

FINAL TAKEHOME EXAM

1. Consider the following pair of sentences:

a) *The police officer arrested at his home was acutely embarrassed.*

b) *The suspect arrested at his home was acutely embarrassed.*

Suppose you used a “self-paced” reading task with a moving window display. Describe this (1point). (Suppose that subjects read 32 such sentences, along with many “filler” sentences.)

“Self-paced” reading task is the experiment in which reading times are measured while subjects read text in presentation ‘windows.’ Sentences are presented word by word or phrase by phrase on the monitor. Participants are instructed to control the rate of presentation with the press of a button. Only one fragment is visible at any one time. When a new sentence region appears, the previous one disappears; participants cannot look back. Reading times (the interval between button presses) for relevant sentence regions are recorded. Minimally-different pairs of sentences are usually used to compare the similar regions within each sentence. Relatively longer reading times could be indicative of greater processing difficulty.

What would the Garden Path Model of Frazier et al.’s, on one hand, and the Constraint Satisfaction Model of MacDonald et al.’s, on the other, Predict about reading times in sentence regions 2 and 3 below? (4 points)

Region 1	Region 2	Region 3
The X	arrested	at his home

For the Garden Path Model of Frazier et al.’s

The information connected with the verb makes the difference whether there is a Garden Path effect or not, and accordingly the reading time would be different, too.

- In this case, the information used by the structural processor is the thematic information associated with verbs.

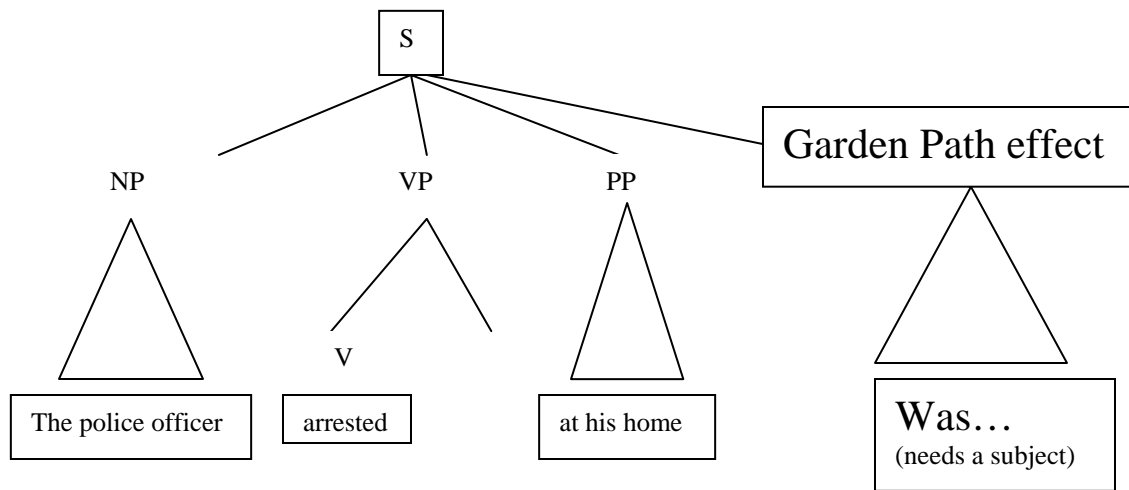
	Region 1	Region 2	Region 3		
a	<i>The police officer</i>	<i>arrested</i>	<i>at his home</i>	<i>was acutely embarrassed.</i>	GP
b	<i>The suspect</i>	<i>arrested</i>	<i>at his home</i>	<i>was acutely embarrassed.</i>	No GP

For (a), there will be a Garden Path effect.

The structural processor is receiving words from the lexical processor and building structure as it goes along. It begins by creating a subject noun phrase ‘*The police officer*’ (agent/animate), they proceed to region 2 ‘*arrested*’, which is a very likely verb (past, active), because ‘*The police officer*’ is an appropriate thematic role of agent for the verb ‘*arrested.*’ By now, the sentence **1a** looks like a past tense main clause [Look at Figure 1A: the structural processor has a general preference for simple structures, and it relies strongly on the basic order of grammatical relations in English, subject-verb-(object) (adverbial)]. This preferred structure is a result of the combination of thematic information associated with the verb and the minimal attachment strategy. So far, the reading in regions 1 & 2 are generally smooth and fast.

The subjects continue to Region 3, ‘*at his home.*’ Normally (high frequency), ‘arrest’ is a transitive verb which requires a direct object. However region 3, ‘*at his home,*’ violates the expectation, thus slows down the reading speed a little bit and the reading speed slows down even longer when the subjects notice that there is no subject available for ‘was’ in the following unit ‘*was acutely embarrassed.*’ The minimal structure turns out to be incorrect. The structural processor must reprocess the sentence and consequently increase much reading time. Overall, the reading time in region 3 is a little bit longer and owing to the garden path effect (the reprocessing), the reading time after region 3 is much longer.

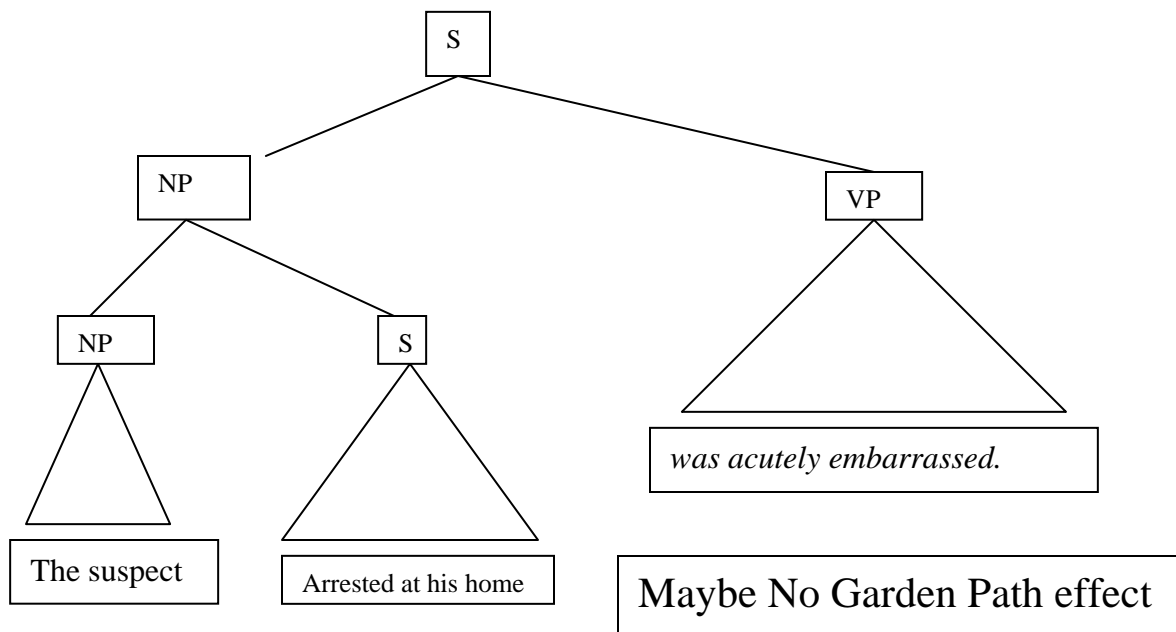
Figure 1A



For (b), subjects read ‘*The suspect,*’ and continue to region 2 ‘*arrested*’, which is not a semantically compatible verb for ‘*the suspect.*’ Namely, ‘*the suspect*’ is not a good agent for the verb ‘*arrest.*’ We would predict, the reading speed in region 2 will be slowed down.

However, we are not so sure whether the thematic information or information about real-world will be accessible on line or not. In the real world, police officer tends to arrest people, but the suspect tends to be arrested. With this thematic information, the processing complexity might be reduced. Nonetheless, we are not certain whether this thematic cue (the incompatible subject-verb), the real-world probability is quickly available to the parser or not. I tend to believe for the proficiency reader, it might be accessible and help prevent the structural processor from performing incorrect minimal attachment on sentence (b), and makes the reduced relative structure the most possible structure to construct (see Figure 1B). The subjects continue to Region 3, ‘*at his home*’ and read along smoothly until the end.

Figure 1B



Constraint Satisfaction Model of MacDonald et al.’s

In Constraint Satisfaction Model, rich lexical representations make available multiple syntactic alternatives that are weighted by the frequency of lexical forms and their argument structures in specific syntactic environments. The alternatives are continuously evaluated, using relevant linguistic and nonlinguistic constraints such as the semantic/thematic fit between a phrase and a potential argument position.

Subjects found 1(a) confusing because ‘*The police officer arrested*’ has the high frequency to be identified as a subject-verb simple past tense active sentence. The subjects would read along smoothly in region 1 & 2, but starts to feel confused as they expect that there is a direct object for the verb ‘arrest.’ There is a strong correlation between frequency of use as a transitive verb and the frequency with which a verb is used as a past participle in a relative clause. ‘Arrested’ is often used transitively, now with the region 3, not a direct object, all the information slows down the reading speed in region 3 and with all the continual constraints, the subjects adjust their processing and reach the possible solution by now that this is a reduced relative clause. They proceed smoothly to the end ‘*was acutely embarrassed.*’ Notice, even though there is a slow reading speed in region 3, without the need to undo and redo the processing, the reading speed in and after region 3 here is not as long as that in the garden path

model (we can predict the reading speed after region 3 in the garden path model will be the slowest).

For 1(b), subjects first read ‘*The suspect*’ a noun phrase, they proceed to region 2 ‘*arrested.*’ In real world, the suspect is usually (high frequency) arrested by people, instead of arresting people. Such semantic/thematic fit is evaluated and slow down the reading speed in region 2. Syntactic and semantic aspects of verb-argument structure are accessed as soon as a verb is recognized and verb-specific constraints are rapidly used in resolving local ambiguities and in projecting upcoming structure, including potential arguments. The particular analysis (the reduced restrictive relative clause) settles earlier when sources of information are congruent. Therefore, the information makes the reading toward region 3 relatively easy. There’s no significant slow reading in region 3 or after region 3.

2. *What effect has “frequency of occurrence” been shown to play in language comprehension, at the word, verb subcategory, and sentence level? (5 points)*

Sentences are easier to process when words and structures are used in high frequency.

Word-specific (fine grain)

As each word is input, all the information associated with the word is accessed. The information includes the frequency of occurrence of different aspects of the word.

For instance: “raced”

- The boy raced down the slope.
Active, main verb, past tense, Subject=agent, intransitive (no direct object).
Around 80% of the time
- The boy raced his bike down the hill.
Active, main verb, past tense, Subject=agent, Transitive
Around 10% of the time
- The jeep (that was) raced around the track crashed.
Passive, passive participle, Subject=’theme,’ relative clause, Transitive
Around 1% of the time

When we read the sentence fragment “the boy raced...,” at ‘raced,’ the different ‘meanings or usages’ of race and accompanying frequency information becomes activated, and the activation strength depends on frequency.

verb subcategory

Different verbs will start with different ‘biases.’ Some verbs are equally frequent as past tense main verbs as passive participles. For example, *Carried* appears as a participle 52% of the time (more likely to construct a reduced relative structure. Others may be strongly biased, e.g. *Raced* only appears as a participle 8% of the time.

Some verbs, such as *think*, cannot be followed by a direct object, but only by a clausal complement. The presence of such a verb would prevent the parser from creating a subject-verb-object structure. For instance, *We thought Joe’s fiancée* would be given a clausal analysis even without the clause boundary mark *that*, because only a clause can follow *thought*. Others, such as *understand*, can appear either with a direct object (*Brian understood the situation*) or with a clausal complement (*Brian understood the situation was getting better*).

In addition, the context can play a role. For, instance, if the subject of the sentence is more ‘theme-like’ than ‘agent-like,’ then this will affect the activation of verb features. In the example:

The doctor (Likely agent)	The evidence (Likely theme)
The doctor examined...	The evidence examined...
Likely to be past tense, main verb, active sentence	Likely to be passive participle in reduced relative clause sentence
Context—such as the animacy of the subject—can affect the activation levels of the different verb feature	

3. *According to Nicol & Swinney, pronouns re-activate their antecedents immediately.*
What evidence is this claim based on? (3 points)

Love and Swinney (1995) examined a number of test points throughout the comprehension of a sentence containing a pronoun, and attempted to obtain more detail about the time course of the initial processing and reactivation of such antecedents. They used cross-modal semantic priming.

Procedure: subjects heard sentences of the following form:

Jeff had read about problems with savings and loan institutions, so he went to the
[bank]¹ to ask about the ²safety that [it]³ provided with respect to CD investments.

Priming for each meaning of the ambiguous word bank (1. financial institution, 2. river edge) was examined at each of these points (marked numerically). The results:

1. Significant priming for words related to both meanings of the ambiguity was found at the first test point immediately following initial occurrence of the ambiguous word in the sentence.
2. At test point 2, no significant priming was found for words related to either of the meanings of the ambiguity.
3. At test point 3, immediately follow the pronoun, a significant facilitation effect was found for only the target word related to the primary and contextually relevant meaning of the ambiguity (the financial institution interpretation).

Therefore, only the contextually relevant meaning of the ambiguity was immediately reactivated once the pronoun was heard. The experimental results elegantly proved the assumption 'pronouns re-activate their antecedents immediately' is correct.

What are some constraints on the re-activation process? (1 point)

Only a subset of constraints affects the initial candidate set. Syntactic and featural constraints on conference limit the initial candidate set to just those NPs which could be the antecedent.

Syntactic constraints

The grammar requires that reflexive pronouns, such as *herself*, refer to a noun phrase in its clause (usually the subject), while personal pronouns, such as *her*, can not be referred to noun phrases in the same clause.

In the sentence:

3a. The janitor told the landlord that the fireman with the gas mask would protect himself from getting hurt.

3b. The janitor told the landlord that the fireman with the gas mask would protect him from getting hurt.

Nicol & Swinney's (1989) experiment using the cross-modal priming task demonstrated that in 3a. *the fireman* was reactivated after *himself*, but *the janitor* and *the landlord* were not. On the contrary, in 3b, *the janitor* and *the landlord* were reactivated after *him*, but *the fireman* was not.

Featural constraints

Pronominal forms must match their antecedents in gender, number and animacy.

For example, in the sentence:

3c. The ballerina told the skier that the doctor for the team would blame him for the recent injury.

Priming only happened for 'skier,' because 'ballerina' mismatches 'him.'

3d. The ballerina told the skier that the doctor for the team would blame her for the recent

Priming happened for both 'ballerina' and 'skier,' because neither of them mismatches 'her.'

Some other constraints that might come into play:

1) a possible preference for parallel function (i.e., a preference for coreference with the NP in the matrix clause which has the same thematic role as the pronoun). For instance, in the sentence:

3e. *Tom* told *Joe* that *he* must pay *Sam* the money.

There might be a preference to consider *Tom* as *he*, because both of these NPs are subjects.

2) a preference for coreference with a 'topic': In 3e, *Tom* is also preferred as the antecedent of *he* because subject NPs are usually topics, and as such are more salient than object NPs.

3) Real-world sensibility: The semantic context in which referents appear is obviously relevant to selecting an antecedent. One prominent plausibility effects is the implicit causality

associated with the matrix verb in constructions in which two clauses are causally linked.

For instance, compare these two verb types:

3f: ‘stimulus-experiencer’ verb, e.g. *Sue amazes Kelly* a lot because she is so talented.

3g: ‘experiencer-stimulus’ verb, e.g. Eric *admires Sam* a lot because she is so talented.

Perceivers expect to hear more about the stimulus and construe a pronoun as coreferent with the stimulus (*Sue* in 3f, and *Sam* in 3g).

4. What is a “TOT”? (1 point)

TOT is Tip of the Tongue. This is a common speech event in which the speaker tries to say something and can’t find the word but is sure that he is about to remember.

TOTs are often accompanied by a feeling of imminent recall and the ability to report partial information about the target word form. In a famous experiment in 1966, Roger Brown and David McNeill, read out definitions of rare words to students, and then quizzed those in a TOT state. One example:

A navigational instrument used in measuring angular distances, especially the altitude of sun, moon, and stars at sea.

This experiment showed that people with tip-of-the-tongue generally had a relatively accurate outline of the target word. They could remember the beginnings of words better than the ends, and the ends better than the middle. They could also often remember the number of syllables, 57% of the time, where by chance they should be correct only 20% of the time. This suggests that these facts of the word are more clearly ‘inked in’ in the mind than some others.

What does the TOT phenomenon suggest about how the language production system is designed? (2 points)

During a TOT, speakers fail to retrieve a word or name that they are sure they know. This phenomenon provides important information about how words are stored and retrieved from the mind, because the searcher can often remember some information about the ‘missing’ word, and can propose similar sounding and similar-meaning words. TOT phenomenon suggests a separation of lexical meaning and lexical form. This can further suggest how our language production system is designed:

1. We emerge/form an idea, a **message (lexical meaning)** we want to convey.
2. We try to retrieve the words (**lexical forms**) that match the meanings.

3. We put them in the right order, and then pronounce them in sequence.
5. **Give an example of a “word exchange error” (1 point) and a “sound exchange error” (1 point). Apart from the fact that one type of exchange involves sounds and the other type involves words, how are these errors typically different? (1 point).**

word exchange error

We should put *knowledge* into *use*.

We’ll sit around the song and sing fires.

Words that exchange:

They are not related in meaning.

They share grammatical category.

They are both active at the same time.

Exchange across phrases suggests a multi-phrase planning window.

“The assignment processes for phrasal role and phrasal position are not directly coded for meaning.”

sound exchange error

Take my *bike* → *bake* my bike

Have you turn on the *washdisher*. (*dishwasher*).

Please *show* me to a *seat* → Please *sew* me to a *sheet*.

Sounds that exchange:

They are often similar in form and/or have similar phonetic environments.

Exchange within a phrase.

“Sound exchanges are presumed to arise in the process of phonological interpretation of the lexical items that are assigned to positions in the phrasal frames of this planning level.”

6. What is lemma? (1 point)

A lemma is an abstract mental representation of a word, the equivalent of a headword in a dictionary, which is the form given before all the variant forms are listed. For example: in a

dictionary entry, the headword talk appears before forms such as talked, talking and so on. Some psycholinguists argue whether a lemma has true psychological reality.

At the pre-linguistic (conceptual) level we begin with a content we want to convey. The lemma is a representation of this concept that we retrieve from the lexicon. This is a message level representation with no link to form. For example, if the message includes cat (the image not the word) we may go from the specific message to retrieve from the mental lexicon (our representation of cat). It is not yet attached to words.

***For any given lexical item, could a bilingual speaker have one lemma for both languages?
Explain. (2 points)***

In the bilingual masked priming studies, a robust asymmetry exists when using lexical decision: masked primes in L1 facilitate decision times on L2 targets, but not vice versa. However, in different task, semantic categorization, we find evidence that masked L2 primes facilitate L1 targets. The assumptions are:

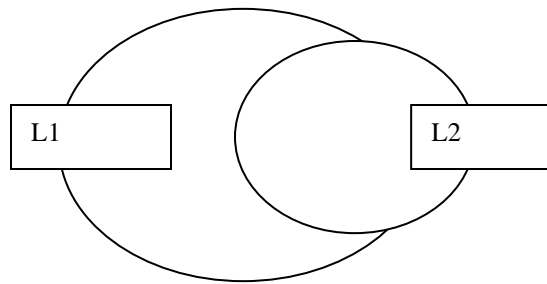
- There is a representation asymmetry between L1 and L2 lexical semantic representations. L1 representations are more richly populated than L2 representations.
- L2->L1 priming does not occur in lexical decision because L2 primes are not rich/strong enough to activate sufficient proportion of the L1 lexical semantic representation.
- In semantic categorization, the semantic information recruited to generate a decision is restricted by the task category, and that this restriction enhances the effectiveness of the L2 prime.

Finkbeiner (2004) tested these assumptions in a within-language setting by pairing many-sense words (e.g., 'head') with few-sense words (e.g., 'skull'). The results:

- In lexical decision:
Robust priming was obtained in the *many* → *few* direction (analogous to *L1* → *L2*), but no priming was obtained in the *few* → *many* direction (*L2* → *L1*).
- In semantic categorization:

Priming was obtained in both directions.

These findings reconfirm that there exists an L1 vs. L2 lexical semantic representation asymmetry. They are overlapped with L1 richer than L2.



7. Do open class vocabulary words and closed class elements appear in the same kinds of speech errors? Explain (3 points)

No. They appear in different kinds of speech error.

Open class: The word class which contains an unlimited number of items. Nouns, verbs, adjectives, and adverbs are open-class words. New words can be added to this class as the need arise, e.g. laser. They are considered as content words because they express the main meaning in speech. Lexical processes have to do with content words.

Closed class: They are affixes (word segments which are added to the beginning or end of a word, including inflectional affixes, which mark tense or number, e.g., *she is dancing* or *she waltzes*; derivational affixes, which are used to derive related words, e.g. *dancer*) and function words (such as articles, demonstratives, conjunctions, prepositions, auxiliary verbs, and pronouns). They are used in order to express grammatical relations between words. The closed class consists of relatively few words, and new words are not usually added to them. Since words in the closed class have a syntactic rather than a semantic role in speech they are hence referred to as function words.

In Stemberger' experiments (1984), he found out open class words vs. closed class elements are involved in different kinds of errors. His findings suggest that:

- There are two different processing between open vs. closed lexical items. Therefore, each of them has its own distinct production error pattern.
- Production of words from the open class is characterized by a high frequency of substitution, exchange and phonological errors.

- Production of words from the closed class is characterized by a high frequency of stranding, shift, loss and addition errors and very few phonological errors.

- Example in Stranding:

It waits to pay → it pays to wait

This suggests that inflectional segment is 'insulated' from the exchange.

Within production model, the selection of lemmas and retrieval of phonological forms is about open class (content) words. The generation of function words occurs after the insertion of phonological forms of content words into syntactic frame. Closed class elements are represented as part of the planning frame.

8. What is “syntactic persistence” in language production? (1 point)

Bock and Loebell (90) designed a priming experiment using syntactic structures as primes. Subjects were asked to describe what was happening in unrelated pictures. The results demonstrated that syntactic patterns tend to remain activated. The subject was more likely to use a structure that he had just heard even though his statement has no semantic relation to the priming sentence. Syntactic primes tended to cause the subjects to utilize the same structure. Meaning appeared to have no effect upon results. The explanation for this result is that syntactic structures remain active for a brief time after they are accessed. This phenomenon is syntactic persistence.

What does a finding of syntactic persistence suggest about the types representations that are computed during production? (2 points)

The results show that overall what is carried over from one utterance to the next is syntactic form, not the conceptual or semantic features of prime sentence. Bock and Loebell's (1989) study also suggest if thematic relations do predate in production, their workings would be insulated from the elaboration of constituents, and they may play their part before constituent representations are formed. The implication is that the ongoing use of language involves abstract syntactic categorizations. The products of these categorization are the obvious candidates for the input to structure formation. The experimental evidence suggests that syntactic construction process is separable from meanings that sentences try to convey, when they are computed during language production.

9. According to Glenberg et al., what is meant by the term “mental model”? (1 point)

Glenberg and Mathew (1992) describe a mental model as "a representation of what the text is about, a representation of the events, objects, or processes described by the text, rather than of the words, sentences, or structures of the text itself." Constructing a mental model requires continual interaction between the text and the reader's linguistic, pragmatic and world knowledge. The mental model represents a subset of the world described in the text. It is constantly updated as the reader processes additional information; it is also manipulable—portions of the representation can be moved and interwoven with other portions to generate emergent images. In contrast to viewing reading as understanding a static text, Glenberg et al. offer an alternate way to look at reading. The model is dynamic, interacting with and accommodating to new information from the text. It reflects not just the structure of the text, but the structure of the events, and guides the inference making.

Briefly describe one piece of evidence in support of such a model (2 points)

The key feature of the mental model is that a mental model is a **representation** of the situation described by a text (what the text is about), not the text itself. This concept can be illustrated by the experiment below:

Subjects were asked to memorize one sentence from pairs of sentences, 1a and 1b, and 2a and 2b.

1a. Three turtles rested on a floating log, and a fish swam beneath them.

1b. Three turtles rested on a floating log, and a fish swam beneath it.

(1a and 1b reflect the same mental picture: a fish swam under the turtles/log.)

2a. Three turtles rested beside a floating log, and a fish swam beneath them.

2b. Three turtles rested beside a floating log, and a fish swam beneath it.

(The mental image for 2a: a fish swam under three turtles.)

(The mental image for 2b: a fish swam under a log.

2a and 2b reflect two different mental pictures).

On the recognition test, subjects asked to memorize 1a or 1b had great difficulty remembering which sentence they had been asked to memorize in pair 1. On the contrary, subjects asked to memorize 2a or 2b had little difficulty remembering which sentence they had been asked to memorize in pair 2, while in pair 1 and pair 2, the only difference is the preposition (on vs. beside). If reading comprehension is about the text itself, the recognition should be similarly difficult: both two sentences in pair 1 and pair 2 differ to exactly the same degree, so the results should be similar.

However, the two sentences in pair 1, represent identical pictures, so it is more difficult for subjects to remember whether it is 1a or 1b they were asked to remember. On the other hand, the two sentences in pair 2, reflect two different mental pictures, so it is easier for subjects to distinguish and remember which sentence they were asked to memorize.

The different results are compatible with the mental models' assumption: the cognitive representation of text is a representation of the things (objects, events, processes) described by the text (what the sentences are about), not the text itself.

10. *Figure 1.3 in Cairns shows a diagram in which production processes and comprehension processes are “mirror images” of each other. Discuss the appropriateness of this view with respect to ambiguity. (3 points)*

To understand a sentence, the hearer must reconstruct the process that was done by the speaker to convey the intended meaning, which makes production processes and comprehension processes look like ‘mirror images.’ The hearer uses information contained in the acoustic signal and in his own linguistic competence to reconstruct the phonological representation of the speaker’s utterances, and then used it to retrieve the proper lexical items from his/her lexicon inventory, and finally the structural processor reconstructs the structure of the sentence. It’s among these reconstruct processes (at different levels of language comprehension, from categorizing phonemes to recognizing a speaker’s intentions), ambiguity occurs. Sentences inevitably contain many temporary ambiguities as they unfold over time. For example, linguistic forms such as words and morphemes are frequently ambiguous with respect to their syntactic category, and tense and voice (e.g. *spotted* could be either an adjective or a verb, and as a verb it could be a past tense form of a passive participle).

Another common ambiguous case: Ambiguous forms and non-adjacent grammatical dependencies often combine to result in fragments that are temporarily ambiguous among multiple syntactic structures. For example, the student spotted ...is ambiguous between a past tense main clause in the active voice (e.g. *The student spotted the proctor*) and a relative clause (e.g. *the student spotted by the proctor...*).

Reference

Glenberg, A. M., and Mathew, S. (1992) When minimalism is not enough: Mental models in reading comprehension. *PSYCOLOQUY* 3(64) reading-inference-2.1