

A cross-linguistic analysis of the acquisition and processing of epistemic relations

1. Researchers involved

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2. Background of the topic

Without much risk of overstatement, we may claim that all languages of the world provide their speakers with means to indicate causal relationships (Sanders & Sweetser 2009). Causal relations between discourse segments can be expressed by connectives such as *because*, *since* and *for*. What is the system behind the use of these connectives in languages like French and Dutch, compared to English? How do these connectives affect discourse processing? And how do children acquire this connective system? These are three leading questions in our joint research. In this proposal, we focus on one specific type of causal relation, the one expressed in (1) rather than in (2) below:

1. They must really hope they'll get the funding they applied for, because they put a lot of effort in writing the proposal.
2. They were able to travel to each other's universities to discuss their research because they got the funding they applied for.

In both cases in English a causal relation is expressed, made explicit by a specific connective: *because*. In Dutch, however, contrary to English, examples (1) and (2) are expressed using different connectives (*want* in (1); *omdat* in (2)), consistently reflecting the fact that the type of causal relation differs. In order to understand the relation in (1), the hearer has to make assumptions about the speaker's intentions or expectations. Indeed, the hearer/reader does not know for a fact that the persons talked about really do hope to get the funding. It is a conclusion drawn by inference on the basis of a premise, namely the fact that the authors put a lot of effort in writing their proposal. Example (2), on the other hand, involves a straightforward description about two events. The hearer/reader need not make any assumptions about the speaker's state of mind in order to understand the relation conveyed. Knowing what the funding is meant for (travel grants) is enough to understand the main clause as a consequence of the subclause (introduced by *because*).

The distinction between these two kinds of sentences – respectively coined epistemic (1) and content (2) relations by Sweetser (1990) – has been discussed by several authors from various theoretical perspectives (e.g. Sanders et al. 1992, Verstraete 1998, Dancygier 1998, Pander Maat & Degand 2001, Dancygier & Sweetser 2005, Sanders & Sweetser 2009). Independently of the underlying theoretical assumptions, it has been hypothesized from various angles that epistemic relations are more complex and more difficult to acquire than content relations. Content relations should be easier to read and acquire because there is a one-to-one correspondence with reality. Epistemic relations are harder because they require that the hearer make an inference on the basis of a premise. They are not a description of reality but present a form of thinking about reality. Others have argued that epistemic relations would be more complex because they involve subjective reasoning by the author or speaker, thereby invoking evaluation processes in the reader.

In acquisition studies, it has been found that epistemic relations emerge later than content relations (Evers-Vermeul 2005, Evers-Vermeul & Sanders 2009, Kyratzis, Guo & Ervin-Tripp 1990, Spooren & Sanders 2008, Verbrugge 2007b, Zufferey 2010). Some evidence for their relative complexity has been found in reading and reasoning experiments too (Douven & Verbrugge to appear, Noordman and de Blijzer 2000, Traxler, Sanford, Aked & Moxey 1997, Verbrugge 2007a, Verbrugge, Dieussaert, Schaecken, Smessaert & Van Belle 2007, Sanders & Spooren 2009) and in eyetracking experiments with adults (Traxler, Bybee & Pickering 1997).

However, several crucial questions remain unsolved, and the Geneva, Leuven and Utrecht research groups join forces in order to develop new experimental designs to answer these and some totally new questions, as explained below.

3. Planned method and goals of the study

1. **Processing by adult speakers:** Traxler, Sanford, Aked & Moxey (1997) have shown that the processing of epistemic relations takes longer than the processing of content relations. Their results also indicated that epistemic relations can become easier to process when some epistemic markers like *I think* or *perhaps* are added to the sentences. However, the exact role of connectives has not been assessed, because all the tested sentences included the connective *because*. Millis and Just (1994) have found that connectives like *because* and *although* increase processing speed with respect to sentences that are not related by a connective, because they provide a more integrated clausal relation. However, their study only included relations in the content domain. We want to complete these two sets of results by a more comprehensive study measuring reading times and recall for sentences with and without connectives, in the content and the epistemic domains.
2. **Cross-linguistic comparison of the role of connectives for processing:** languages vary on the number of connectives they possess to express a given relation. In the causal domain for instance, Dutch and French have at least two which are commonly used (*omdat* and *want* in Dutch; *parce que* and *puisque* in French)¹, whereas in English one connective (*because*) dominates in use, even though others exist (*since*, *for*) but are far less frequently used. We will investigate whether the distribution for Dutch and French connectives differs, as well as the impact of these different connectives on processing.
3. **Processing by normally-developing children:** Several corpus studies have shown that, in different languages, epistemic relations are acquired later than content relations (Evers-Vermeul 2005; Zufferey 2010). However, little is known about the way children *process* these relations (does the complexity immediately affect the interpretation process?), neither is anything known about the exact age at which children actually master this type of relation. We will compare the processing of epistemic relations in several age groups: with young children who are not yet able to read, using a very recently developed version of the visual world paradigm used by Van Veen, Mak & Sanders (2010). We will also run processing experiments similar to those applied to adults with children who are old enough to be able to read fluently through texts, i.e. from the age of 9 years onwards. This will enable us to investigate possible differences in processing, compared to adult readers.
4. **Acquisition by autistic children:** Zufferey (2010) has argued that epistemic relations require the ability to reason about other people's mental states, and therefore require the possession of theory of mind abilities. Following this account, autistic children should be unable to use and understand epistemic relations, because of their inability to reason about other people's mental states. Content relations, on the other hand, should be unimpaired. It might also be argued that the presence of a

¹ The use of *car* is limited to the written domain in contemporary French (Degand & Fagard 2009; Zufferey to appear)

connective may help these children to understand the causal relation, by providing a linguistic clue.