind of classify reading. Table 7 presents a number of sentences that illustrate a comparison with other classes, but that are stated in such a way that they were not counted as classes according to the criteria. In total, nine sentences of this kind were given, eight of which were contained in sentences after a demonstrative anaphor, and one after a definite anaphor[4].

[4] These sentences were not included in the data presented in Table 6.

Table 7

Examples Continuation Sentences Following Experimental Sentences

---

Es Deze bloem wordt naar alle delen van de wereld geëxporteerd.

Cs En vormt **naast de kaas, de klompen en de molens** het bekende toeristische plaatje.

Es This flower is exported all over the world.

Cs And forms **together with the cheese, the wooden shoes and the windmills** the familiar tourist picture.

Es Dit wapen wordt veel gebruikt bij roofovervallen.

Cs Het is tegenwoordig niet meer weg te denken **qua enige vorm van echte bescherming**.

Es This weapon is often used for hold-ups.

Cs Nowadays it can no longer be ignored **as the only form of real protection**.

Second, the low percentage of mentions of class members and classes is really not surprising since each subject was absolutely free to continue with any information they like. A number of continuations are presented in Table 8. They illustrate the variability of the continuations the subjects came up with.

Table 8

Examples Continuation Sentences Following Experimental Sentences

---

Es Deze vis lijkt een lage overlevingskans te hebben.

Cs **Wat fijn voor die vis**.

Es This fish seems to have a low survival probability.

Cs **How jolly nice for that fish**.

Es Deze schrijver schrijft vrijwel nooit over vrouwen.

Cs **Vrouwen zijn toch mooie schepsels**.

Es This writer hardly ever writes about women.

Cs **Women are beautiful creatures, aren't they**.

Es Deze edelsteen kan alleen in gouden sieraden verwerkt worden.

Cs **Kost een paar centen maar dan heb je ook wat**.

Es This jewel can only be set in golden jewellery.

Cs **Costs a few bucks, but it's sure worth it**.

Es De god werd een vriendelijk karakter toegeschreven.

Cs **Wat een leuk verhaaltje!**

Es The god was believed to have a friendly character.

Cs **What a cute little story!**

Third, the low percentage of mentions of class members or classes can be viewed as a consequence of the task. Those mentions start a new (sub)topic in a text. But in understanding a text subjects generally prefer to integrate the next sentence with the preceding sentence. This strategy can be stated in the form of a default principle, called the nextness principle (Ochs, 1979), or the principle of continuity: ‘‘readers assume by default, that continuity is maintained’’ (Segal, Duchan & Scott, 1991). Subjects are reluctant to start a new (sub)topic in a text (Vonk, Hustinx & Simons, 1992). This may be even stronger if subjects are asked to *complete* the text with a sentence.

4 Rating: Experiment 3

In the previous experiments, a task was used in which a continuation was elicited from subjects after text fragments ending with an Experimental Sentence containing a demonstrative or a definite superordinate anaphor. In experiment 3, the classify effect was investigated using text fragments that contained, following the Experimental Sentence, a Continuation Sentence in which a co-subordinate class member already was presented. The method used in Experiment 3 was a rating task, in which subjects had to judge each sentence in terms of theme continuity and theme discontinuity (on a scale from 1 to 5, in which 1 stands for highly continuous and 5 for highly discontinuous). An example of a text fragment is presented in example 6.

(6)		Wilhelmina is nooit werkelijk tot 'haar' volk gekomen.	1 2 3 4 5
	Es	Deze koningin gedroeg zich erg vormelijk.	1 2 3 4 5
	Cs	*Juliana was afkerig van iedere vorm van decorum.*	1 2 3 4 5
		Wilhelmina never really got close to 'her' people.	1 2 3 4 5
	Es	This queen always behaved in a formal way.	1 2 3 4 5
	Cs	*Juliana hated every form of decorum.*	1 2 3 4 5

In example 6 the Continuation Sentence (in italics) contains another member of the class of Dutch queens. In a strict sense, this sentence can be considered to initiate a new discourse topic. However, if in the DemNa condition the demonstrative superordinate evokes a classify relation towards the antecedent, which should activate other members of the class of queens, a topic shift more or less should have been introduced, compared to the DefNa condition, in which no such activation has taken place. It was hypothesized that a Continuation Sentence following an Experimental Sentence in the DefNA condition, will be rated as more theme shifting than following an Experimental Sentence in the DemNA condition. This should become apparent from lower ratings in the DemNA condition than in the DefNA condition.

Theme continuity of the Continuation Sentence depends on the content of that sentence and the content of the preceding sentences, especially of the last preceding sentence, the Experimental Sentence. It is possible, for instance, that the continuity itself of the Experimental Sentence affects the continuity rating of the Continuation Sentence. Therefore, the content continuity of the Experimental Sentence was included as a factor in this experiment.

4.1 Method

Subjects

Sixteen students of the Nijmegen University participated in the experiment. They varied in age between 19 and 28 years, and were paid Fl 8,50 for their participation.

Materials

The experimental materials for the rating experiment (24 texts) were taken from the continuation experiments. Twelve texts contained factual subordinate/superordinate pairs, and twelve categorical ones. The text fragments were extended with two or three sentences. Following the Experimental Sentence in the DefNA or DemNA condition, a Continuation Sentence was constructed. The grammatical subject of the Continuation Sentence was a class member of the superordinate mentioned in the Experimental Sentence. This class member was selected from the materials pretest: the most frequently generated class member was taken.

Twelve texts contained an Experimental Sentence that was continuous with the preceding text, and the Experimental Sentences of the remaining twelve texts were discontinuous with the preceding text. The continuity assignment of the Experimental Sentences was based on a pilot rating experiment, in which subjects rated the continuity of the sentences on a five-point scale. Experimental Sentences with an average rating score below 1.8 on the scale were taken to be continuous sentences, Experimental Sentences with an average score above 1.8 were taken to be discontinuous sentences. Some Experimental Sentences were adjusted to make them more continuous or more discontinuous. In addition, the discontinuous Experimental Sentences were sentence-initially extended with adverbs of time or place, and the continuous Experimental Sentences with causal conjunctions or other conjunctions or adverbs, expressing a coherence relation with the previous sentence. Consequently, the superordinate anaphor occurred after the adverb or conjunction and the finite verb. An example text (with a discontinuous Experimental Sentence) is presented in Table 9.

Table 9

Example Text Rating Experiment 3

Het Kubisme is in 1907 ontstaan onder leiding van George Braque.
Volgens de opvatting van het Kubisme is alles in de natuur opgebouwd uit de bol, de kegel en de cilinder.
Deze vormen worden bij een kunstwerk uitgeschakeld en alleen de vlakken, waaruit de vormen zijn opgebouwd, worden weergegeven.
Het doel was tot de kern der dingen te komen.
Het kubisme is dus totaal niet gericht geweest op de schoonheid der dingen.
Es Tegenwoordig wordt de/deze stroming niet gewaardeerd door een breed publiek.
Cs Het Impressionisme wordt door iedereen gewaardeerd.
De interesse in schilderijen van het Impressionisme stijgt nog steeds.
De prijzen die tegenwoordig voor bijvoorbeeld een Van Gogh betaald worden gaan alle perken te buiten.

Cubism came into existence in 1907, under the leadership of George Braque.
In Cubism, everything in nature is build from spheres, cones, and cylinders.
These forms are eliminated in a work of art, and only the planes of the forms are represented.
The aim was to attain the essence of all things.
Cubism has not at all been directed at the beauty of things.
Es Nowadays, the/this school is not popular with the public.
Cs Impressionism is widely appreciated.
The interest in the paintings of Impressionism is still increasing.
Nowadays, the prices paid for a Van Gogh go beyond all limits.

Design

Two different lists of texts were constructed. Each list contained the 24 texts in a fixed order. Each text occurred in both demonstrative and definite anaphor type conditions. Each of the two anaphor type conditions was assigned to a different list. Each list contained the same number of texts in each of the anaphor type conditions. The subjects were assigned to the lists randomly, and each list was assigned to an equal number of subjects. In this way, texts and subjects were counterbalanced.

Procedure

Subjects were asked to read each text sentence by sentence and to judge to what extent each sentence was continuous with its previous sentence. The subjects had to indicate their continuity judgment on a 5 point scale: 1 meaning 'no change of subject of the text', 2 'subject of text is fairly continuous', 3 'subject is not continuous, nor discontinuous', 4 'subject of text changes somewhat', and 5 'subject of text changes'. The 5-point scale was printed at the end of each sentence. To avoid the influence of information in the sentences to be read on the continuity judgment of the current sentence subjects had to read the text using an opaque piece of paper with which they had to uncover the text line by line.

4.2 Results

Experimental Sentence

Two three-way analyses of variance were conducted over the means of the ratings of the Experimental Sentence, one over subjects, one over items. In the subject analysis, subject groups was treated as a between subjects factor, the factor anaphor type (demonstrative/definite) and theme continuity of the Experimental Sentence (continuous/discontinuous) were treated as within subjects factors. In the item analysis, item groups and theme continuity were treated as between items factors, anaphor type as a within items factor.

The mean rating scores are presented in Table 10 as a function of theme continuity and anaphor type of the Experimental Sentence.

Table 10
Mean Rating Scores of the Experimental Sentence
as a Function of Anaphor Type

and Theme Continuity of the Experimental Sentence

ANAPHOR TYPE	CONTINUITY of Es: Continuous	Discontinuous
DefNA	1.3	2.9
DemNA	1.3	2.9

A main effect for theme continuity was found ($F_1(1,14) = 125.46$, $p < 0.001$; $F_2(1,20) = 149.96$, $p < .001$). This means that the factor theme continuity was successfully manipulated. There was no main effect of the factor anaphor type ($F_1 < 1$; $F_2 < 1$). This means that the Experimental Sentence, containing the DefNA or DemNA, did not differ with respect to continuity judgement. No interaction between the factors anaphor type and theme continuation type was found ($F_1 < 1$, $F_2 < 1$). Apparently, the anaphor manipulation in the Experimental Sentence did not affect the continuity judgements of the sentence.

Continuation Sentence

The same two three-way analyses of variance were conducted over the means of the ratings of the Continuation Sentence, one over subjects, one over items. In the subject analysis, subject groups was a between factor, and the factors anaphor type (demonstrative/definite) and theme continuity (continuous/discontinuous) were treated as within factors. In the item analysis, item groups and theme continuity were between factors, and anaphor type was a within factor.

The mean rating scores of the Continuation Sentence are presented in Table 11 as a function of theme continuity and anaphor type of the Experimental Sentence.

Table 11

Mean Rating Scores of the Continuation Sentence as a Function of Anaphor Type and Theme Continuity of the Experimental Sentence

ANAPHOR TYPE	CONTINUITY of Es: Continuous	Discontinuous
DefNA	3.8	4.2
DemNA	3.9	4.2

Contrary to the expectation, there was no effect of the factor anaphor type ($F_1 < 1$; $F_2 < 1$). This means that the Continuation Sentences were not judged as more continuous in the DemNA condition than

in the DefNA condition. In the subject analysis as well as in the item analysis, a main effect theme continuation was found ($F_1(1,14) = 20.42$, $p < .001$; $F_2(1,20) = 6.81$, $p < .05$): Sentences following a continuous Experimental Sentence were considered more continuous than sentences following a discontinuous Experimental Sentence. Note that the sentences of the continuous condition are different from the sentences in the discontinuous condition. Finally, no interaction was found between the factors anaphor type and theme continuity ($F_1 < 1$; $F_2 < 1$).

4.3 Discussion

In this experiment two effects were investigated: the classify effect on the one hand, and an effect of theme continuity in the Experimental Sentence on the classify effect on the other hand. To start with the second effect: although there was a significant main effect of theme continuity for the Experimental Sentence as well as for the Continuation Sentence, this factor did not interact with the factor anaphor type. This means that the continuity of the Experimental Sentence did not influence the continuity ratings of the Continuation Sentence differently under the different anaphor conditions.

Contrary to the expectation, no difference was found between the DemNa and DefNa condition for the Continuation Sentence. Because the expected difference was obtained between the continuity conditions in the Experimental Sentence, it cannot be concluded that subjects are not able to correctly assess the continuity of a sentence. The fact that no effect of the demonstrative anaphor was obtained may nevertheless be due to the task: It is possible that subjects pay more attention to the content of the continuation sentence (which is the same in both anaphor type conditions), as they are instructed to do, than to the linguistic form of the preceding sentence.

A possible interpretation of a difference in continuity ratings between anaphor conditions is that the Experimental and Continuation Sentences had been more natural in one condition than in the other condition: Subjects might have made their continuity ratings (partly) on the basis of the naturalness of the sentences. As this difference in continuity ratings was not obtained, at least one cannot conclude that the anaphoric conditions differed in naturalness.

It has been argued above that a rating task might be inappropriate for measuring the classify interpretation. In the next experiment a more fine-grained method has been used: Sentence reading times were measured, as they reflect comprehension processes more directly.

5 Reading: Experiment 4

In experiment 4 reading times were measured while subjects read the texts for comprehension. This experimental method is based on the idea that the time it takes to read a sentence reflects the ease or complexity of the integration of that sentence. It is assumed that sentences that are relatively easy to integrate with the previous sentence(s), are more easy to comprehend and require shorter reading times than sentences that are more difficult to integrate.

A Continuation Sentence that initiates a new discourse topic (a new class member) should be easier to integrate if the new topic (class member) had already been activated. The demonstrative anaphor should activate such a new class member. Therefore, it was predicted that the Continuation Sentence requires a shorter reading time when it follows an Experimental Sentence in the DemNa condition than when it follows an Experimental Sentence in the DefNa condition.

The activation of the new class member by the demonstrative anaphor should take place during reading the Experimental Sentence. Therefore, the reading times of the Experimental Sentence should be longer in the DemNa condition than in the DefNa condition.

5.1 Method

Subjects

A total of 20 students of the Nijmegen University participated in the experiment. They varied in age between 19 and 28 years, and were paid Hfl 10,- for their participation.

Materials

The materials for the reading experiment were taken from the rating experiment. Of the 24 experimental texts, twelve texts were factual, and 12 were categorical. For the rating experiment conjunctions and adverbs of time and place were added sentence-initially to the Experimental Sentence, meant to enhance the interpretation of continuity and discontinuity, respectively. Apart from any influence of these additions, it caused the superordinate anaphor to be positioned after the finite verb and not, as in the continuation experiments, in sentence-initial position. This could have made the anaphor less salient, and therefore less effective.

In order to place the superordinate anaphor in sentence-initial position, the Experimental Sentence was changed into the form it had in the continuation experiment: the adverbs of time or place and the causal and other conjunctions were removed. In all other respects, the experimental texts remained the same as in the continuation experiments.

The lengths of the Experimental Sentences of the different texts were about the same, as were the lengths of the Continuation Sentences. The DefNa and DemNa version of the Experimental Sentence differed necessarily in length in two characters (*de* vs. *deze*). The length of the Continuation Sentences was exactly the same in both anaphor type conditions. Thus, if any difference is obtained, it can only

be attributed to the experimental manipulation in the Experimental Sentence.

To make sure that the subjects would read for content, the last sentence of each text was used to test whether the subject had read thoroughly. A crucial part was taken out of this sentence and replaced by dashes. Two possibilities for completing the test sentences were constructed. Subjects had to indicate which of the two possibilities was appropriate in the text.

Additionally, six practice texts and four filler texts were constructed. The filler texts were shorter than the experimental texts to vary the moment of the presentation of the test sentences. In this way the subjects could not predict when they would be tested.

Design

Two different lists of texts were constructed. Each list contained the texts in a fixed order. Each text occurred in both anaphor type conditions. Each of the two anaphoric reference conditions was assigned to a different list. Each list contained the same number of texts in each of the anaphor type conditions. The subjects were assigned to lists randomly, each list was assigned to an equal number of subjects. In this way, texts and subjects were counterbalanced.

Procedure

Subjects read the texts from a computer screen sentence by sentence. After heaving read a sentence, they pushed a button, the sentence disappeared and immediately the next sentence appeared on the screen, on the position below the previous sentence. The time between the onset of a sentence on the screen and the button press was registered as the reading time of that sentence. In the last sentence of each text a crucial part was replaced by dashes. Together with this sentence two possibilities to complete the sentence were presented on the left hand and right hand side of the screen, just beneath the last sentence. By pressing the corresponding left or right button on a panel, subjects had to indicate which of the two possibilities they considered to be the appropriate one with respect to the text. After the answer, the next text was presented, starting with the indication ‘NEW TEXT’.

5.2 Results and discussion

Analyses of variance were conducted on the reading time means of the Experimental Sentence and the Continuation Sentence. Two three-way analyses of variance were conducted on the reading time means of the Experimental Sentence, one over subjects, and one over items. In the subject analysis, subject groups was treated as a between factor, the factor anaphor type (demonstrative/definite), and text-type (categorical/factual) were treated as within factors. In the item analysis, item groups and text type were treated as between factors, anaphor type as a within factor. The same three-way analyses of variance were conducted on the reading time means of the Continuation Sentence.

The mean reading times are presented in Table 12 as a function of anaphor type condition.

Table 12

Mean Reading Times of the Experimental Sentence and Continuation Sentence as a Function of Anaphor Type

ANAPHOR TYPE	SENTENCE	
	Experimental	Continuation
DefNA	2018	2182
DemNA	2165	2108

For the Experimental Sentence a marginal main effect of the factor anaphor type was found in the subject analysis: $F_1(1,18) = 2.21$, $p = 0.07$ (one-tailed), and a significant effect in the item analysis: $F_2(1,20) = 8.54$, $p < .01$. The DemNa version of the Experimental Sentence took longer to read than the DefNA version. The difference in reading times is not interpreted as reflecting the difference in sentence length, because the effect of a difference of two characters is too small compared to the obtained difference in reading time.

For the Continuation Sentence a main effect of the factor anaphor type was found in the subjects analysis: $F_1(1,18) = 5.26$, $p < .05$, but only a trend in the item analysis: $F_2(1,20) = 2.10$, $p = 0.08$ (one-tailed). The reading of a Continuation Sentence took less processing time when it was preceded by a demonstrative noun anaphor than when it was preceded by a definite noun anaphor.

If a classify interpretation is reflected by longer reading times for the Experimental Sentence in the DemNa condition than in the DefNa condition, and by shorter reading times for the Continuation Sentence in the DemNa condition than in the DefNa condition, then the interaction between the factors sentence type and anaphor type should be statistically significant in the reading times. Two four-way analyses of variance were conducted. These analyses were the same as the analyses described above, except for the factor sentence type (Experimental Sentence / Continuation Sentence). This factor was a within factor in the subject analysis, and a between factor in the item analysis. The interaction between the factors sentence type and anaphor type was significant ($F_1(1,18) = 4.32$, $p < .05$; $F_2(1,40) = 12.93$, $p < .01$). The results on the reading times for the Continuation Sentence combined with those for the Experimental Sentence can be interpreted as follows: Reading the demonstrative anaphor in the Experimental Sentence resulted in the easier integration of the Continuation Sentence that contained one of the other members. The interaction can be interpreted also as indicating that a demonstrative superordinate anaphor activates co-subordinate class members during the reading of the Experimental Sentence.

In the next experiment a task more directly tapping the activation was used.

6 Lexical decision: Experiment 5

In Experiment 5 subjects had to make a lexical decision while reading a the texts for comprehension. In this technique, a letterstring is presented to the subject and the subject has to decide as fast as possible whether this letterstring is an existing word in the language or not. The time it takes to make this decision is taken to reflect the activation of that word. A comparison of the decision latencies under different conditions indicates the relative activation of the word under those conditions.

After the Experimental Sentence a noun was presented to the subject that was a subordinate of the superordinate anaphor of the Experimental Sentence. This co-subordinate class member was the same as was presented in the Continuation Sentence in Experiment 4. The classify effect of the demonstrative anaphor in the Experimental Sentence should activate co-subordinate class members. Therefore, it is predicted that the lexical decision to the co-subordinate noun should require a shorter decision latency in the DemNa condition than in the DefNa condition of the Experimental Sentence.

6.1 Method

Subjects

A total of 24 subjects participated in the experiment. They were all students at the Nijmegen University, who varied in age between 19 and 27 years. They were paid Hfl 10,- for their participation.

Materials

In a lexical decision task the subject should be presented not only letterstrings that require the decision that they are a word, but also letterstrings that require the decision that they are not a word. The letterstrings that required such a negative decision (the negative test words) were pseudo-words, e.g. ‘bluit’ or ‘jaffer’. The factual text type could not be used in this experiment, because it is a strange task to decide whether a word an existing word of a language, if the word is a proper name, let alone if it is a negative test word that is similar to a proper name, but is not a proper name. As a consequence, only categorical type texts were used as experimental texts. The test words of these experimental texts were always words.

The experimental materials were the categorical texts from Experiment 4. In order to avoid the *strategy* to decide positively if the test word is related to words in the text, as is the case for the experimental test words, the proportion of related test words should be small. Therefore, 30 filler texts were constructed, of which six contained one test word, and 24 contained two test words (either two positive, or two negative test words, or one positive and one negative test word). None of the positive filler test words were related to the text. The factual texts of Experiment 4 were used also as filler texts. For these texts negative test words were constructed and presented at any position in the text. In total, 40 positive test words were presented, and 38 negative test words. In all, 15 % of the test words were related. The test words in the filler text were presented at different positions in the text. In this way the subjects could not predict the moment at which the test words were presented in the texts.

Seven practice texts were constructed to precede the experiment proper. To make sure that subjects would read for content, a number of texts were followed by a question about the content of the text. Questions were constructed for all factual texts, for seven other filler texts, and for two of the practice texts. About half of the questions required a positive answer, the remaining half a negative answer.

Design

Two different lists of texts were constructed. Each list contained the texts in a fixed order. The experimental texts were presented in both anaphor type conditions, but each of the two conditions was assigned to a different list. Each list contained the same number of texts in each of the anaphor type conditions. The subjects were assigned to lists randomly, each list was assigned to an equal number of subjects. In this way, texts and subjects were counterbalanced.

Procedure

Subjects read the texts on a computer screen in a sentence by sentence mode, as in Experiment 4, by pushing a button. At some point in each text, the button press caused two attention asterisks to appear on an otherwise empty screen, in the center of the line where the subject expected the next sentence to appear. After 500 msec., these asterisks disappeared and the test word was presented where the empty space between the asterisks had been. The subjects had to indicate as fast as possible whether the word presented on the screen was an existing word or not, by pressing one of two buttons, the 'yes'-button or the 'no'-button. The time between the onset of the test word and the pressing of the button was registered as the decision latency. The test word disappeared after the button press, and the remaining text was presented in the same way as the text before the test word. In a number of texts the word QUESTION was presented for 800 msec after the final sentence's button press, whereafter the question appeared. After having answered the question, by pressing the 'yes' or 'no' button, the next text was presented, starting with the indication NEW TEXT during 1500 msec.

6.2 Results and conclusion

Two two-way analyses of variance were conducted on the decision latencies, one over subjects, and one over items. In the subject analysis, subject groups was treated as a between factor, the factor anaphor type (demonstrative / definite) was treated as a within factor. In the item analysis, item groups was treated as a between factor, anaphor type as a within factor. The mean decision latencies of the test words of the experimental texts are presented in Table 13.

Table 13

Decision Latencies of Test Word as a Function of Anaphor Type

ANAPHOR TYPE	
DefNA	662

DemNA 637

A main effect was found on the factor anaphor type: $F_1(1,22) = 4.13$, $p = .05$; $F_2(1,10) = 6.26$, $p < .03$. Decision times were shorter when the co-subordinate noun followed a sentence with a demonstrative superordinate noun anaphor than when it followed a sentence with a definite noun anaphor. This difference indicates that activation of the test word must have taken place in the DemNa condition. The demonstrative superordinate noun anaphor in the Experimental Sentence activates the class of other nouns, one of which is presented as the test word.

In conclusion, the lexical decision experiment has demonstrated that a demonstrative superordinate anaphor indeed evokes a non-default classify interpretation.

7 Concluding remarks

In this subtask a classify interpretation of demonstrative anaphors was tested experimentally. Experiments were conducted with four different tasks: continuation, rating, reading, and lexical decision.

In the continuation experiments subjects had to continue text fragments with a sentence. In an unconstrained continuation task more co-subordinate terms were generated by the subjects when the Experimental Sentence contained a demonstrative noun anaphor than when it contained a definite noun anaphor.

In the rating and reading time experiments, texts were presented to subjects in which an Experimental Sentence in one of two conditions -either with a demonstrative noun anaphor, or with a definite noun anaphor-, preceded a Continuation Sentence containing a co-subordinate class member of the class mentioned in the noun anaphor of the Experimental Sentence. In the rating experiment, it appeared that subjects did not consider the Continuation Sentence with the co-subordinate class member more theme continuous when preceded by an Experimental Sentence with a demonstrative anaphor, than when preceded with such a sentence with a definite anaphor. In the reading time experiment, reading times were measured for the Experimental Sentence and the Continuation Sentence. The interaction between the factors sentence type and anaphor type indicated that the demonstrative anaphor must have activated co-subordinate class members during reading the Experimental Sentence, which must have resulted in the easier integration of the Continuation Sentence that contained such a co-subordinate class member.

The lexical decision experiment, finally, measured more directly the activation of the co-subordinate class members. The results showed that the demonstrative superordinate anaphor indeed activates co-subordinate class members of the referent. This constitutes strong experimental evidence for the non-default qualificational nature of the classify type of demonstrative anaphors.

As is stated in the Technical Annex the DANDELION project aims at developing a theory that models the interactions between preferences for and constraints on surface forms that express the same propositions, but are pragmatically different. A domain where this issue manifests itself par excellence is the domain of anaphoric expressions. From a propositional point of view the function of nominal anaphors is to identify a referent in the discourse representation. As far as this identificational function is concerned, demonstrative nominal anaphors are equivalent to definite nominal anaphors. It is argued that the difference in form of these anaphors determines a function of the anaphors that goes beyond identification. Demonstrative nominal anaphors have in addition to their identificational function a function in characterizing the referent. Depending on the specific form of the demonstrative nominal anaphor, this function is an attributing, contextualizing, or classifying function. In this paper empirical support was obtained for the classifying function of demonstrative noun anaphors. By demonstrating the difference between definite noun anaphors and demonstrative noun anaphors this study illustrates contextual constraints of the selection of a particular form of nominal anaphors.

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