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Resolving Referential Ambiguity in English as L2

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As speakers of a certain language, people produce and receive a great amount of linguistic material each day, which they usually process at a really high speed and without much difficulty. However, rarely is this material completely devoid of anything that could cause confusion and make the process of communication difficult. Ambiguities in language belong to this category. This paper deals with the way speakers process ambiguous elements in language, with the aim of determining the means by which speakers assign one or another possible interpretation to an ambiguous linguistic unit. More specifically, we try to determine how speakers choose one or another possible meaning when dealing with an ambiguous structure. In doing so we must note that ambiguity in this paper is dealt with from the theoretical perspective of language comprehension, and not language production, and the analysis is from the viewpoint of the reader, i.e. based on written, rather than spoken language material. The research involved learners of English as L2, with a group of English native speakers as a control group, and the focus is on referential ambiguity. The main goal was to determine the criteria people use in order to identify the referent of an ambiguous pronoun. Furthermore, we also attempt to answer whether age and level of language learning affect the process of sentence comprehension, whether the participants are aware of ambiguity in processing sentences with ambiguous pronouns, whether they tend to eliminate ambiguity in the completion of such sentences and how they treat ambiguous pronouns in a broader context.

Keywords: referential ambiguity, pronouns, second language, English, Croatian

1. Language comprehension

One of the most fundamental skills that we as speakers of a certain language possess is the ability to understand what we hear or read. Therefore, language comprehension represents one of the two elementary language skills that constitute the basis of psycholinguistic research[1]. As Clark/Clark (1977: 43)

[1] The other is language production.

explain, there are two possible definitions of language comprehension. The narrow definition refers to

> '…the mental processes by which listeners take in the sounds uttered by a speaker and use them to construct an interpretation of what they think the speakers intended to convey.'

These processes fall under a more general operation called the construction process, whereas the utilization process describes what happens once listeners extract meaning from sounds and construct the appropriate interpretation. This is language comprehension in a broader sense, and it includes utilizing

> '…this interpretation for further purposes – for registering new information, answering questions, following orders, registering promises, and the like.' (Clark/Clark 1977: 45).

It is important to notice, as Erdeljac (2009) points out, that language comprehension is not a passive, but a dynamic act, during which the listener needs to adequately join an array of linguistic and extralinguistic information to the speech signal in order to construct an appropriate interpretation. Furthermore, in order to understand the message, the listener needs access to the knowledge of the internal structure of language, structured linguistic information, i.e. previous linguistic context, thematic structure, sentence roles, etc., as well as general, encyclopedic knowledge[2]. The final goal of language comprehension is the interpretation of the received message in accordance with speaker's intentions, which includes several levels (phonological, grammatical, syntactic, lexical and semantic) of linguistic analysis of the speech signal, as well as taking into consideration the context of discourse as a whole.

1.1. Sentence comprehension

When listeners are presented with a string of either spoken or written words, it will not be difficult for them to decide whether they understand what is given to them. And it is not just because they understand the meaning of individual words that they will be able to perform this task. Although individual words do carry information, human language cannot rely solely upon words in isolation to carry out the task of communication. The relationship between words also bears meaning, and it is within the structural organization of a sentence that this meaning is conveyed (Fodor 1995). The notion of a hierarchically organized syntactic structure, which is present in the majority of syntactic theories, is based on the idea that

> '…syntactic structures provide the means whereby the meanings of individual words can be combined with one another to add to the information conveyed by language.' (Caplan 1999: 253).

The entire process of computing the syntactic structure of a sentence – determining syntactic categories, forming phrases, identifying grammatical roles

and assigning thematic roles so that one can build a representation of a sentence – is known as *parsing* (Caplan 1999, Harley 2001). Since syntax is crucial for the process of parsing, the information on word order becomes essential. Different languages have different rules restricting the order of words in sentence and for a language such as English[3], word order is a significant factor in parsing, while for highly inflectional languages, such as Croatian or German, word order is less important in this respect (cf. Harley 2001).

Although syntactic processing represents only one of the steps in the overall comprehension process, it certainly plays an important, maybe even essential role.

1.2. Discourse comprehension

As it has already been mentioned, recognizing individual words and building the structure of a sentence are just some of the stages of language processing. However, in order to construct not just a representation of the whole sentence, but also of the whole conversation or a text, one must take into consideration a variety of other factors and execute a series of further operations. As Harley (2001: 311) puts it, the reader or listener needs to

> '…*integrate* these different aspects into a representation of the sentence, to integrate it with what has gone on before, and to decide what to do with this representation.'

Thus, in order to use the meaning of what we have processed in the previous stages of language processing and to decode the communicative purpose of the message, we have to deal with a structure more complex than the sentence – discourse[4] (Harley 2001).

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[2] Encyclopedic knowledge (also known as general, background, socio-cultural, real-world knowledge) is a type of cultural knowledge that speakers have about the way the world is. Charles Fillmore (1977) and George Lakoff (1987) both make the division between the two types of knowledge speakers have in relation to any word. One is linguistic or semantic (a dictionary-type definition) and the other is encyclopedic (Fillmore deals with it in connection with *scenes* and *frames* (cf. note 19) and Lakoff in connection with *idealized cognitive models*), which comes from experience and is rooted in culture. Using a word, then, involves combining both types of knowledge. Furthermore, encyclopedic knowledge is shared by the members of a speech community, which facilitates communication (cf. Saeed 1997).

[3] From a typological viewpoint, English has many similarities with analytic (isolating, root) languages (languages in which all words are invariable and syntactic relationships are shown by the use of word order), rather than with synthetic (including inflecting and agglutinative) languages (in which words contain more than one morpheme and syntactic relationships are shown by changing the internal structure of the words). However, since the distinction between these two categories is not always clear-cut, one cannot say that English is a purely analytic language (Crystal 1985).

[4] American linguistic tradition tends to draw a distinction between text and discourse along the lines of written vs. spoken, which is reflected in Harley's (2001: 311) definition of discourse as 'the spoken equivalent of text' and text as 'printed or written material,

Discourse represents a linguistic unit that is higher on the organizational level than the sentence. Caplan (1999: 359) explains that everything which is characteristic of every linguistic level up the hierarchy, is also very important for discourse, namely that

> '…the level of discourse structure introduces new semantic features into language. Among these features are what the topic of a sentence or a portion of the discourse is, which ideas are leading ideas and which are subordinate, what information has previously been presented in the discourse and what has not, what information a speaker can assume the listener should know and what information has to be explicitly presented in a new sentence, and others.'

For the reader or the listener, it is important that the discourse makes sense, i.e. that it is both cohesive and coherent.[5] Processing discourse thus becomes highly constrained and dependent on several different factors. Namely, discourse structures are different from other linguistic structures, since processing the former requires that the listener make a number of inferences based on what is directly present in the discourse. Furthermore, both the speaker and the listener need to operate on the assumption that they are aware of the complex rules involved in the process of encoding and decoding a discourse structure, some of which include access to long-term memory, keeping track of what has been said, shifting attention, having access to world-knowledge, etc. (Caplan 1999).

1.3. The role of context and memory

In normal, everyday use of language, a linguistic unit is rarely devoid of other influences, linguistic as well as non-linguistic or, in other words, it is highly dependent on context. Context, therefore, can be described as the linguistic material which is found near or adjacent to the linguistic unit in question on the one hand, and as the extralinguistic (physical) world in relation to which language is used on the other[6] (Crystal 1985). Linguistic context is especially important for

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usually longer than a sentence'. However, when dealing with discourse, linguistic structuralism takes a different perspective and looks at discourse as any structure bigger than a sentence, disregarding the medium and looking at the relations between different parts of discourse (cf. Harris 1951 and Schiffrin 1994).

[5] Cohesion, in most linguistic theories, refers to the use of grammatical units for achieving semantic integrity, while coherence includes a more general interconnection of different parts of discourse, an overall continuity in meaning (cf. Harley 2001). According to Gernsbacher (1990), there are four types of coherence, each of which is rooted in different logical or semantic device. *Referential coherence* refers to consistency in who or what is being talked about, while *temporal coherence* refers to consistency in when the events occur. *Locational coherence* refers to consistency in where the events occur, and *causal coherence* refers to consistency in why events happen.' (cf. Harley 2001: 312).

[6] Some linguists make a terminological distinction and refer to the immediate linguistic context as co-text and the non-linguistic context as context or situational context (cf. Yule 1998).

referring expressions since it limits the range of possible interpretations. As Yule (1998) points out, referring expressions provide a number of possible referents, which is known as a range of reference, and it is the role of linguistic context to guide the listener or the reader towards the correct interpretation.

Physical context (also known as situational context) is also necessary for a complete understanding of a linguistic unit. According to Crystal (1985: 71),

> 'In its broadest sense, situational context includes the total non-linguistic background to a text or an utterance, including the immediate situation in which it is used, and the awareness by speaker and hearer of what has been said earlier and of any relevant external beliefs and PRESUPPOSITIONS [sic].'

Situational context is essential for the interpretation of referring expressions since it includes not just the features of the physical situation in which a unit is used, but also the characteristics of the people using it and the knowledge of the situation in which it is used (Yule 1998). Therefore, in order to correctly understand a sentence such as *Table two ordered Greek salad*, the listener needs to be aware that the context is the restaurant, the tables are numbered and the staff uses these numbers to correctly deliver the orders.

Memory functions play yet another vital role in language comprehension. This is not surprising since memory is a key factor in all forms of human complex thinking. More specifically, Working Memory is a type of memory which is crucial for both production and understanding of language because 'both producing and comprehending language require the processing of a sequence of symbols over time' (Carpenter/Miyake/Just 1994: 1075). The role of Working Memory is twofold: it functions as a temporary storage of information extracted from the linguistic input or retrieved from Long Term Memory, as well as a transformational unit for converting units of thought into linguistic units and vice versa. Working Memory has a limited capacity; both in terms of storage and the amount of language operations it can undertake (Field 2006). Therefore, certain language situations represent a constraint on the capacity of Working Memory, which is demonstrated by the duration and accuracy of language processing. Such situations include highly complex sentences, which affect the speaker's reading span, and linguistic ambiguity, the processing of which demands additional memory capacity. In order to compensate for these limitations, when processing language, people need to combine smaller units into bigger pieces of information, transform them into abstract units and rapidly transfer them into Long Term Memory (Carpenter/Miyake/Just 1994; Field 2006).

When it comes to linguistic units larger than a sentence, Working Memory limitations may have an effect on how readers integrate different information scattered through larger chunks of discourse. According to Carpenter/Miyake/Just (1994: 1085), studies have shown that'…readers with larger working memory spans were better at interconstituent or intersentential integration, presumably because they were able to maintain more information in an activated state'.

Therefore, our understanding of the message presented to us (whether written or spoken) depends not just on the linguistic structure, but also on the extralinguistic situation and the features of our cognitive abilities.

2. Ambiguity

The study of language comprehension, especially the study of the structure of the syntactic and semantic components of language, relies heavily on empirical data. An important role in building and evaluating models of language processing has been assigned to ambiguity (*The MIT encyclopedia* 1999). *The MIT encyclopedia of the cognitive sciences* (1999: 14) defines ambiguity in the following way: 'a linguistic unit is said to be ambiguous when it is associated with more than one meaning', while MacKay/Bever (1967: 193) opt for a more psychological version: 'any stimulus pattern which is capable of two and only two distinct interpretations is ambiguous'. A more technical definition is also presented in *The MIT encyclopedia* (1999: 14): 'the term ambiguity is used to describe only those situations in which a surface linguistic form corresponds to more than one linguistic representation'. What can be understood from these definitions is the fact that ambiguity is encountered in any linguistic situation in which there is more than one possible interpretation.

2.1. Types of ambiguity

According to *The MIT encyclopedia of the cognitive sciences* (1999) there are four basic types of ambiguity in language[7]: lexical, syntactic, scope ambiguity and referential ambiguity. Lexical ambiguity is present when a single lexical unit has more than one independent meaning (and as such must be distinguished from polysemy[8], although the boundaries are not always clear-cut). The most cited example is the lexeme *bank* with its two distinct meanings: 1) a financial institution, and 2) a riverbank. Furthermore, ambiguity may arise from syntactic category, not just meaning (e.g. *watch* as a verb and a noun, and *patient* as a noun and an adjective). According to Harley (2001), context plays a crucial role in resolving this type of ambiguity.

Syntactic ambiguity (often referred to as structural or grammatical ambiguity) occurs when a sentence, consisting of unambiguous words, has more than one possible interpretation. Harley (2001) distinguishes between less and more complex types of syntactic ambiguity. The former include bracketing types of ambiguities, which can be found on the phrase structure level (as in the example *Young men and women were asked to come early*, where the adjective modifies either one or both of the nouns), while the latter are associated with parsing[9], as in the

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[7] This paper deals with what Harley (2001: 247) calls *permanent* or *global ambiguity*, i.e. sentences which are still ambiguous once read completely. Many sentences can also be locally (temporarily, transiently)

[8] ambiguous, but their ambiguity is resolved by the material located after the ambiguous part. The so-called *garden path* sentences are an example of local ambiguity (Harley 2001). Polysemous words have more than one interrelated meaning (Harley 2001).

[9] MacKay/Bever (1967) refer to these two types of syntactic ambiguity as ambiguity at the surface structure level and ambiguity at the underlying structure level respectively.

sentence *We saw the monkeys going to the post office*. The two possible interpretations of this sentence – *We saw the monkeys while we were going to the post office* and *We saw the monkeys while they were going to the post office* – can both be attributed their respective descriptions in the form of a tree diagram, which is often used to illustrate the difference in the meaning of such sentences (Harley 2001)[10].

Scope ambiguity is not as straightforward as the previous two types. Often considered controversial, scope ambiguity is found in sentences such as *Some woman tolerates every man* and *John doesn't think the King of France is bald*[11]. The first sentence has two possible interpretations: *There exists a single woman who tolerates each and every man* and *Every man is tolerated by at least one woman (any woman, not one in particular)*, and possible interpretations of the second sentence are: *John believes that the King of France is not bald* and *John does not hold the belief that the King of France is bald*. As it is clear from the examples, it can be argued that scope ambiguity relies more on the logical, rather than structural form of a sentence[12]. Moreover, it is difficult to devise syntactic tests for scope ambiguity, which would help reveal the underlying structure.

Referential ambiguity is a type of ambiguity which involves

> '…not multiple possible structures, but rather, multiple associations between linguistic expressions and specific entities in the world.' (*The MIT encyclopedia* 1999: 14).

This type of ambiguity is in the focus of interest of this paper.

2.2. Models of processing ambiguous sentences

When it comes to language comprehension, linguists believe that devising models for processing ambiguous sentences helps to discover the mechanisms that govern the comprehension of unambiguous sentences. Foss/Bever/Silver (1968) claim that readers and listeners are able to detect ambiguity in everyday sentences and are able to describe it. However, although a great number of everyday sentences are in fact ambiguous, this ambiguity usually goes unnoticed in normal, regular discourse. This then affects the construction of a model of sentence comprehension, since it is not clear how many structures are actually

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[10] More on processing structural ambiguity in Harley (2001).

[11] Examples from *The MIT encyclopedia of the cognitive sciences* (1999).

[12] In semantic and philosophical discussions, there is often a distinction between ambiguity and vagueness.
'An ambiguous sentence is formulated as having more than one distinct structure; a vague sentence, on the other hand, permits an unspecifiable range of possible interpretations (i.e. is unstatable in syntactic or PHONOLOGICAL [sic] terms).' (Crystal 1985:15).
Following this distinction, scope ambiguity could be classified as vagueness, rather than a type of ambiguity.

formed in the process of sentence analysis. According to Foss/Bever/Silver (1968), three alternative models of this process can be constructed[13].

The first model assumes that the listener or the reader recognizes only one of the meanings of an ambiguous sentence and, therefore, constructs and maintains only one structure, unless further input or context suggest otherwise (Foss/Bever/Silver 1968, Caramazza/Grober/Garvey/Yates 1977). In other words, the listener or the reader does not perceive the sentence as ambiguous. MacKay (1966: 426) refers to this as the Suppression Hypothesis and defines it as 'the perceptual domination of one of the meanings of ambiguous sentences over the other'. Presumably, the suppression of one meaning consumes time and effort; therefore, ambiguous sentences take longer to be processed than those which are unambiguous.

The second model is based on the idea that listeners or readers are fully aware of all the possible syntactic structures and meanings of an ambiguous sentence which they then use (or fuse) in order to come up with a single interpretation (MacKay 1966, Caramazza/Grober/Garvey/Yates 1977). Namely, what this model suggests is that listeners or readers actively employ the information about possible syntactic and semantic interpretations of a sentence to reach a single, final interpretation. Furthermore, this model predicts no differences in the time of processing ambiguous and unambiguous sentences and is referred to by MacKay (1966) as the Fusion Hypothesis.

The Oblivion Hypothesis is MacKay's (1966) term for the third model of comprehension which assumes that listeners or readers do not assign any syntactic or semantic interpretation to an unanalyzed sentence until further unambiguous context allows for the resolution of ambiguity and construction of single interpretation. The assumption is that listeners or readers hold the unanalyzed string of words in suspension for a brief period of time until enough context provides the resolution of ambiguity (MacKay 1966, Foss/Bever/Silver 1968). It is thus presumed that ambiguous sentences should take longer to complete than unambiguous sentences.

The first model seems to account best for what is typical in everyday normal communication. It is highly unlikely that after hearing or reading a sentence, speakers immediately become aware of all the possible meanings (in cases with ambiguity). Some interpretations (or only one interpretation) may be more prominent (or dominant) in the mind of the speaker, and thus more easily triggered. However, context is important and if the context suggests a different interpretation, it is possible for speakers to change their initial reading. In that case, speakers are aware of the existence of more than one meaning, but they become so at a later stage of language processing. Also, it seems more plausible that ambiguous sentences require more time for processing than unambiguous sentences.

[13] Foss/Bever/Silver (1968) adopt the three models MacKay (1966) introduces, while Caramazza/Grober/Garvey/Yates (1977) distinguish between only two models, the first and the second in this paper.

In order to test some of these theoretical postulates, both MacKay (1966) and Foss/Bever/Silver (1968) devised studies of comprehension and verification of ambiguous sentences.

The results of MacKay's (1966) study support the claim that it takes longer for people to complete ambiguous sentences than the ones which are unambiguous, despite the fact that the participants reported not being aware of the ambiguity in the sentences during testing. Furthermore, the completion time for sentences grew with the number of ambiguous elements the sentences contained. These results are consistent with the Suppression and Oblivion Hypotheses.

On the other hand, Foss/Bever/Silver (1968) assumed that the Suppression Hypothesis model is valid for normal sentence comprehension, i.e. due to the speed of typical language comprehension (which is under one second) and in case there is no disambiguating context present, people tend to select one possible interpretation for ambiguous sentences. Foss and his associates devised an experiment in which the participants heard an ambiguous or an unambiguous sentence, and were presented with two pictures representing the meaning of the sentence. They were then asked to decide whether the pictures were "right" or "wrong", in other words, they needed to decide which picture represented the meaning of the sentence. The results of this study showed that their initial hypothesis was correct and that the Suppression Hypothesis model provides the best description of normal sentence comprehension. However, if the initial interpretation of a sentence turns out to be unsatisfying, listeners or readers will reinterpret it. This model, unfortunately, does not make predictions towards which of the interpretations listeners or readers are going to be biased.

Although neither of the studies provide definite answers to the problems of constructing models of comprehension, they give significant insight into what could work best and what needs to be taken into further consideration.

3. The notion of referential ambiguity

In a strictly grammatical sense, a pronoun is 'a grammatical grade of words that can stand for nouns or noun phrases' (Harley 2001: 423). When encountered in discourse, pronouns are treated as referring[14] expressions, i.e. speakers use them to refer to nominal entities in the discourse. The relationship between the full nominal expression and the referring pronominal expression is defined as the

[14] Moving away from the traditional semantic view which treats reference as a relationship between expressions in text and entities in the world, and focuses mostly on lexical meaning, the term 'reference' is used here in the pragmatic sense in which Brown/Yule (2007: 205) use it: 'That function whereby speakers (writers) indicate, via the use of a linguistic expression, the entities they are talking (writing) about'. The emphasis here is on the speaker and, more precisely, on the dynamics of the speaker-hearer relationship. Thus, 'successful reference depends on the hearer's identifying, for the purposes of understanding the current linguistic message, the speaker's intended referent, on the basis of the referring expression used' (Brown/Yule 2007: 205).

antecedent – anaphor relation (Brown/Yule 2007). Coreference is a term used to describe a situation in which two linguistic expressions refer to the same thing (Harley 2001). Although the term anaphora in theoretical linguistics may be used to denote a situation where 'two nominal expressions are assigned the same referential value or range' (*The MIT encyclopedia* 1999: 20), in this paper the focus is on pronominal referring expressions, i.e. pronouns and noun phrases which function as their antecedents. In the pair of sentences *John picked up a ball*. *He then threw it as far away as he could*, the noun phrases *John* and *ball* are antecedents of anaphors *he* and *it* respectively. As Harley (2001) points out, it is the task of the listener or the reader to match the anaphors with their respective antecedents. This process is called anaphor resolution and it is one of the operations which help establish cohesion in discourse. However, the problem arises when there is more than one possible antecedent matching an anaphoric expression. The reader or listener is then faced with the case of referential (or anaphoric) ambiguity.

Corbett/Chang (1983) explain that the process of resolving referential ambiguity and assigning the correct antecedent to an anaphoric pronoun is not a simple one. Although pronouns themselves provide the basic semantic cues for narrowing down the intended antecedent (gender and number – e.g. the antecedent of *he* must be masculine, and the antecedent of *they* must be in plural), these constraints are often insufficient for a definite identification of the antecedent.

> 'To disambiguate a pronoun, therefore, it is generally necessary to encode the clause containing the pronoun and to integrate semantic and syntactic information in that clause with earlier clauses in the text.' (Corbett/Chang 1983: 283).

Furthermore, Corbett/Chang (1983) provide two general models of the pronoun assignment process, which includes the retrieval of potential antecedents and the selection of the actual antecedent with the help of clausal context:

1. the *unique-access* model, which relies on the assumption that only one antecedent of the pronoun is accessed in memory, while other potential antecedents are not taken into consideration. Semantic context is used for the identification of the intended antecedent. Presumably, the clause with the pronoun is encoded before the process of the pronoun assignment starts, which means that the information from the two clauses is already integrated and ready to be used for the identification of the right antecedent.
2. the *multiple-access* model, which, on the other hand, suggests that the pronoun encountered in the discourse is a cue for the activation and retrieval of potential antecedents from memory. As it has already been mentioned, the pronoun itself does not contain enough information for the retrieval of the intended antecedent. However, if the process is somehow restricted - for example, to constituents highly available in memory – such as antecedents which appear later, rather than earlier in discourse – it may produce a single antecedent. (Corbett/Chang 1983).

The results from Corbett/Chang's (1983) study[15] seem to support the multiple-access model, since there was no evidence obtained that the clausal semantic context limits access to only one antecedent. On the contrary, the conclusion of the study was that when a listener or a reader encounters a pronoun in discourse, they immediately access all the potential antecedents in the previous clause.

However, what is most interesting, and what this paper focuses on, is trying to identify the strategies and factors which in the end help the speaker choose one of the many possibilities.

3.1. Referential ambiguity resolution

In everyday communication people are constantly confronted with sentences such as *Tom sold the house to John because he offered a good price* or *Jane angered Mary because she had stolen a tennis racket*[16]. Although the pronoun has two potential antecedents in both examples, a listener or reader will have no trouble deciding what the actual antecedent is. The cues and information people use in order to build a final interpretation of a sentence containing referential ambiguity are called *coping strategies* (cf. Harley 2001). Listeners and readers use a number of such strategies which help them attach an anaphoric pronoun to its intended antecedent. These strategies differ according to the linguistic level which serves as their basis, and they will be described accordingly.

A strategy which relies heavily on the syntax of the sentence is called *parallel function* (Harley 2001; McNeill 1987; Grober/Beardsley/Caramazza 1978; Sheldon 1974). In dealing with the acquisition of relative clauses in English Sheldon (1974) introduced the notion of parallel function and claimed:

> 'In a complex sentence, if coreferential NPs have the same grammatical function in their respective clauses, then that sentence will be easier to process than one in which the coreferential NPs have different grammatical functions. The grammatical function of the relative pronoun will be interpreted to be the same as its antecedent.' (Sheldon 1974: 274)

Although she defined parallel function with respect to the way children process sentences in English, Sheldon (1974) did point out that in the grammar of adult English, parallel function has an impact on pronominalization and functions as a 'constraint on the interpretation of pronouns and their antecedents in conjoined sentences' (1974: 279). What this essentially means is that speakers tend to match anaphors to the antecedents in the same position, i.e. with the same parallel grammatical function. For example, if readers or listeners are faced with a complex sentence with the pronoun in the second clause in the subject position they will prefer to interpret it as coreferential with the NP in the subject

[15] The aim of the study was to examine the relationship between the process of retrieving potential antecedents and using clausal context to identify the intended antecedent (Corbett/Chang 1983).

[16] Example from Caramazza/Grober/Garvey/Yates (1977).

position of the first clause. Consequently, if the pronoun actually matches the NP in some other position in the sentence, it will be more difficult to understand such a sentence (Harley 2001). Grober/Beardsley/Caramazza (1978) adopted the term parallel function in their study on the effect of syntactic factors on the assignment of pronoun antecedents. They also wanted to see how much of the semantic content of the sentence impacts the process of assignment, as well as how semantics restricts syntax in such cases[17]. What they found out was that parallel function in fact does have a major role in pronoun assignment process. As Grober/Beardsley/Caramazza (1978: 128) explain,

> '…the pronoun in the subject position of the subordinate clause was interpreted as being coreferential with the NP that had the parallel grammatical function in the main clause.'

This was true in over 70% of all test examples. However, they also concluded that the semantics of the verb restricted the applicability of parallel function.

The semantics of the verb is the basis of yet another coping strategy – implicit causality. Garvey/Caramazza/Yates (1976) claim that semantic properties of the verb are what is important, maybe even dominant, in determining the appropriate antecedent. Since verbs specify the relationship between the participants of an action, implicit causality is defined as a semantic feature of the verb which marks one of the two possible NPs as the instigator or the causal source of the action expressed in the clause with the antecedent (Garvey/Caramazza/Yates 1976; Caramazza/Grober/Garvey/Yates 1977). In other words, 'certain verbs code the direction of cause and effect' (McNeill 1987: 82), and readers and listeners use this feature to select the antecedent of the pronoun. For example, the verb *telephone* implies that the action is caused by the first NP or the Agent (e.g. *Mark telephoned Tom because he wanted some information*.), while the verb *criticize* implies that it is the second NP which causes the chain of events (e.g. *Mark criticized Tom because he withheld some information*.). With action verbs, it is usually the Agent which causes the action (these verbs are marked as NP1 verbs) and with state verbs the Stimulus is the instigator (these verbs are marked as NP2 verbs). It is important to notice, however, that implicit causality is not a binary feature; verbs differ in terms of the degree to which they determine or restrict the assignment of the antecedent (Garvey/Caramazza/Yates 1976). Garvey/Caramazza/Yates (1976) presented empirical evidence for their claims. In two experiments they conducted, groups of participants needed to complete sentence fragments in the form *NP1 V NP2 because pronoun* (e.g. *John telephoned Bill because he*…). Although they were mostly unaware of the ambiguity of the sentences, the participants were consistent in assigning the pronoun to the antecedent according to the direction of the implicit causality of the verb. Caramazza/Grober/Garvey/Yates (1977: 606) see the explanation for this in the fact that 'one of the major social

[17] Grober/Beardsley/Caramazza (1978) asked their participants to complete sentence fragments and added two semantic variables to the fragments: a modal auxiliary verb and the connective *but* instead of *because* in a certain number of sentences.

functions of language is to give reasons for actions', and it appears that people process sentences faster if the anaphor-antecedent relation reflects the verb's causality feature. Nevertheless, it is important to stress that the impact of implicit causality can be restricted and is often just one of the factors that influences the assignment of antecedents (cf. Grober/Beardsley/Caramazza 1978, Garvey/Caramazza/Yates 1976).

Implicit causality is not the only verb-based feature that influences the process of pronoun assignment. Caramazza/Grober/Garvey/Yates (1977) describe a restriction on coreferentiality called The Experiencer Constraint**.** Namely, the Experiencer is a thematic role assigned to verbs which describe introspective states and emotions such as *bore, amaze, like, scare*, etc. If such verbs mark the object of the sentence as the experiencer of the emotion, then the subject is the cause of the emotion, and vice versa. The Experiencer Constraint is applicable to complex sentences which have a state verb and the object position pronoun in the second clause and a declarative communication verb in the first clause, e.g. *Mark told Jim that Andy bored him*. The pronoun in the second clause is assigned to the subject of the first clause, in this case to *Mark*. However, this constraint only functions if the pronoun is in the object position of the second clause. Otherwise, the sentence is potentially ambiguous (*Mark told Jim that he bored Andy*). Caramazza/Grober/Garvey/Yates (1977: 607) explain that the Experiencer Constraint reflects the principle by which

> '…the person who has experienced an emotional state, a private experience, is in an epistemologically privileged position to make statements about that state.'

Thus in everyday conversation people expect that the person who has experienced something would be the speaker explaining the event, rather than someone else. Furthermore, it appears that listeners or readers have less problems resolving pronoun assignment in sentences with the Experiencer Constraint than in unconstrained sentences (cf. Caramazza/Grober/Garvey/Yates 1977).

A big group of coping strategies contains strategies dependent on the emergent discourse model. Some of them include: recency, plausibility, accessibility and the given-new strategy.

The recency effect implies that it is easier to identify the antecedent of the pronoun when it is situated closer to the anaphor; the distance can refer to the number of intervening words or clauses (McNeill 1987, Harley 2001). A study by Clark/Sengul (1979) showed that people could understand sentences faster (the difference being measured in milliseconds) if the coreferring nouns of the pronouns in these sentences were closer (e.g. just in the preceding clause), rather than further away (two or three clauses earlier in the discourse). Garrod/Sanford (1994) see the reason for this in the fact that very recently mentioned referents tend to be in the focus of the reader's attention. Moreover, there are factors which may contribute to longer term focusing, such as introducing the referent by proper name in short narrative passages. Harley (2001: 324) also proposes that in some cases frequency might affect the process of pronoun assignment, since

it seems that speakers are biased 'to select the referent in the model that is most frequently mentioned'.

In some examples, however, there is a need for the use of our background knowledge and elaborative inferences in order to find the right antecedent. McNeill (1987) refers to this strategy as plausibility and explains that in some cases matching the pronoun with the antecedent has to agree with a plausible scenario[18]. This is heavily influenced by the speakers' background knowledge and requires from speakers to draw inferences based on what they hear or read, as well as what they know. Thus in the sentence *Henry went to the party while John minded the store; he ate all the canapés*[19], the pronoun *he* is ambiguous, but the scenario where Henry is the referent of *he* is much more plausible than the one in which John would be the referent. Moreover, as McNeill (1987: 82) points out, 'the greater the difference in plausibility between alternative pronoun interpretations, the faster the interpretation.'

A very important factor for comprehension and construction of discourse is the information structure, namely the way new information is introduced with respect to what is already known (given). The given-new (also known as old vs. new, known vs. unknown, shared vs. new) relation directly influences the cohesion of discourse and the comprehension of pronouns (Harley 2001). It is not easy, however, to define what counts as new and what as given in discourse. It seems that when people enter a conversation, whether spoken or written, they do so with a belief that 'each clause or utterance contains elements the speaker believes he holds in common with the listener and elements the speaker believes he does not' (Tomlin/Forrest/Pu/Kim 2011). Furthermore, it is believed that participants in a conversation function in such a way that they agree to introduce new information in a way in which it will be easy to incorporate it with what is already known. This is referred to as the given-new contract (Clark/Haviland 1977). Along with the view that given information represents a referent which in

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[18] This notion of a *scenario* may be linked to Fillmore's (1977, 2003) notion of *scene*, which he introduces in his papers on lexical semantics, and to what is in cognitive linguistics referred to as the *ground*. In an attempt to describe the connection between the knowledge of the world and the knowledge of the language, as well as offer an approach to describing different structures of meaning, Fillmore (1977, 2003) distinguishes between *scenes*, *schemas* and *frames*. When one speaks about real-world experiences, object and actions, as well as memories of them, one refers to *scenes*. *Schemas* refer to conceptual frameworks which are used in the process of categorization of objects, actions, etc. and *frames* are linguistic units which are used in any language to name and describe the categories in the schematic framework.
'The integration of these concepts can be talked about in this way: from experiences with real-world scenes, people acquire conceptual schemata; in the acquisition of schemata, sometimes items from language frames are learned for labeling these and their parts; *words* from a language frame activate in the mind of the user the whole frame and the associated schema (…)' (Fillmore 2003:251).
In cognitive linguistics, the context of a speech event (the participants and their shared knowledge, the time and place, previous discourse, etc.) is described as the *ground.* The process which locates an entity with respect to the ground is *grounding* (Taylor 2002).

[19] Example from McNeill (1987).

a way is shared both by the speaker and the listener, another basic idea behind the given – new relation is that given information represents a cognitively activated referent (Tomlin/Forrest/Pu/Kim 2011). This, then, influences the way different types of information are represented in discourse. According to Tomlin/Forrest/Pu/Kim (2011), who summarize different authors dealing with this phenomenon, if a concept is already active in the listener's mind, it will probably be pronominalized, as opposed to concepts which are not active in the listener's mind and will thus be nominalized. Consequently, old, known or given entities will most likely be verbalized as pronouns or definite NPs, while new entities will be verbalized as indefinite NPs. In cognitive terms, if the speaker believes that the referent is highly mentally accessible to the listener or the reader, they will express it in the form of a pronoun. Otherwise, the speaker uses either a definite NP for referents with lower accessibility, or an indefinite NP for referents with very low accessibility.

It is important to note, however, that the distinction between given and new is contextually established and most easily marked in spoken language with the help of different intonation patterns (Halliday/Hasan 1976; Greenbaum/Quirk 2006). In written language, as Halliday/Hasan (1976) point out, one can mark the information structure using punctuation marks. Still, punctuation cannot fully express information structure and is often

> '…a compromise between information structure (punctuating according to intonation) and sentence structure (punctuating according to the grammar).' (Halliday/Hasan 1976: 325).

On the other hand, theme and rheme are two elements of discourse which are linguistically defined and which depend both on the prosody and the position they are given during the construction of a message. More specifically, when it comes to information structure, the initial part, the first element of each sentence, is called theme, while the remainder is known as rheme (Halliday/Hasan 1976). Furthermore, there is a parallel with given and new relation, since it is presumed that the initial element in every message carries the known information and the rest is new information. Greenbaum/Quirk (2006) use the term focus, instead of rheme, when they describe the bearer of new information (this can range from a syllable to a whole clause) in a message, which is, in principle, situated at the end of an information unit. However, in certain cases, and mostly for communication purposes, speakers can reverse the position of these two elements in a sentence and move the focus from the predictable end position to another position. This happens when speakers want to emphasize, contrast or correct part of the message and is known as marked focus. In addition, marked focus is expected in some sentences and with some verbs. As Greenbaum/Quirk (2006: 401) point out,

> 'In certain circumstances, it is quite normal to have the focus on a noun phrase as subject of a clause, in violation of the end-focus principle. This is frequently because, with the subject concerned, the predicate is relatively predictable and thus has lower communicative dynamism.'[20]

[20] This happens most frequently with intransitive verbs (Greenbaum/Quirk 2006).

Such observations on the nature of information structure have already been noticed by Grober/Beardsley/Caramazza (1978), who used it to support their claims about the effect of parallel function strategy on the resolution of referential ambiguity. Namely, since the theme is most often the subject of the sentence (the person or the thing that is being talked about), and there is often a parallel between the theme of the subordinate and the theme of the main clause, Grober/ Beardsley/Caramazza (1978) conclude that a listener or a reader confronted with an ambiguous sentence would use a strategy which connects the theme of the subordinate clause with the theme of the main clause. If a pronoun is the subject of the subordinate clause, the principles of parallel function dictate that the antecedent of the pronoun needs to be the grammatical subject (the initial NP) in the main clause.

It is important to note that speakers rarely rely upon a single strategy when assigning antecedents to pronouns. Rather, it is more probable that they combine strategies which go in favor of what they think is the antecedent of the pronoun.

4. A study into processing sentences with ambiguous pronouns

In order to determine how speakers process sentences with potentially ambiguous pronouns, we designed and conducted an experiment with a threefold aim:

- to see whether speakers perceive the sentences as ambiguous, that is to see if they are aware of more than one possible interpretation;
- to identify the factors which contribute to pronoun antecedent assignment;
- to analyze the means which speakers use in comprehension of discourse containing a possibly ambiguous pronoun.

Our specific interest was to see how speakers with different levels of L2 proficiency process sentences with ambiguous pronouns. The assumption was that speakers with a higher level of proficiency would be more successful in dealing with referential ambiguity, i.e. they would perceive more sentences as ambiguous and resolve the ambiguity. Moreover, we expected speakers with different levels of language proficiency to rely upon different strategies when deciding about the pronoun antecedent in both sentences and discourse.

4.1. Participants

Four groups of informants participated in the experiment: two groups of high-school students of different age and level of language proficiency, one from the 1st grade (HS1) and one from the 4th grade (HS4), one group of English majors (EM) and one group of native speakers of English (NS). The high-school students and the English majors were all native speakers of Croatian who had been learning English as a second language. None of them were simultaneous bilinguals. The high-school students were from the Vladimir Prelog Science School in Zagreb[21],

[21] We would like to the thank Ms. Andrea Pongrac, the English teacher, for her kind help in conducting this experiment.

and the English majors all attended the Faculty of Humanities and Social Sciences at the University of Zagreb. The native speakers were all native speakers of British English. HS1 had been learning English for 9 years on average, while HS4 and EM had been learning English for an average of 9.5 and 19.8 years respectively. All of the participants participated voluntarily and anonymously, and were in no way recompensed for their participation in the research.

Participants	Overall number of participants	Number of male participants	Number of female participants	Average age	Average time learning English (in years)
HS1	21	8	13	15.45	9
HS4	26	13	13	17.65	9.5
EM	19	3	16	23.57	19.8
NS	4	2	2	32.75	-

Table 1. Basic information about the participants

4.2. Method

The participants were presented with a written survey that consisted of two parts. The first part comprised 30 incomplete sentences with two noun phrases[22] in the first clause and a pronoun at the beginning of the second clause[23]. Half of the sentences were devised as ambiguous, that is, the pronoun could be interpreted as referring to either the first or the second noun phrase in the first half of the sentence, and the other 15 sentences were similar in form and meaning, but without pronoun ambiguity[24]. The sentences were presented in random order and the participants were asked to complete the sentence fragments so that the finished sentence made sense. They were given 5 minutes to complete this task. They were then asked to circle those sentences which they considered ambiguous, that is, for which they could find an alternative interpretation. In addition, they were also instructed to write down the alternative interpretations.

In the second part of the survey, the participants were presented with four short discourse fragments, each consisting of longer, mostly complex sentences, but neither comprised more than three sentences. Each of the fragments contained

[22] One of the sentences contained three noun phrases as possible antecedents.

[23] Four examples (two pairs of sentences) consisted of one full sentence (with one or two clauses containing the noun phrases) and one incomplete sentence (with only one clause containing the pronoun). Two examples (one pair of sentences) consisted of a sentence containing three clauses, with the pronoun in the third clause.

[24] Ten ambiguous sentences were taken from an experimental task devised by Field (2006), while five more were added by the authors of this paper.

a pronoun and two possible noun phrases as antecedents. The participants were asked to match the pronoun with the noun phrase which they think is the antecedent, and to explain their answer[25]. Example sentences and discourse fragments are presented in Appendix 1.

The participants had 20 minutes to complete the entire survey.

4.3. Results and Discussion

4.3.1. First task

The overall quantitative results for the first task are presented in Table 2.

Participants	**Completed sentences (A and UA*)**	**Sentences still ambiguous after completion**	**Sentences recognized as ambiguous**	**Number of resolved ambiguities**
HS1	15.71 (A- 8.09 UA- 7.61)	2	2	0.33
HS4	21.38 (A- 11 UA-10.38)	1.88	3.11	1.11
EM	29.89 (A- 14.89 UA- 15)	1	10.31	7.52
NS	29.75 (A- 14.75 UA- 15)	0.25	6	4

*A- ambiguous, UA – unambiguous

Table 2. Quantitative data for the first task stating the number of sentences per participant

As it had been expected, the results have shown that the participants were aware of ambiguity but to a varied degree. As to the number of completed sentences, it increased with speakers' age and their level of language proficiency[26]. Naturally, there were participants in each group who had a higher score than the group average; yet, the fewest of these were in HS1. In addition, participants from this group completed the sentences with fewer words than the participants from other groups. Furthermore, all four groups had a relatively low score regarding the number of sentences still ambiguous after completion[27]. A very interesting

[25] Discourse fragments were taken from Brown/Yule (2007) (the first two examples) and Tomlin/Forrest/Pu/Kim (2011) (the last two examples).

[26] In this study language proficiency was determined on the basis of the number of years the participants had been learning English, with the assumption that the longer one had been learning a foreign language, the higher their level of proficiency is.

[27] Sentences which provided no clues as to which of the noun phrases was the antecedent of the pronoun.

piece of data is the number of sentences correctly recognized as ambiguous. As it can be seen from Table 2, English majors were most successful in this task. The difference between them and high-school students may reflect the fact that high-school students were still insufficiently skilled L2 users, they had probably not been exposed to such types of ambiguity or they showed more L1 interference. On the other hand, the fact that the native speakers considered fewer sentences ambiguous may reflect the fact that in everyday language use speakers are not always aware of the ambiguity in sentences, while the students, who are used to a more metalinguistic view on language, were more prone to dissecting sentences and looking for more than one interpretation. This is also connected to the number of resolved ambiguities. While the high-school students were neither able to recognize nor successfully resolve referential ambiguity, the English majors were both aware of the ambiguity and were successful in recognizing all the possible pronoun antecedents[28].

Regarding the strategies used to resolve ambiguity, Tables 3 to 6 provide an overview of the bias in choosing the antecedent of pronouns. Each group's answers are provided in a separate table and only for those sentences that were devised as ambiguous. Before discussing the results, it is important to note several things. Firstly, only those sentences which were envisioned as ambiguous during the construction of the experiment were taken into account while processing the results. It is possible that the participants may have perceived a sentence as ambiguous for some other reason[29], and completed it accordingly. However, these were not included in the final data.

Furthermore, the AMB column represents those sentences for which it was not possible to determine (without any doubt) the participants' intended antecedent. In some cases, however, the evidence is strongly in favor of one of the NPs, although the participant may not have expressed it, and in such cases the symbol in the table is > (meaning: the sentence may appear to be still ambiguous, but the participant probably referred to this NP). An example is the first sentence (*John phoned Bill. The first thing he said was…)*. Many of the participants completed the sentence with just *Hi!* or *Hello!*, which, technically, does not resolve the ambiguity. Nevertheless, in Croatian culture the person who calls greets first (after the person being called answers the call with a type of question, e.g. *Hello?* or *Yes?*). Therefore, it is safe to assume that in such cases, the bias is towards the first NP.

Finally, the pronouns in this experiment were specifically designed so as to refer to one of the given NPs. The pronoun 'it', however, may not refer to any of the NPs, but can be interpreted as an empty subject (Greenbaum/Quirk 2006). Some of the participants have interpreted it as such, and this is noted in the IT column of the tables.

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[28] The discrepancy between the number of recognized ambiguous sentences and resolved ambiguities stems from the fact that a few participants openly disregarded the task to write alternative endings for sentences.

[29] However, when the experiment was being constructed, attention was paid to marking the sentences as referentially ambiguous.

Sentence Number	NP1	NP2	NP3	AMB	IT
1	7	0	-	14 (>NP1)	-
4	10	1	-	5 (>NP1)	-
6	11	3	0	0	-
7	20	1	-	0	-
10	10	1	-	0	1
11	15	2	-	0	-
13	1	8	-	7	-
15	2	11	-	0	-
18	1	2	-	8 (4>NP1)	-
20	4	2	-	2	-
21	3	0	-	0	-
23	4	2	-	0	-
25	1	3	-	1	-
26	1	1	-	1	-
29	0	0	-	1	-

Table 3. The results of pronoun assignment for HS1

Sentence Number	NP1	NP2	NP3	AMB	IT
1	9	0	-	17 (>NP1)	-
4	19	1	-	3(1> NP1)	-
6	7	2	5	2	2
7	26	0	-	0	-
10	17	2	-	0	3
11	14	11	-	0	-
13	0	13	-	10	-
15	1	19	-	0	-
18	7	8	-	5	-
20	17	3	-	0	-
21	14	1	-	0	-
23	3	10	-	0	1
25	6	7	-	2	-
26	3	1	-	7	-
29	2	6	-	0	-

Table 4. The results of pronoun assignment for HS4

Sentence Number	NP1	NP2	NP3	AMB	IT
1	13	1	-	5 (>NP1)	-
4	15	2	-	2	-
6	11	2	4	0	2
7	14	5	-	0	-
10	12	4	-	0	2
11	14	11	-	0	-
13	2	15	-	2	-
15	4	15	-	0	-
18	8	7	-	3	-
20	19	0	-	0	-
21	18	1	-	0	-
23	11	8	-	0	-
25	9	9	-	1	-
26	10	4	-	5	-
29	1	18	-	0	-

Table 5. The results of pronoun assignment for EM

Sentence Number	NP1	NP2	NP3	AMB	IT
1	3	0	-	1 (>NP1)	-
4	4	0	-	0	-
6	2	1	1	0	-
7	4	0	-	0	-
10	4	0	-	0	-
11	1	3	-	0	-
13	2	2	-	0	-
15	1	3	-	0	-
18	2	2	-	0	-
20	4	0	-	0	-
21	2	1	-	0	-
23	4	0	-	0	-
25	3	1	-	0	-
26	4	0	-	0	-
29	1	3	-	0	-

Table 6. The results of pronoun assignment for NS

In the following sections we give a more detailed analysis of the test sentences in Appendix 1, grouped according to the strategies used in their comprehension and pronoun assignment.

a) the principle of parallel function and implicit causality

In sentences no. 1, 7, 11, 20, 26 and 29 there is a match between parallel function and implicit causality principles in these sentences (they all contain a NP1 verb and the pronoun has the function of subject in the second clause), it would be expected that participants assign the pronouns to the first NP. However – and all four groups of participants seem to agree on this – only the first two sentences meet the expectations, i.e. the majority of participants in all four groups matched the pronoun with the first noun phrase. In addition, in sentence number 20 syntax is given advantage over semantics. Although the verb *like*, as a state verb, would guide the assignment towards NP2, the majority of participants identified NP1 as the antecedent, as would the strategy of parallel function suggest. In other sentences the situation is not so clear. In sentence number 29 NP1 is a collective noun, which most often used with singular verb but may be used with plural verb as well. Since the pronoun in this example is in plural (*they*), it is not unusual that the majority of participants chose NP2. Two of the sentences contain the verb *tell*. Since this is an action verb, the Agent in the sentence should be perceived as the cause of the action.

b) extralinguistic context

There are evidently many factors that speakers take into consideration while resolving referential ambiguity. Thus in sentence number 15 (*The taxi driver told the passenger that she...*) it is probably the extralinguistic context which guides the pronoun assignment. Namely, although both *taxi driver* and *passenger* are gender neutral, based on our knowledge of the world, typical taxi drivers are men. Therefore, since the pronoun is in the feminine form, it is assigned to the noun *passenger*. This becomes even more obvious if we consider sentence number 25. This sentence also contains the verb *tell*, but both of the NPs are proper nouns and both are male names. The HS4 and EM groups are divided as to which of the NPs is the antecedent, while the NS group assigns the pronoun to NP1. This would then suggest that neither implicit causality nor the parallel function strategies are prevalent here, since both of the NPs are legitimate antecedents in this situation. Sentence number 18 is similar because it contains the verb *ask*, a pronoun in the masculine form and two lexical items which in the minds of speakers do not evoke gender bias. The participants are also divided with regard to which of the NPs is the antecedent. Another example, sentence number 26 (*Tom bumped into Sean and he…*), has two proper nouns, both male, as possible antecedents. The interpretation of this sentence depends on the plausible scenario and our knowledge of the world. Namely, when bumping into someone, it is usually the person who does the bumping, that apologizes[30], and not the other

[30] One of the NS group neatly explained this in their answer: '…and 26 is probably only ambiguous to a British person, given that in most countries the person bumped into would never apologize.'

way round. Therefore, the bias in the answers is towards NP1[31]. Finally, sentence number 11 (*They bought the apples because they…*) is an interesting one, since it has a very simple structure (SVO because S), an NP1 verb and identical pronouns. One would expect the participants to unanimously assign the pronoun to NP1. However, only HS1 did that. Others could not decide between the two NPs. In this case, the proximity of the pronoun may be a relevant factor (the pronoun is closer to the second NP, and it seems that this was a relevant factor for the NS group), as well as the extralinguistic context. Since the point of this sentence is to give the cause of the action, and shopping is a very common activity in our everyday life, we as speakers know that when buying something it is our wishes and desires as well as the features of the product that influence the action. This may be then reflected in the participants' answers.

c) information structure

Sentences 4 and 21 are an example of the way sentence structure can be manipulated in order to emphasize one of its constituents, as well as the influence that pragmatic and semantic factors play in resolving ambiguity. Sentence number 4 is an example of a cleft sentence in which, regarding the information structure, the pronoun *it* serves as an empty theme (Greenbaum/Quirk 2006: 411-412) and allows the focus to be placed on the final item (*It was Mary*). Therefore, the prediction is that participants would interpret NP1 as the antecedent of the pronoun. This was confirmed in the experiment by all four groups of participants. Sentence 21, on the other hand, is a passive sentence and this change in voice obviously influenced the participants' decision. Namely, using the passive voice allows the object of the sentence in the active voice to become the subject – and therefore the theme – of the sentence in the passive. Furthermore, although the verb *fire at* is an active verb and should guide the resolution towards the Agent (NP2 in this sentence), the results show that the participants preferred the Patient (NP1) as the antecedent of the pronoun, that is, the theme of the passive sentence.

d) sentence structure

In sentences 6 and 13 the arrangement of elements in the structure of the sentence is quite important. Namely, sentence number 6 holds three NPs (two of them are a part of two PPs), one of them an object, and the other two adjuncts, both optional. Furthermore, NP1 is closest to the verb, while NP3 is closest to the pronoun. It seems that participants are sensitive to this kind of sentence structure. The majority of them chose the first noun phrase as the antecedent of the pronoun, while the rest divided their answers between NP2 and NP3, the latter achieving a slightly higher score. Since out of the three NPs only the first is an obligatory element in the sentence (a direct object), this probably guided the answers of the majority of participants. Those who chose the third NP did so because it was closest to the pronoun (the principle of proximity). Sentence

[31] Since a lot of the answers in this example were ambiguous, the most indicative ones are from the EM group.

number 13, on the other hand, contains two NPs in two coordinated clauses. NP2 is closer to the pronoun, i.e. it is most recent, and it is also the NP the participants were mostly biased towards.

e) syntactic functions

Sentences 10 and 23 both involve two objects, a direct and an indirect one. The only difference is that in sentence number 23 both objects are in the form of a NP, and the indirect object is closer to the verb. In the other sentence, the indirect object is in the form of a prepositional phrase (preposition + NP) and the direct object is closer to the verb. Both direct objects are inanimate, while the indirect objects are animate. The pronoun in both sentences is *it*. The results show that the majority of participants assigned the pronoun to the direct object in sentence number 10, while sentence number 23 obviously posed a problem. Two factors may be important in this case. For sentence number 10, the proximity of the direct object to the verb and the fact that the indirect object is the noun *baby* may have made the participants biased towards the direct object. Although in the English language it is possible to refer to a baby as *it*, this is not possible in Croatian, and in fact would be highly socially unacceptable. Different gender system also appears to be the reason why the majority of HS4 chose the direct object in sentence number 23[32]. The noun *cat* is used as the indirect object, and in English is referred to as *it*, but in Croatian, as a language with grammatical gender, animals too have gender assigned, which makes the bias towards the inanimate object, *the food*. While NS opted for the NP closer to the verb, EM were divided in their answers. It is possible that some of them simply show more L1 interference than others.

Looking at the way the participants have dealt with the sentences, we can conclude that, with the exception of two examples (sentences number 11 and 23, as explained above), all four groups agreed in assigning antecedents to pronouns. It seems that the participants were mostly influenced by the syntactic structure of the sentence, especially if it is in agreement with the semantics of the sentence. However, for a number of participants, semantic features seem to be prevalent. In such cases, the answers were divided between the two NPs as possible antecedents. Nevertheless, in none of the examples did semantics prevail over syntax for the majority of participants. What is also very important is the knowledge of the world, which in some examples heavily influences the assignment of an antecedent to a pronoun. Concerning the information structure of the sentence, it is clear that the participants assigned pronouns to theme in a sentence, unless the structure of the sentence suggested otherwise (cf. example 4 with a cleft sentence).

[32] Only a few participants from HS1 completed this sentence, so their answers were not taken into consideration.

4.3.2. Second task

The overall results for the second task are presented in Table 7. The table includes the score for each antecedent noun phrase arranged by participant groups. As it has already been mentioned, the participants were asked to provide explanations for their choices of antecedents. HS1 were least willing to do this (although in most cases they have chosen one of the noun phrases).

Participants	page	square	both	woman	old lady	lake	hill	ruptures	wormholes	both
HS1	10	9	-	4	15	2	17	6	12	1
HS4	11	14	-	8	15	3	22	6	16	-
EM	7	11	1	6	13	2	17	9	9	1
NS	2	2	-	3	1	0	4	2	2	-

Table 7. Results from the discourse comprehension task

As it can be seen from Table 7, two of the discourse fragments were more problematic and two were less. The explanations show that in understanding the second discourse a great number of high-school students (especially HS4) and English majors constructed some kind of a scenario in which they tried to imagine the setting, the sequence of events, and even included some social stereotypes and/or personal prejudice (the setting is a store, both the woman and the old lady are shoppers, the woman enters first and the old lady second, old ladies are prone to stealing, etc.) However, the answers also indicate that the position of the noun phrase *the old lady* in the sentence is an important feature. Namely, this noun phrase is most recently mentioned and it is the focus of the sentence, therefore containing new information. Furthermore, the coordinator *and* (without a comma) links the clause with the pronoun *she* and the clause with the pronoun *her* referring to the woman. Therefore, the participants who relied on the plausibility of the scenario chose *the woman* as the antecedent[33], and others, who were guided by the structure of the sentence and the recency of mention, chose *the old lady*. The NS group relied more on the scenario principle.

The majority of decisions in pronoun assignment for the third discourse fragment were based on extralinguistic context (our knowledge of the world), and the answers were quite similar. The main idea is that a hill is more suited for camping than a lake. The EM group was, nevertheless, less prone to base their answers purely on their knowledge of the world, so they also included factors such as recency of the antecedent and linguistic context.

It seems that the HS4 and EM groups were guided by similar principles when deciding about the antecedents of pronouns in the first discourse fragment. Participants from both groups based their answers mostly on the recency of mention and focus (which includes the importance of new information) when

[33] In a few less plausible scenarios, the old lady was identified as the antecedent.

opting for *square,* and the extralinguistic context[34] and theme when choosing *page*. From the explanations provided by only a small number of HS1, it can be seen that they based their answers on syntax (*square* is the subject of the sentence), information structure of the sentence (*page* is the theme) and extralinguistic information (pages, and not squares, usually have numbers).

The last fragment was a bit problematic since the topic is not what one would normally find in everyday conversation. Therefore, deciding about the antecedent was mostly guided by syntactic principles in all four participant groups. In addition, HS1 and HS4 had more circular explanations for this fragment[35]. Nevertheless, the answers were mostly based on punctuation, coordination in the sentence, recency of mention, position of the subject and the object in the sentence, and theme.

The results from the discourse comprehension task lead to several important conclusions. First of all, there is a significant distinction between processing a sentence in isolation and in a broader context. As the results suggest, semantics becomes essential for the latter. In order to identify the referent of a pronoun, the majority of speakers constructed some kind of scenario based on what they have read and tried to explain to themselves what happened, when it happened, who were the participants and who did what to whom[36]. If such a scenario construction was not possible, the participants tried to use their knowledge of the world to logically conclude what is the best possible ambiguity resolution. Finally, if these strategies were not applicable in certain situations, the participants turned to syntax and the structure of sentences.

5. Conclusion

Language comprehension is a complex and dynamic process which includes the process of constructing an interpretation of the speaker's intended message, and using this interpretation further to ask questions, make inferences and include this into the listener's or reader's pre-existing knowledge. Language comprehension includes all levels of linguistic analysis – from phonology to discourse. On the level of sentence, language comprehension is influenced by the way individual lexical items are organized and included into a structure. From basic constituents to phrasal combinations, the structure of a sentence is a hierarchical construction, where slight differences in structure result in differences

[34] The most common explanations were that only pages have numbers, numbers are on the bottom of pages and squares do not have bottoms.

[35] E.g. 'The pronoun *they* refers to wormholes because they lead to instability in the magnetic field of the Earth.'

[36] It seems that this would indeed fit Fillmore's (2003) theory about *scenes* and *frames*, since he points out that the speaker needs to assign both a schema and a linguistic frame to an experience in order to be able to talk about it. Therefore, 'the process of interpreting a text, in short, can be thought of as involving a set of procedures for constructing a coherent model of a possible world.' (Fillmore 2003: 251).

in meaning. If one puts a sentence into a broader context, different factors need to be taken into consideration in the process of understanding language. Discourse is a unit on a level higher than the sentence level, the understanding of which includes an array of processes which need to take into account multiple linguistic and extralinguistic factors, such as speaker's intentions, memory functions, inference, knowledge of the world, etc. All this is necessary for the discourse to make sense, i.e. to be considered both coherent and cohesive.

In everyday language processing, speakers often encounter elements which have more than one possible interpretation. Such elements are termed ambiguous and it is still not clear whether speakers construct all the possible meanings or only one during the process of comprehension of ambiguity in language. This is the case with referential ambiguity as well, a type of ambiguity based on the anaphor-antecedent relation between a pronoun and a nominal phrase. Although there is no single model that would best explain the way speakers process this type of ambiguity, we can isolate the criteria people rely on in order to assign what they consider to be the right antecedent to a pronoun. The results of the experiment presented in this paper show the importance of some of them.

Firstly, as this experiment showed, there were no significant differences between the participants with regard to the factors that helped them decide about the antecedents of the pronouns. However, there were differences in the ability to correctly complete sentence fragments in the given time. As it was expected, the success of this task depended on the age and level of proficiency in language. Furthermore, as the results seem to suggest, not all of the participants, except for EM, were aware of all the ambiguities in the sentences. The cause of this may be the fact that English majors become more metalinguistically oriented during their studies; hence, this perspective comes more naturally to them.

As far as coping strategies are concerned, the syntax of the sentence plays an important role. The principles of parallel function (Harley 2001; McNeill 1987; Grober/Beardsley/Caramazza 1978), the position of the pronoun and the NPs, especially if they do not contradict the semantics of the verb and the information structure of the sentence, in the majority of cases guide the assignment process. However, (and this is especially present with high-school students), if such an interpretation contradicts the speaker's knowledge of the world, pronoun ambiguity is resolved according to the information from the extralinguistic context. This becomes even more important when the sentence is a part of a discourse fragment. The participants then try to construct some kind of a plausible scenario into which they incorporate their knowledge of the world and try to resolve the ambiguity in this manner. If the meaning of the sentence is for whatever reason hard to imagine as a scenario, the speakers rely on syntax and the position of pronoun to help them identify it.

Since this research involved learners of English as L2, it would also be interesting to see which factors influence the process of referential ambiguity resolution in the participants' L1 (Croatian), and to what extent this L1 interferes with L2.

Appendix 1

Sentence fragments:

1.) John phoned Bill. The first thing he said was:
2.) She took some photos with her new camera, but they
3.) Mark advised Christopher that he
4.) It was Mary that Anne disliked because she
5.) The boy gave the girl a flower, and she
6.) He held some bread over the fire with a fork. The problem was that it
7.) Jim sold his car to Nigel because he
8.) Guests can complain to the manager if they
9.) The photographer told the actress that she
10.) Michael gave the bottle to the baby, although it
11.) They bought the apples because they were
12.) The professor forgot to pick up his
13.) I need the receptionist and I also need a nurse. I need her to
14.) Andy sold his car to Nigel because it
15.) The taxi driver told the passenger that she did not have
16.) The workers were granted a permit after they
17.) Tom bumped into the door, and he
18.) The architect asked the builder to pick up his
19.) Michael gave the bottle to his son, but it
20.) The children like visiting their grandparents when they
21.) Passengers can be fired at by guards if they
22.) Kate telephoned Alan. The first thing she wanted to know was
23.) Jane gave the cat the food, but it
24.) Mary picked the apples because they were
25.) Mark told Christopher that he
26.) Tom bumped into Sean and he
27.) I'm going to the receptionist because I need a nurse. I need her to
28.) The tourists like visiting the city when it
29.) The city council refused to grant the protesters a permit because they
30.) It was Dan that Brooke loved because he

Discourse fragments:

1. Look for a page in the mathematics book. In the middle of the page there's a square, quite large, and near the bottom of it there's a number five, in red.

2. A woman enters the store. When the woman arrives at the checkout counter, there's an old lady following her and she pays for all the goods except for the bottle in her bag.

3. The next day he discovered the lake. It was a small, low hill about five miles inland that first attracted his attention. It looked like a place from which he could spy out the land and where they could camp at least for the night.

4. Ruptures in the space-time fabric cause wormholes to appear, and they lead to instability in the magnetic field of the Earth.

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Razrješavanje referencijalne dvosmislenosti u engleskome kao drugom jeziku

Govornici nekog jezika svakoga dana proizvode i primaju velike količine jezičnoga materijala, koji obično obrađuju iznimno velikom brzinom i bez poteškoća. No taj je jezični materijal rijetko kada lišen bilo čega što bi moglo zbunjivati govornike ili otežavati komunikaciju. Među takve pojavnosti pripada i dvosmislenost u jeziku. Tema je ovog rada način na koji govornici obrađuju dvosmislene elemente u jeziku, s ciljem utvrđivanja

načina na koji se pridružuje jedno ili više mogućih tumačenja nekoj dvosmislenoj jezičnoj cjelini. Pritom treba istaknuti da se dvosmislenošću u ovome radu bavimo s teorijskog gledišta jezičnog razumijevanja, a ne jezične proizvodnje te stoga naša analiza polazi od čitatelja, tj. utemeljena je na pisanom, a ne govorenom jeziku. U središtu je zanimanja rada tzv. referencijalna dvosmislenost, odnosno utvrđivanje strategija kojima se govornici služe pri određivanju referenata zamjenica u dvosmislenim rečenicama. S tim ciljem provedeno je istraživanje putem upitnika, u kojem su sudjelovali govornici engleskoga kao drugog jezika (L2) te izvorni govornici engleskoga kao kontrolna skupina. Jedan od ciljeva istraživanja bilo je i određivanje utjecaja dobi i stupnja vladanja jezikom na proces razumijevanja rečenica, kao i jesu li govornici svjesni dvosmislenosti pri obradi rečenica s dvosmislenim zamjenicama te nastoje li i na koji način ukloniti dvosmislenost pri dopunjavanju takvih rečenica.

U istraživanju su sudjelovale četiri skupine ispitanika: dvije skupine srednjoškolaca Prirodoslovne škole Vladimira Preloga u Zagrebu različite dobi i stupnja znanja jezika (1. i 4. razred), jedna skupina studenata engleskog jezika s Filozofskoga fakulteta Sveučilišta u Zagrebu te jedna skupina izvornih govornika britanskoga engleskog jezika. Svim srednjoškolcima i studentima engleskoga hrvatski je jezik materinji, a engleski uče kao drugi jezik. Nitko od njih nije simultani dvojezični govornik. Učenici 1. razreda u prosjeku uče engleski jezik 9 godina, dok učenici 4. razreda i studenti engleskoga u prosjeku uče engleski 9,5 odnosno 19,8 godina. Svi su u istraživanju sudjelovali dobrovoljno i anonimno.

Istraživanje je provedeno putem upitnika koji se sastojao od dva dijela. U prvom se dijelu nalazilo 30 nepotpunih složenih rečenica od kojih je svaka imala po dva imenska izraza u prvoj surečenici te zamjenicu na početku druge surečenice. 15 rečenica osmišljeno je kao dvosmisleno, tj. zamjenica u drugoj surečenici može se odnositi i na prvi i na drugi imenski izraz u prvoj surečenici, dok je preostalih 15 rečenica slično oblikom i značenjem, ali s nedvosmislenim referentom zamjenice. Rečenice su nasumično poredane na obrascu, a ispitanici su zamoljeni da ih dovrše tako da svaka rečenica bude smislena. Za taj su zadatak ispitanici imali na raspolaganju 5 minuta. Zatim su zamoljeni da zaokruže one rečenice koje smatraju dvosmislenima, tj. koje imaju, prema njihovu mišljenju, još jedno moguće tumačenje te da navedu to drugo značenje. U drugom dijelu upitnika ispitanicima su dana četiri kraća odlomka s ne više od tri duže, složene rečenice. U svakom se odlomku nalazila zamjenica te dva imenska izraza kao mogući referenti. Ispitanici su trebali navesti koji od dva imenska izraza smatraju koreferentnim sa zamjenicom te objasniti svoj odgovor. Za cjelokupni upitnik ispitanici su imali 20 minuta vremena.

Rezultati istraživanja pokazali su da nema bitnih razlika između ispitanika kada se radi o strategijama u odlučivanju o referentima zamjenica, no razlike postoje u sposobnosti da se ispravno dopune dijelovi rečenica u zadanom vremenu. Uspješnost tog zadatka očekivano ovisi o dobi i stupnju ovladavanja jezikom. K tomu, rezultati pokazuju da nisu svi ispitanici, s iznimkom studenata engleskoga, bili svjesni svih dvosmislenih rečenica, a razlog tomu vidimo u većoj osviještenosti jezika kod studenata engleskog. Kada se radi o strategijama kojima se govornici koriste u razrješavanju dvosmislenosti, ključnu ulogu ima sintaksa rečenice, odnosno načelo sukladne funkcije (eng. *parallel function*) (Harley 2001; McNeill 1987; Grober/Beardsley/Caramazza 1978) te položaj zamjenice i imenskih izraza, odnosno načelo bliskosti (eng. *proximity*) – osobito ako su u skladu sa semantikom glagola i obavjesnom strukturom rečenice. Ako je pak tumačenje rečenice u suprotnosti s govornikovim znanjem o svijetu, dvosmislenost zamjenice razrješava se s obzirom na izvanjezični kontekst. To je osobito slučaj s drugim dijelom upitnika u kojem su ispitanici nastojali osmisliti prikladan scenarij u koji bi uklopili svoje znanje o svijetu i na taj način pokušali razriješiti dvosmislenost. No ako je značenje rečenice iz bilo kojeg razloga teško zamisliti kao scenarij, govornici se prije svega oslanjaju na sintaksu i položaj zamjenice.

Ključne riječi: referencijalna dvosmislenost, zamjenice, drugi jezik, engleski, hrvatski