

## Chapter 10: Language comprehension

The higher-level processes involved in comprehension are rather similar, whether a story is being listened to or read. There are two main levels of analysis in the comprehension of sentences. First, there is an analysis of the syntactical (grammatical) structure of each sentence; this is known technically as *parsing*. Grammar is concerned with the way in which words are combined. Second, there is an analysis of the meaning of the sentence. The intended meaning of a sentence may not be the same as its literal meaning. The study of intended meaning is known as pragmatics. Cases in which the literal meaning is not the intended meaning include rhetorical devices such as irony, sarcasm and understatement. The context in which a sentence is spoken can also influence its intended meaning in various ways.

The processes mentioned so far (e.g., parsing, pragmatics) are important when understanding individual sentences. Most theories of sentence processing have focused on general processes and have ignored individual differences. In fact, however, there is convincing evidence that there are important individual differences in sentence processing. When we read a text or story, we typically try to *integrate* the information contained in the sentences that constitute it. Such integration often involves drawing inferences, identifying the main themes in the text and so on.

- **Parsing: overview**

Parsing is the analysis of the syntactical or grammatical structure of sentences. It is an important process that readers and listeners use to comprehend the sentences they read or hear. There are several possible relationships between syntactic and semantic analysis:

- Syntactic analysis precedes semantic analysis.
- Semantic analysis occurs prior to syntactic analysis.
- Syntactic and semantic analysis occur simultaneously.
- Syntax and semantics are very closely associated.

Most studies on parsing have considered only the English language, where interpretation depends heavily on word order. In inflectional languages (e.g., German) word order is less important. The predominance of English studies may give a misleading view of human parsing.

Linguists such as Chomsky (1957) have produced rules to take account of the productivity and the regularity of language, i.e., *a grammar*. Ideally a grammar should be able to generate all the permissible sentences in a given language, while at the same time rejecting all the unacceptable ones. Some sentences are syntactically ambiguous at the global level where the sentence has two or more possible interpretations. Others are ambiguous at the local level with various interpretations possible at some point during parsing. Observing the problems encountered by readers struggling with ambiguous sentences can provide revealing information about parsing processes.

One way in which listeners work out grammatical structure of speech is by using *prosodic cues* in the form of stress, intonation and duration. Prosodic cues are most likely to be used when spoken sentences are ambiguous.

Implicit prosodic cues seem to be used during silent reading. Steinhauer and Friederici (2001) found that, when participants read or listened to sentences, the ERPs to intonational boundaries in speech or commas in text were similar. The overall pattern of prosodic phrasing is important rather than what happens at a particular point in a sentence. Prosodic cues can be used to predict to-be-presented information.

Parsing is the process used by readers and listeners to understand the sentences they read or hear. The grammar of a language refers to the set of rules according to which sentences are organised, allowing us to reject

unacceptable sentences. When sentences are ambiguous in their grammatical structure, prosodic cues can be used to disambiguate their meaning.

- **Models of parsing**

Frazier and Rayner's (1982) *garden-path model* is so called because readers or listeners can be misled or "led up the garden path" by ambiguous sentences. The garden-path model is based on the following assumptions:

- Only *one* syntactical structure is initially considered for any sentence.
- Meaning is *not* involved in the selection of the initial syntactical structure.
- The simplest syntactical structure is chosen, making use of two general principles: minimal attachment and late closure.
- According to the principle of minimal attachment, the grammatical structure producing the fewest nodes (major parts of a sentence such as noun phrase and verb phrase) is preferred.
- The principle of late closure is that new words encountered in a sentence are attached to the current phrase or clause if grammatically permissible.
- Conflict between the above two principles is resolved in favour of the minimal attachment principle.
- If the initial syntactic structure a reader constructs for a sentence is incompatible with additional information (e.g., semantic) generated by a thematic processor, there is a second processing stage in which it is revised.

Readers' use of late closure was shown by van Gompel and Pickering (2001). Breedin and Saffran (1999) studied patient DM, who, as a result of dementia, had an extremely severe loss of semantic knowledge. He performed at essentially normal levels on tasks involving the detection of grammatical violations. Wilson et al. (2012) reviewed research on the brain regions associated with syntactical processing. Patients with impaired ability to process syntax often have damage to the left inferior and middle frontal gyri.

According to the garden-path model, visual context should *not* influence the initial parsing of an ambiguous sentence. However, much research using the visual world paradigm indicates that is not always the case (Spivey et al, 2002). Disambiguating context is only used effectively when it is presented ahead of the spoken instruction (Ferreira et al., 2013).

The garden-path model provides a simple and coherent account of key processes involved in sentence processing. There is evidence that the principles of minimal attachment and late closure often influence the selection of an initial syntactic structure for sentences. However, the assumption that meanings of words do not influence the initial assignment of grammatical structure is wrong (Trueswell et al., 1994). Factors can prevent readers and listeners from using the principles of minimal attachment and late closure (Pauker et al., 2012). The model cannot be definitively tested. This model does not consider differences among languages.

The *constraint-based model* was proposed by MacDonald et al. (1994) and is based on a connectionist architecture. The key assumption is that all relevant sources of information or constraints are immediately available to the parser. According to the theory, the processing system uses four language characteristics to resolve sentence ambiguities:

- Grammatical knowledge constrains interpretations.
- Information associated with a word is typically not independent.
- A word may be more ambiguous in some ways than in others.
- Interpretations generally differ in probability on the basis of past experience.

This model has been developed by MacDonald (2013) into the production-distribution-comprehension account. This model assumes speakers use various strategies to reduce processing demands:

- Start with common words and syntactically simple phrases while the rest of the utterance is planned.
- Favour more practised and easy sentence plans.

The major difference between the constraint-based model and the garden-path model is that the former assumes sentence processing is parallel whereas the latter assumes it is serial. Cai et al. (2012) found evidence in favour of the constraint-based model. Wilson and Garnsey (2009) studied the effects of verb bias on ambiguous sentences involving a direct object or embedded clause. The findings were as predicted by the constraint-based model. Brysbaert and Mitchell (1996) found there were substantial individual differences among Dutch people in their parsing decisions, which is more consistent with the constraint-based model. There are two main criticisms of this model:

- It fails to make predictions about parsing.
- Many of the findings regarding non-syntactic structures having an effect early in reading can be accounted for in the garden-path model.

Van Gompel et al. (2000) proposed a new theoretical approach to the resolution of syntactic ambiguity: the *unrestricted race model*. This model combines aspects of the garden-path and constraint-based models. It assumes:

- All sources of information are used to identify a syntactic structure.
- All other possible syntactic structures are ignored unless the favoured syntactic structure is disconfirmed.
- If the initially chosen syntactic structure has to be discarded then there is an extensive period of reanalysis.

Van Gompel et al. (2001) compared their findings with other models and believe that they support the unrestricted race model. With ambiguous sentences, readers rapidly use syntactic and semantic information to form a syntactic structure. Reanalysis will sometimes be required with noun-phrase and verb-phrase sentences. Reading times of ambiguous and disambiguating regions of sentences are most consistent with the predictions of the unrestricted race model (Mohamed & Clifton, 2011).

The unrestricted race model is an interesting attempt to combine the best features of garden-path and constraint-based models. It seems reasonable that all sources of information (including world knowledge) are used to construct syntactic structure. However, sentence processing is more flexible than assumed in the unrestricted race model.

Previous theories of sentence processing have the limitation that they assume the language processor generates complete, detailed and accurate representations of the linguistic input. The alternative viewpoint (Ferreira et al., 2002) is based on the assumption of “good-enough” representations. Readers’ goals are to parse sufficiently to generate a response (Swets et al., 2008). For example, Ferreira (2003) presented sentences aurally and obtained further evidence that our representations of sentences are sometimes inaccurate; for example, in the Moses illusion, an incorrect image of “the mouse was eaten by the cheese” is often created. According to Ferreira, we use heuristics (rules of thumb) to simplify the task of understanding sentences (see also Christianson et al., 2010). Readers do indeed engage in very shallow and heuristic processing when understanding speech (Dwivedi, 2013).

Cognitive neuroscience is making substantial contributions to our understanding of parsing and sentence comprehension, particularly through ERP studies. There is evidence that semantic information is processed very early on (Kutas et al., 2011). The N400 wave reflects aspects of semantic processing – a mismatch between the meaning of the word and its context. Hagoort et al. (2004) found the N400 component was very similar for violations of world knowledge, and violations of word meaning. There is evidence that contextual information has a rapid and major impact on sentence processing. Nieuwland and van Berkum (2006a) found the N400 was greater for words that were appropriate in meaning, but not appropriate to the context of a story.

Sentence processing involves parsing and the assignment of meaning. The garden-path model is a two-stage model in which the simplest syntactic structure is selected at the first stage using the principles of minimal attachment and late closure. Semantic processing occurs only during the second stage. In fact, semantic information is often used earlier in sentence processing than proposed by the model. According to the

constraint-based theory, all relevant sources of information are available immediately to someone processing a sentence. Competing analyses of a sentence are activated at the same time, with several language characteristics (e.g., verb bias) being used to resolve ambiguities. According to the unrestricted race model, all sources of information are used to identify a single syntactic structure for a sentence. If this structure is disconfirmed, there is extensive reanalysis. Nearly all theories assume that sentences are eventually interpreted correctly, but the evidence suggests we use heuristics and are prone to error. Evidence from cognitive neuroscience studies indicates clearly that we make use of world knowledge, speaker knowledge and contextual knowledge at an early stage of sentence processing. These findings are more supportive of constraint-based theories than of the garden-path model.

- **Pragmatics**

Pragmatics is concerned with practical language use and comprehension, especially aspects going beyond the literal meaning of what is said. Pragmatics is also concerned with intended, rather than literal, meaning and often involves drawing inferences. Figurative language is language not intended to be taken literally, for example metaphor.

**WEBLINK:** [Pragmatics](#)

Our processing of metaphors depends on many factors (Gibbs, 2013):

- language ability;
- nature of the metaphor;
- goal.

Grice's (1975) model states that there are three stages of processing figurative expressions:

- The literal meaning is assessed.
- The reader decides if the literal meaning makes sense.
- A non-literal meaning that does make sense is sought.

One prediction is that literal meanings will be assessed faster and accessed automatically. However, Glucksberg (2003) argued that literal and metaphoric meanings are processed in parallel and involve the same mechanisms.

Kintsch (2000) put forward a *predication model* of metaphor understanding to identify underlying mechanisms. The model has two components:

- the latent semantic analysis component;
- the construction–integration component.

Non-literal or metaphorical meanings are typically understood as rapidly as literal ones. Metaphors are typically non-reversible (Chiappe & Chiappe, 2007). Inhibitory processes are also important when people are presented with metaphors (Pierce, et al., 2010). Figurative language processing typically requires the use of more cognitive resources than literal language processing. However, insufficient attention has been paid to possible processing differences between various types of metaphors

Grice (1975) argued that speakers and listeners generally conform to the cooperativeness principle – they work together to ensure mutual understanding. Thus, it is important for speakers and listeners to share a *common ground* (knowledge and beliefs). Keysar et al. (2000) assumed that it is effortful for listeners to work out common ground and thus proposed a rapid, non-effortful *egocentric heuristic* – the tendency to consider potential referents from one's own perspective. Information about common ground is calculated more slowly, and can be used to correct misunderstandings resulting from the heuristic.

Keysar et al.'s findings supported the perspective adjustment model, with initial eye movements of listeners indicating that they did not consider just the common ground. Subsequent research has suggested we rarely

make use of the egocentric heuristic. Heller et al. (2008) repeated Keysar et al.'s (2000) experiment, eliminating a systematic bias. They found participants had no trouble making use of the common ground. Indeed, research typically focuses on very narrow aspects of common ground and ignores the richness of it.

It used to be assumed that the literal meaning of figurative language (e.g., metaphors) is always accessed before the non-literal meaning. That assumption is incorrect, as is shown by evidence that non-literal meanings are often accessed as rapidly as literal ones, and are accessed automatically. There is reasonable support for the graded salience hypothesis, according to which salient messages (whether literal or non-literal) are processed initially. The processing of metaphors is also influenced by context and by individual differences in IQ. It has been debated whether listeners use their knowledge of the common ground when trying to understand a speaker, or whether they use an egocentric heuristic. However, the distinction between these accounts is oversimplified. Listeners generally expect speakers will make use of the common ground and the cooperativeness principle. It is likely that they will also make use of as much common ground as their processing limits will allow.

- **Individual differences: working memory capacity**

There are considerable individual differences in almost all complex cognitive activities. Theories based on the assumption that everyone comprehends text in the same way are likely to be incorrect. Just and Carpenter (e.g., 1992) assumed there are individual differences in the capacity of working memory. Working memory is used for both storage and processing during comprehension so this has substantial effects on language comprehension.

Daneman and Merikle (1996) considered *global* measures of comprehension ability (e.g., vocabulary) and *specific* measures (e.g., making inferences, detecting ambiguity) in a meta-analysis. Working memory capacity correlated approximately +0.35 with global measures and +0.50 with specific measures. Thus, comprehension is moderately strongly associated with individual differences in working memory capacity. This correlation continues despite IQ being controlled for (Christopher et al., 2012). BarreYRO et al.'s (2012) key finding was that high-capacity individuals were more likely than low-capacity ones to draw elaborative causal inferences on a reading task.

Since individuals with high working memory capacity have greater capacity to control attention, individuals high in working memory capacity reported more ability to maintain on-task thoughts and avoid mind wandering (McVay & Kane, 2012a). Unsworth and McMillan (2013) confirmed that high working memory capacity produces superior reading comprehension partly because of reduced mind wandering. Kaakinen et al. (2003) concluded that high-span readers are better at allocating their attentional resources to relevant information.

However, it is hard to know precisely why high-capacity individuals have higher comprehension performance. Individuals low and high in working memory may differ in other ways, such as verbal intelligence.

Reading span and operation span have been used as measures of working memory capacity. According to Just and Carpenter's (1992) capacity theory, individual differences in working memory capacity have substantial effects on language comprehension. Individuals with high working memory capacity are better able than those with low capacity to allocate resources to relevant information and to suppress unwanted information. The cognitive neuroscience approach offers the prospect of clarifying the processing differences between individuals with high and low working memory capacity.

- **Discourse processing**

In real life we are generally presented with connected *discourse*, i.e., speech or written text at least several sentences long. A sentence in discourse is rarely ambiguous. Comprehension of discourse would be impossible without the process of drawing inferences or filling in gaps. There are three main types of inferences:

- *Logical inferences* depend only on the meaning of words.

- *Bridging inferences* need to be made to establish coherence between the current part of the text and the preceding text.
- *Elaborative inferences* serve to embellish or add details to the text (using world knowledge).

Readers generally draw logical and bridging inferences because they are essential for understanding, but the extent to which non-essential, elaborative inferences are drawn automatically is controversial. Bransford et al. (1972) argued that readers typically construct a relatively complete “mental model” of the situation. However, McKoon and Ratcliff’s (1992) minimalist model assumes:

- Inferences are either automatic or strategic (goal directed).
- Some automatic inferences establish local coherence (two or three sentences making sense on their own or in combination with easily available general knowledge). These inferences involve parts of the text in working memory at the same time.
- Other automatic inferences rely on information readily available because it is explicitly stated in the text.
- Strategic inferences are formed in pursuit of the reader’s goals; they sometimes serve to produce local coherence.
- Most elaborative inferences are made at recall rather than during reading. The greatest difference between the minimalist hypothesis and the constructionist position concerns the number of automatic inferences formed.

Graesser et al. (1994) argued in their search-after-meaning theory that there is much *flexibility* in the number of inferences drawn by readers.

#### **CASE STUDY:** Assumptions in the search-after-meaning theory

A simple form of bridging inference is involved in *anaphor resolution*, in which a pronoun or noun has to be identified with a previously mentioned noun or noun phrase. Evidence that gender information can make anaphor resolution easier was reported by Arnold et al. (2000). Anaphor resolution is also easier when pronouns are in the expected order (Harley, 2013).

#### **RESEARCH ACTIVITY:** Text comprehension and inference drawing

In an ERP study, Nieuwland and van Berkum (2006b) assessed pronoun processing. They found individuals high in working memory capacity were more likely to take account of two possible interpretations of the pronoun. There was a smaller probability of processing both interpretations when the contextual bias was strong.

Garrod and Terras (2000) studied the processes involved in bridging inferences. They proposed that there are two stages in forming bridging inferences:

- The first stage is bonding, which is a low-level process involving the automatic activation of words from the preceding sentence.
- The second stage is resolution, which involves making sure that the overall interpretation is consistent with the contextual information.

Resolution is influenced by context but bonding is not. Inference drawing is an automatic process (Gras et al., 2012). Kuperberg et al. (2011) found some inference processing is initiated very rapidly even with complex causal inferences.

Graesser et al. (1997) concluded that:

- The minimalist hypothesis is probably correct when:
  - the reader is reading quickly;
  - the text lacks global coherence;
  - the reader has very little background knowledge.
- The constructionist theory is probably correct when the reader is attempting to comprehend the text for enjoyment or mastery.

## **RESEARCH ACTIVITY:** Inferences – which theory is supported by the most evidence?

There is general agreement that we typically make logical and bridging inferences, with anaphor resolution being a very common type of bridging inference. However, there is more controversy concerning the extent to which elaborative inferences are drawn. According to the minimalist hypothesis, only a few inferences are drawn automatically; additional strategic inferences depend on the reader's goals. This contrasts with the constructionist viewpoint, according to which numerous automatic inferences are drawn. It is likely that the number of inferences drawn by readers will depend on their reading goals and background knowledge of the text.

- **Discourse comprehension**

Gomulicki (1956) showed the selective way in which stories are comprehended and remembered. Story processing involves relating text information to relevant structured knowledge in long-term memory. It is probable that what we process in stories, how we process information in stories and what we remember from stories all depend, in part, on stored information. Statements causally connected to several other statements were judged to be much more important than those lacking causal connections (Trabasso & Sperry, 1985).

*Schemas* are well-integrated packets of knowledge about the world, events, people and actions. The schemas stored in long-term memory include scripts and frames. Scripts deal with knowledge about events and consequences of events. Frames are knowledge structures relating to some aspect of the world containing fixed structural information and slots for variable information. Schemas are important because they contain much of the knowledge used to facilitate understanding of what we hear and read. They also allow us to form expectations and help us make the world predictable. Ghosh and Gilboa (2014) argued that schemas possess four necessary and sufficient features:

- *Associative structure*: Schemas consist of interconnected units.
- *Basis in multiple episodes*: Schemas consist of integrated information based on several similar events.
- *Lack of unit detail*: This follows from the variability of events from which any given schema is formed.
- *Adaptability*: Schemas change and adapt over time as they are updated in the light of new information.

Evidence that schemas can influence story comprehension was reported by Bransford and Johnson (1972).

Bartlett (1932) argued that schemas play an important role in determining what we remember from stories. Memory is affected not only by the presented story, but also by the participant's store of relevant prior schematic knowledge. Bartlett found a substantial proportion of recall errors were in the direction of making the story read more like a conventional English story. He used the term *rationalisation*. Bartlett assumed memory for the precise material presented is forgotten over time, whereas memory for the underlying schemas is not. Therefore, rationalisation errors increase in number at longer retention intervals (Bergman & Roediger, 1999).

## **CASE STUDY:** Bartlett – The War of the Ghosts

Brewer and Treyens (1981) investigated the effect of schemas on memory when information is acquired incidentally in a naturalistic situation. They found participants recalled more schema-consistent than schema-inconsistent objects, objects that were falsely recognised were all highly schema-consistent, and participants recognised many more objects than they recalled. These results suggested that the schema was used as a retrieval mechanism to facilitate recall. See Steyvers and Hemmer (2012) for inconsistent evidence.

Schemas can influence retrieval of information from long-term memory. Anderson and Pichert (1978[DOI: 10.1016/S0022-5371(78)90485-1]; see Eysenck & Keane, 2010, p. 403) found altering perspective on a story produced a shift in the schematic knowledge accessed, and enhanced recall. This provides support for the notion of schema-driven retrieval.

Our organised schematic knowledge of the world is used systematically to help text comprehension and recall. Many errors and distortions occur due to the influence of schematic information. Limitations of schema research are that it has proved hard to identify the characteristics of schemas – most versions of schema theory are sadly lacking in testability and the conditions determining when a given schema will be activated are unclear. The effects of schemas on memory have been exaggerated and their effects on comprehension not fully explored.

#### *Construction–integration model*

Kintsch (1998) proposed a construction–integration model specifying the processes involved in comprehending and remembering story information. The model assumes story comprehension involves forming propositions. A *proposition* is a statement making an assertion or denial. Here are the main assumptions of the construction–integration model:

- Readers turn sentences in the text into propositions (statements that are true or false) representing its meaning.
- The propositions constructed from the text are stored briefly along with associatively related propositions (e.g., inferences). At this stage, many irrelevant propositions are stored.
- A spreading-activation process selects propositions for the text representation. In this integration process, clusters of highly interconnected propositions attract most activation and have the greatest probability of inclusion in the text representation. Within the text representation, it is hard to distinguish between propositions based directly on the text and those based on inferences.
- As a result of the above processes, three levels of text representation are constructed:
  - surface representation (the text itself);
  - propositional representation or textbase (propositions formed from the text);
  - situation representation (a mental model describing the situation referred to in the text). This is the only representation depending mostly on the integrating process.

Kintsch et al. (1990) has shown the forgetting functions for the surface, propositional or textbase, and situational representations were distinctively different. There was rapid and complete forgetting of the surface representation. Propositional information showed forgetting over time, but there was only partial forgetting. However, information from the situational representation showed no forgetting over four days. Kintsch et al. predicted that the most complete representation of the meaning of the text was best remembered. Mulder and Sanders (2012) found causal relations were represented within the situation representation but not the propositional or surface representations. Thus, readers may not *always* form three levels of text representation even for important information such as causal relations. According to the model, textual information is first linked with general world knowledge, then to contextual information. Cook and Myers (2004) found that, in contrast to the model, contextual information could be used *before* general world knowledge during reading.

The construction–integration model spells out the ways in which information in the text combines with the reader’s related knowledge. Limitations of the model are:

- The assumption that only bottom-up processes are used during the construction phase is dubious.
- It is wrongly assumed that other sources of information (like contextual information) are only used at the integration phase.
- Factors relating to the readers’ goals have been de-emphasised in this model.
- Two levels of discourse representation are ignored: the genre level and the communication level.
- The model does not spell out which inferences will and will not be drawn.
- The model is not specific about processes involved in construction of situation models.

#### **INTERACTIVE EXERCISE:** Construction–integration model

#### *The event-indexing and event-segmentation theories*

The previous models typically ignore the importance of events. Events are fundamental to human experience (Radvansky & Zacks, 2011). McNamara and Magliano (2009, p. 321) pointed out that a fundamental

assumption of the event-indexing model (Zwaan et al., 1995) is that “the cognitive system is more attuned to perceive dynamic events (changes in states) rather than static information”. According to the event-indexing model, readers monitor five situational aspects to decide whether their situation model needs to be updated:

- *Protagonist*: the central character or actor in the present event compared to the previous one.
- *Temporality*: the relationship between the times at which the present and previous events occurred.
- *Causality*: the causal relationship of the current event to the previous one.
- *Spatiality*: the relationship between the spatial setting of the current event and a previous event.
- *Intentionality*: the relationship between the character’s goals and the present event.

Readers are continually updating the situation model so that it accurately reflects the information presented with respect to all five aspects. It is assumed that unexpected change requires more processing effort than when all five aspects remain the same. The five indexes are monitored independently, predicting that processing effort should be greater when two aspects change at the same time than when only one aspect changes. Zwaan and Madden (2004) distinguished between:

- The *here-and-now view* – the most current information is more available than outdated information.
- The *resonance view* – new information resonates with all text-related information in memory.

According to event-segmentation theory (Zacks et al., 2007), updating of a situation model can take two main forms:

- Incremental updating of individual situational dimensions (the “brick by brick” approach emphasised within the event-indexing model).
- Global updating in which an old situational model is replaced by a new one (the “from scratch” approach emphasised by event-segmentation theory).

Support for the prediction that reading a sentence involving discontinuity takes longer was reported by Rinck and Weber (2003). They found there was a progressive increase in reading time as the number of indexes shifted. Curiel and Radvansky (2014) found updating time was greater when two dimensions required updating than when only one did. Readers generally update information on intentionality, time and protagonist, but are less likely to do so with spatial information (Smith & O’Brien, 2012). The notions that situation model updating can be incremental (as emphasised by the event-indexing model) or global (as emphasised by event-segmentation theory) were investigated by Kurby and Zacks (2012). Readers indicated what they were thinking while reading an extended narrative. Readers showed evidence of incremental updating by increased mentions of the character, object, space, time and goal, when the relevant situational aspect changed.

The greatest strength of the event-indexing model is that it identifies key processes involved in creating and updating situational models. The models have limitations in their applicability (only to simple short narrative texts describing event sequences) and in that they de-emphasise the reader’s goal and skills.

According to schema theory, schemas or organised packets of knowledge help to determine what we remember of stories. Recall of texts often includes schematic information that was not presented. Schemas influence comprehension and retrieval processes. There is support for a dissociation between higher-level schemas and scripts, and lower-level information from studies with brain-damaged patients. According to Kintsch’s construction–integration model, three levels of representation of a text are constructed, with the surface representation being forgotten most rapidly and the situational representation most slowly. Processes involved in the formation of situational models were identified in the event-indexing model. According to this model, readers monitor five aspects of the evolving situational model. Discontinuity in any of these aspects creates difficulties in situation-model construction and increases reading times. According to the experiential-simulations approach, people construct a single meaning-related representation consisting of a perceptual simulation of the situation described by the text.