



## Original Articles

# Iconicity affects children's comprehension of complex sentences: The role of semantics, clause order, input and individual differences

Laura E. de Ruiter<sup>a,\*</sup>, Anna L. Theakston<sup>a</sup>, Silke Brandt<sup>b</sup>, Elena V.M. Lieven<sup>a</sup>

<sup>a</sup> ESRC International Centre for Language and Communicative Development, School of Health Sciences, University of Manchester, Oxford Road, Manchester M13 9PL, United Kingdom

<sup>b</sup> ESRC International Centre for Language and Communicative Development, Linguistics and English Language, Lancaster University, Lancaster LA1 4YL, United Kingdom



## ARTICLE INFO

## Keywords:

Language acquisition  
Complex syntax  
Adverbial clauses  
Iconicity of clause order  
Input  
Language processing

## ABSTRACT

Complex sentences involving adverbial clauses appear in children's speech at about three years of age yet children have difficulty comprehending these sentences well into the school years. To date, the reasons for these difficulties are unclear, largely because previous studies have tended to focus on only sub-types of adverbial clauses, or have tested only limited theoretical models. In this paper, we provide the most comprehensive experimental study to date. We tested four-year-olds, five-year-olds and adults on four different adverbial clauses (*before*, *after*, *because*, *if*) to evaluate four different theoretical models (semantic, syntactic, frequency-based and capacity-constrained). 71 children and 10 adults (as controls) completed a forced-choice, picture-selection comprehension test, providing accuracy and response time data. Children also completed a battery of tests to assess their linguistic and general cognitive abilities. We found that children's comprehension was strongly influenced by semantic factors – the iconicity of the event-to-language mappings – and that their response times were influenced by the type of relation expressed by the connective (temporal vs. causal). Neither input frequency (frequency-based account), nor clause order (syntax account) or working memory (capacity-constrained account) provided a good fit to the data. Our findings thus contribute to the development of more sophisticated models of sentence processing. We conclude that such models must also take into account how children's emerging linguistic understanding interacts with developments in other cognitive domains such as their ability to construct mental models and reason flexibly about them.

## 1. Introduction

In order to construct a coherent mental representation of the events described in complex sentences, listeners must be able to interpret connectives to establish the semantic relationship (e.g., temporality – *after*, *when* etc., causality – *because*, *since*, concession – *although*, *even if* etc.) between the main- and the subordinate clause. An additional challenge for listeners is that in English (and other languages, but not in all) the two clauses can occur in two orders. Compare “She had a cup of coffee before she submitted the paper” and “Before she submitted the paper, she had a cup of coffee”. In the first sentence, the clause order reflects the order of events in the real world – it is ‘iconic’. In the second sentence, the clause order is reversed.

Although complex sentences involving adverbial clauses appear in children's speech at about three years of age (Diessel, 2004), experimental studies found that children have difficulty comprehending these sentences even at the age of six, nine, or even twelve years (e.g.,

Emerson & Gekoski, 1980; Johnson & Chapman, 1980; Pyykönen, Niemi, & Järvikivi, 2003). They misinterpret the temporal order, or reverse cause and effect in causal sentences. Researchers have suggested different explanations to account for these – often conflicting – findings. But because individual studies have typically looked at only one type of adverbial clause, and used varying methodologies, it is difficult to determine possible differences and commonalities in the precise influences of different factors on children's performance across sentence types. The present study investigates the comprehension of four different sentence types (*after*, *before*, *because*, *if*), to test the predictions of four different theoretical accounts.

We first provide a brief characterisation of the four sentence types under investigation, together with a short discussion of causality, which is central for the understanding of *because*- and *if*-clauses. We then present four different theoretical accounts of complex sentence processing in children that we have identified in the literature: (1) the semantic account, which assumes that iconicity is the main factor; (2)

\* Corresponding author.

E-mail addresses: [laura.deruiter@manchester.ac.uk](mailto:laura.deruiter@manchester.ac.uk) (L.E. de Ruiter), [anna.theakston@manchester.ac.uk](mailto:anna.theakston@manchester.ac.uk) (A.L. Theakston), [s.brandt@lancaster.ac.uk](mailto:s.brandt@lancaster.ac.uk) (S. Brandt), [elena.lieven@manchester.ac.uk](mailto:elena.lieven@manchester.ac.uk) (E.V.M. Lieven).

<https://doi.org/10.1016/j.cognition.2017.10.015>

Received 31 March 2017; Received in revised form 10 October 2017; Accepted 19 October 2017

0010-0277/ © 2017 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

**Table 1**  
Interaction of connective type and clause order yielding iconicity.

Connective	Clause order		Iconicity
after	Subordinate-main	After he pats the dog, he jumps the gate.	Iconic
	Main-subordinate	He jumps the gate after he pats the dog.	Non-iconic
before	Subordinate-main	Before he jumps the gate, he pats the dog.	Non-iconic
	Main-subordinate	He pats the dog before he jumps the gate.	Iconic
because	Subordinate-main	Because she puts a hat on, she feels warm.	Iconic
	Main-subordinate	She feels warm because she puts a hat on.	Non-iconic
if	Subordinate-main	If she puts a hat on, she feels warm.	Iconic
	Main-subordinate	She feels warm if she puts a hat on.	Non-iconic

the syntactic account, which assumes that main-subordinate clause orders are easier to process; (3) the frequency-based account, which assumes that forms that are more frequent in the input should be easier to process; (4) the capacity-constrained account, which assumes that individual working memory capacities determine sentence-processing performance. We discuss the details of these four accounts and review the empirical evidence for each of them by summarising previous findings on children's comprehension of sentences containing the connectives *after*, *before*, *because*, and *if*, as well as the few studies done with adult participants.

### 1.1. Complex sentences

Complex sentences consist of a main and a subordinate clause. While there are other types of complex sentences (e.g., relative clauses, complement clauses), in the context of this article we mean sentences with adverbial clauses. The adverbial clause is introduced with a connective (subordinating conjunction) that specifies the semantic relationship between the two clauses. In sentences with *before* and *after*, this relationship is purely temporal (indicating priority and posteriority, respectively). Sentences with *because* and *if*, however, can express a range of different meanings. As the present study focusses on one particular type of causality expressed by *because*- and *if*-sentences, we give a short overview of the different types of causality.

According to Sweetser (1990), causality can occur on three different cognitive levels. Compare the utterances in (1–3) below:

- (1) The cup broke because it fell off the table.
- (2) She must be a queen, because she is wearing a crown.
- (3) Can you tell me what time it is, because I have this meeting at one.

In (1), there is a clear causal relation between the two events, and the two events take place in the world independent of the speaker. This type of causality has been called physical or content-level causality. In (2), in contrast, the speaker is using the *because*-clause as evidence for her (subjective) belief. This type of causality is said to take place on the epistemic level (epistemic causality). Finally, in (3), the *because*-clause functions as a reason for the speaker's request – it takes place on the level of the speech act (speech act causality). Other scholars have suggested dichotomous distinctions such as objective (content) vs. subjective (epistemic and speech-act) causality (Lois Bloom & Capatides, 1987).

Like *because*-sentences, *if*-sentences can be used to express content-relations, epistemic relations, and speech act relations between clauses. In the content domain, *if*-sentences typically express causal relations via predictions (Dancygier & Sweetser, 2000: 121), as in “If you take this, you'll feel better”.

Our study investigates children's comprehension of sentences expressing content-level or physical causality. Note that in this case, there is also a clear temporal element in the semantic relationship between the two events: The cause precedes the effect. However, it is worth pointing out that in conversation, describing causally linked events is not the primary function of *because*- and *if*-sentences. In spoken

discourse, *because*-clauses typically provide a reason for a statement made (speech-act causality), rather than a cause for an effect (Diessel & Hetterle, 2011). And *if*-clauses often provide a conceptual framework for the interpretation of the following discourse, not just the main clause within the complex sentence (e.g., Ford & Thompson, 1986). For example, a speaker may say: “If the weather is good tomorrow, we could go for a hike”, before providing more details for that proposal. We will return to this distinction between the semantics of *because*- and *if*-clauses and their communicative function at various points in this article.

As noted above, in English, complex sentences can occur in two clause orders: main-subordinate and subordinate-main. (Note that this is true only for adverbial sentences, not for other types of complex sentences.) For each sentence type (*after*, *before*, *because*, *if*) one clause order reflects the order of events in the real world, while the other reverses it. Table 1 illustrates the interaction of connective and clause order yielding (non-) iconicity. For *after*-, *because*-, and *if*-sentences, subordinate-main clause orders are iconic. For *before*-sentences, however, main-subordinate clause orders are iconic.

Iconicity is the central aspect in the semantic account of children's comprehension of complex sentences, which is the first of four different accounts, to which we turn now.

### 1.2. Theoretical accounts

#### 1.2.1. Semantic account

Clark (1971) conducted the first experimental study on the acquisition of the temporal connectives *before* and *after*, looking at both production and comprehension in three- to five-year-olds. In the comprehension task, children were asked to act out sentences like “He patted the dog after he jumped the gate” with toys. Not surprisingly, younger children made more errors than older children. In addition, children of all age groups made more errors with those sentences that were non-iconic, and more errors with sentences containing *after* than with sentences containing *before*. These findings led her to suggest that children's comprehension of complex sentences is driven primarily by a semantic principle. Children initially employ an “order-of-mention” strategy: They assume that what they hear first, happens first. In other words, a sentence is being interpreted by assuming a direct mapping (analogy) between the sequence of events in the linguistic form (clause order) and the sequence of events in the real world. As a consequence, children interpret iconic sentences correctly, but misinterpret non-iconic sentences. A correct understanding of both orders emerged in her sample at around age five. It should be pointed out that Clark based her account on an experiment that included only temporal clauses, and did not specify to what extent it should also apply to other complex sentence types. However, it seems reasonable to assume that if children operate with an order-of-mention strategy on the incoming speech stream, they would do so also with causal and conditional sentences, where these describe a causal relationship between two events.

Clark furthermore suggested that *before* and *after* differ in terms of their semantic features. The underlying assumption is that words are made up of a number of semantic features, which can have positive or

Download English Version:

<https://daneshyari.com/en/article/7285650>

Download Persian Version:

<https://daneshyari.com/article/7285650>

[Daneshyari.com](https://daneshyari.com)