

# 10 - Sentence Production Models

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December 11, 2019

## Five-minute exercise

### Models of sentence production

1. Message level
2. Functional level
3. Positional level
4. Phonetic level

### Bibliography

#### 5 min ex.

5 min ex.

#### Modes of sent. prod

The model

Garrett's model

Levitt's model

#### 1. Message level

1a. info at ML

1b. ML to FL

#### 2. Functional level

2a. Info at FL

2b. FL to PosL

The linking problem

Errors in children

#### 3. Positional level

3a. Info at PosL

PosL to PhonL

#### 4. Phonetic level

4a. Info at PhL

4b. PhL to ArtL

Motivation for syllables as  
units of representation

#### Bibliography

Nick Riches

5 min ex.

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4. Phonetic level

4a. Info at PhL

4b. PhL to ArtL

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Look at the following speech errors. What does this say about the integration between (a) planning the structure of the sentence, and (b) inserting words in sentences, and (c) producing phonemes.

1. I'm a weekend for maniacs.

5 min ex.

10 - Sentence  
Production Models

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5 min ex.

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4a. Info at PhL

4b. PhL to ArtL

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**A** SUBJ + be + NOUN PHRASE + for + NOUN PHRASE

**B** I am a weekend for maniac + PL



**C** I am a weekend for maniac-s

5 min ex.

5 min ex.

## Mods of sent. prod

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1b. ML to FL

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2a. Info at FL

2b. FL to PosL

The linking problem

Errors in children

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PosL to PhonL

## 4. Phonetic level

4a. Info at PhL

4b. PhL to ArtL

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## Five-minute exercise

## Models of sentence production

### 1. Message level

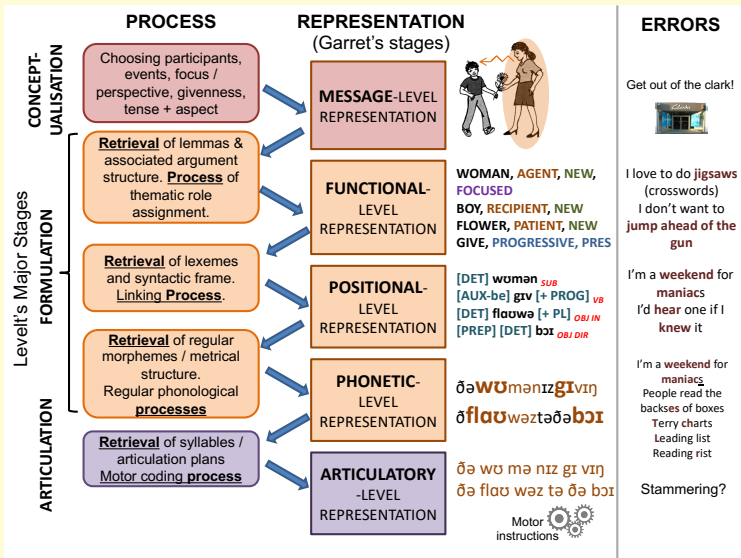
### 2. Functional level

### 3. Positional level

### 4. Phonetic level

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# The model



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4a. Info at PhL

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Mods of sent. prod

The model

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1. **Message level** - Very abstract representation of what we are going to say
2. **Functional level** - Activations of relevant lemmas. Still no syntactic frame
3. **Positional level** - Syntactic frame chosen, insertion of invariant lexemes/morphemes
4. **Phonetic level** - Insertion of variant lexemes/morphemes and syllabification
5. **Articulatory level** - Speech motor programme assembled.

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2. Functional level

2a. Info at FL

2b. FL to PosL

The linking problem

Errors in children

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5 min ex.

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Mods of sent. prod

The model

Garrett's model

Levelt's model

1. **Conceptual level** (corresponding to Garrett's message level)
2. **Formulation level** (corresponding to Garrett's Function, Positional, and Phonetic levels)
3. **Articulation level** (corresponding to Garrett's Articulatory level)

1. Message level

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2. Functional level

2a. Info at FL

2b. FL to PosL

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Errors in children

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PosL to PhonL

### 4. Phonetic level

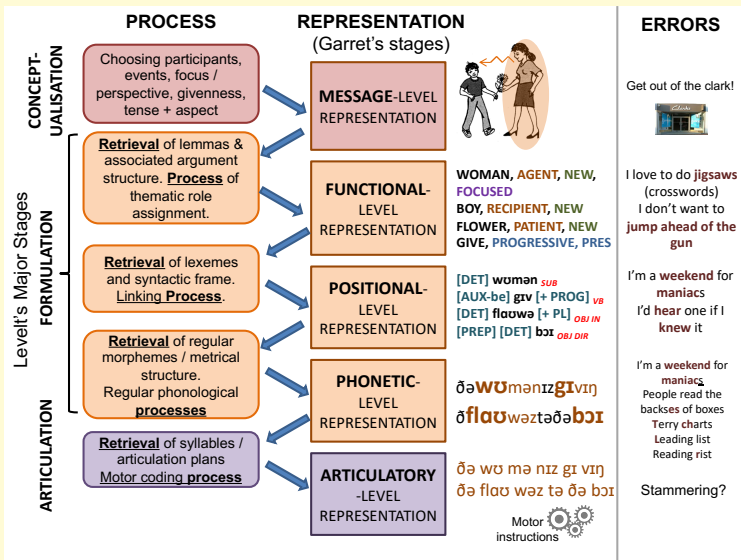
4a. Info at PhL

4b. PhL to ArtL

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## Bibliography

# 1a. What information is represented at the message level?



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2a. Info at FL  
 2b. FL to PosL  
 The linking problem  
 Errors in children

3. Positional level

3a. Info at PosL  
 PosL to PhonL

4. Phonetic level

4a. Info at PhL  
 4b. PhL to ArtL  
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# 1a. What information is represented at the message level?

**Entities** we wish to talk about, and what kind of **situation** or **event** they are participating in.

**Relational information**, e.g. what is the relationship between an entity and an action? Is that entity the **AGENT** of the action, or the **PATIENT** of the action?

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4a. Info at PhL

4b. PhL to ArtL

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# 1a. What information is represented at the message level?

We take a particular **perspective** on the action.

We decide which entity to **focus** on.

Focused element expressed using full Noun Phrase (not pronoun), and placed sentence finally.

1. I saw a strange man in the street. [ He *TOPIC* ] was wearing [ the weirdest clothes I've ever seen *FOCUS* ].

5 min ex.

5 min ex.

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Errors in children

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PosL to PhonL

4. Phonetic level

4a. Info at PhL

4b. PhL to ArtL

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# 1a. What information is represented at the message level?

Focus on the verb

## Tense

Are we inside or outside of the event? (**grammatical aspect**)

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5 min ex.

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The model

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2. Functional level

2a. Info at FL

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The linking problem

Errors in children

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PosL to PhonL

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4a. Info at PhL

4b. PhL to ArtL

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# 1a. What information is represented at the message level?

1. John **has chopped** the carrot PERFECTIVE aspect for completed event
2. John **is chopping** the carrot PROGRESSIVE aspect for ongoing event

5 min ex.

5 min ex.

Modes of sent. prod

The model

Garrett's model

Levelt's model

1. Message level

1a. info at ML

1b. ML to FL

2. Functional level

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2b. FL to PosL

The linking problem

Errors in children

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PosL to PhonL

4. Phonetic level

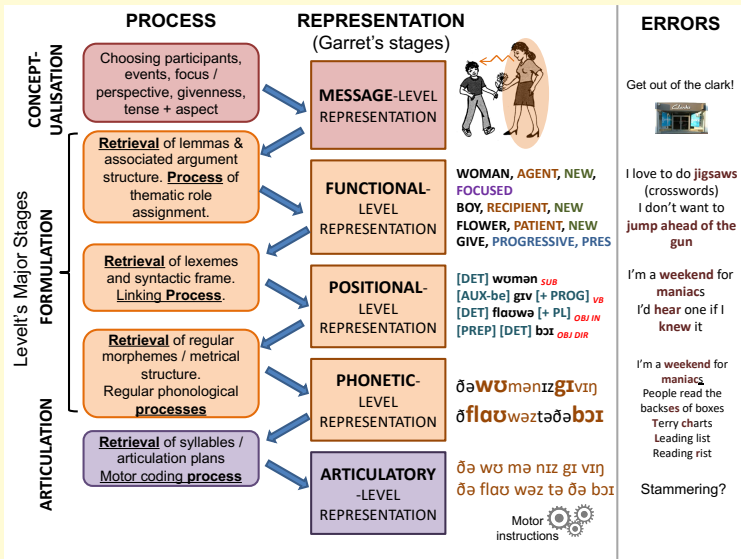
4a. Info at PhL

4b. PhL to ArtL

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# 1b. How do we get from the Message level to the Functional level?



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The model  
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1. Message level

1a. info at ML  
1b. ML to FL

2. Functional level

2a. Info at FL  
2b. FL to PosL  
The linking problem  
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3. Positional level

3a. Info at PosL  
PosL to PhonL

4. Phonetic level

4a. Info at PhL  
4b. PhL to ArtL  
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# 1b. How do we get from the Message level to the Functional level?

We **retrieve** (a) the lemmas (b) the argument structure

We assign thematic thematic relations

5 min ex.

5 min ex.

Modes of sent. prod

The model

Garrett's model

Levelt's model

1. Message level

1a. info at ML

1b. ML to FL

2. Functional level

2a. Info at FL

2b. FL to PosL

The linking problem

Errors in children

3. Positional level

3a. Info at PosL

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4. Phonetic level

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# 1b. How do we get from the Message level to the Functional level?

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Errors in children

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PosL to PhonL

4. Phonetic level

4a. Info at PhL

4b. PhL to ArtL

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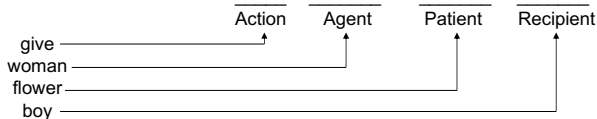
Bibliography

*"The woman is giving the flower to the boy"*

## Message Level Representation

1. Retrieval of Semantic  
Representation  
(in lemma)

2. Retrieval of Argument  
Structure (also in lemma)



## 3. Process of Thematic Role Assignment

## Functional Level Representation

Adapted from Schwartz (1987)

## Five-minute exercise

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The linking problem

Errors in children

### 3. Positional level

3a. Info at PosL

PosL to PhonL

### 4. Phonetic level

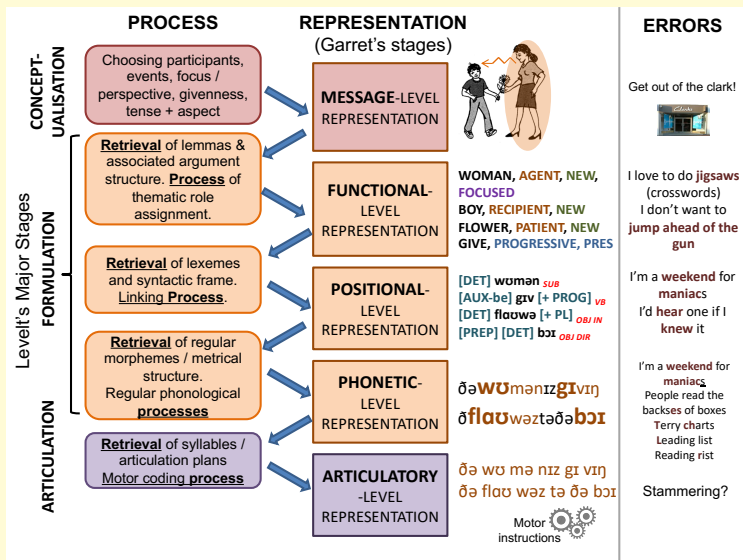
4a. Info at PhL

4b. PhL to ArtL

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## 2a. What information is represented at the functional level?



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1. Message level

1a. info at ML  
1b. ML to FL

2. Functional level

2a. Info at FL  
2b. FL to PosL  
The linking problem  
Errors in children

3. Positional level

3a. Info at PosL  
PosL to PhonL

4. Phonetic level

4a. Info at PhL  
4b. PhL to ArtL  
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## 2a. What information is represented at the functional level?

**Semantic information:** arguments with correct roles

**Focusing information**

**No syntactic information**

5 min ex.

5 min ex.

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The model

Garrett's model

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1. Message level

1a. info at ML

1b. ML to FL

2. Functional level

2a. Info at FL

2b. FL to PosL

The linking problem

Errors in children

3. Positional level

3a. Info at PosL

PosL to PhonL

4. Phonetic level

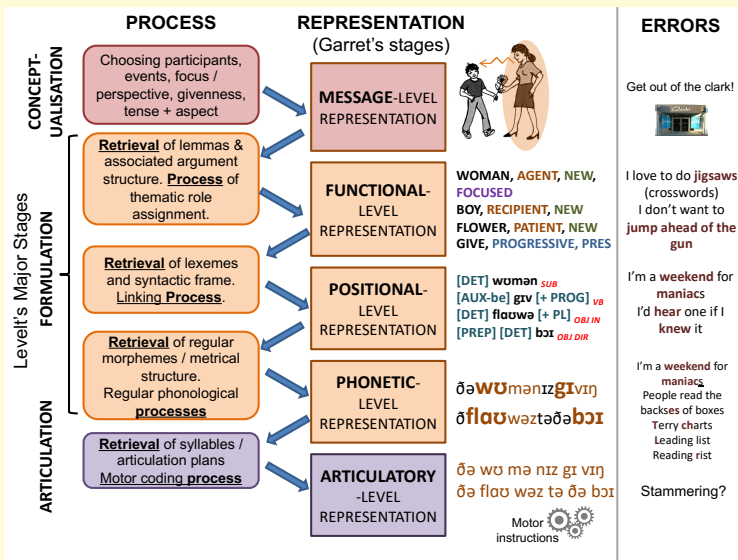
4a. Info at PhL

4b. PhL to ArtL

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## 2b. How do we get from the Functional level to the Positional level?



5 min ex.

5 min ex.

Modes of sent. prod

The model  
Garrett's model  
Levelt's model

1. Message level

1a. info at ML  
1b. ML to FL

2. Functional level

2a. Info at FL  
2b. FL to PosL  
The linking problem  
Errors in children

3. Positional level

3a. Info at PosL  
PosL to PhonL

4. Phonetic level

4a. Info at PhL  
4b. PhL to ArtL  
Motivation for syllables as units of representation

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## 2b. How do we get from the Functional level to the Positional level?

We **retrieve** (a) the lexemes (b) the syntactic frame

We **link** or **map** the arguments to their correct position in the frame.

5 min ex.

5 min ex.

Mods of sent. prod

The model

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1. Message level

1a. info at ML

1b. ML to FL

2. Functional level

2a. Info at FL

2b. FL to PosL

The linking problem

Errors in children

3. Positional level

3a. Info at PosL

PosL to PhonL

4. Phonetic level

4a. Info at PhL

4b. PhL to ArtL

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## 2b. How do we get from the Functional level to the Positional level?

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2a. Info at FL

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The linking problem

Errors in children

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4a. Info at PhL

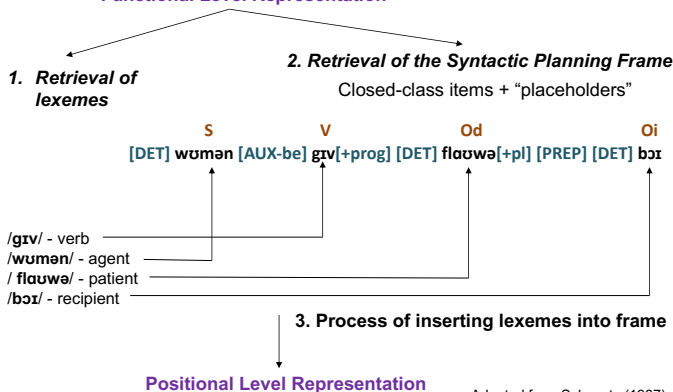
4b. PhL to ArtL

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*"The woman is giving the flower to the boy"*

### Functional Level Representation



## 2b. How do we get from the Functional level to the Positional level?

The syntactic planning frame consists of (a) closed class morphemes (not yet phonetically substantiated), and (b) slots/placeholders for open class morphemes, e.g.

1. [DET] \_\_\_ [AUX-be] \_\_\_ [+prog][DET] \_\_\_ [PREP][DET] \_\_\_  
(**dative**, e.g. *the woman is giving the flowers to the boy*)
2. [DET] \_\_\_ [AUX-be] \_\_\_ [+perf][PREP][DET] \_\_\_  
(**passive**, e.g. *the cat was chased by the dog*)
3. [DET] \_\_\_[+past][DET]\_\_\_\_. [PREP][DET]\_\_\_\_.  
(**locative**, e.g. *the dog chased the cat up the tree*)

5 min ex.

5 min ex.

Modes of sent. prod

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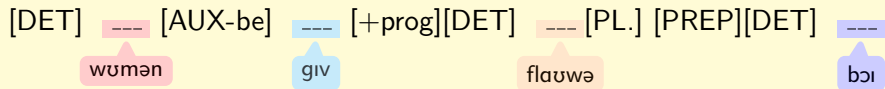
4b. PhL to ArtL

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2b. How do we get from the Functional level to the Positional level?



# The linking problem

Jackendoff, 1990

5 min ex.

5 min ex.

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The model

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1. Message level

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1b. ML to FL

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**The linking problem**

Errors in children

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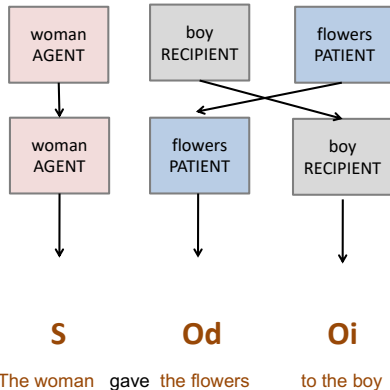
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Unordered at message  
level (though "external"  
argument specified)

Line up in  
order

Insert into frame  
at positional  
level



# The linking problem

5 min ex.

5 min ex.

Mods of sent. prod

The model

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1. Message level

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**The linking problem**

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But note this won't always give the right results, e.g.

1. \*The man<sub>AG</sub>. **gave** the present<sub>PAT</sub>. the woman<sub>REC</sub>.

5 min ex.

5 min ex.

Mods of sent. prod

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Have a look at these errors in children. How have they arisen?

1. Can I fill some salt into the bear?
2. I'm going to cover a screen over me. (Bowerman, 1982)
3. The lady is filling the sweets into the jar.
4. The lady is covering the scarf on her head. (Ebbels, 2007)

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1a. info at ML

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2. Functional level

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## Why are these errors happening?

*Fill + Salt* FILLER + *jar* THING BEING FILLED

Verb + NP + with + NP

Verb + NP + into + NP

salt

jar

Mis-selection of frame at positional level, but correct  
linking of arguments **for that frame**

5 min ex.

5 min ex.

Modes of sent. prod

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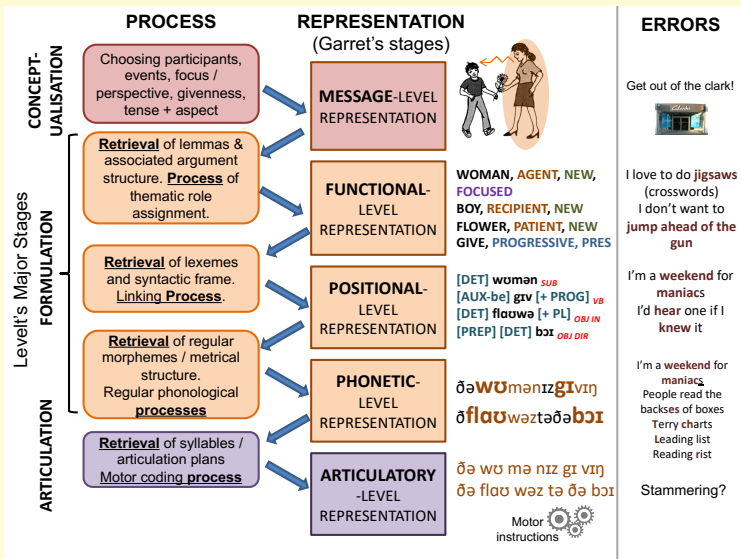
2. Functional level

3. Positional level

4. Phonetic level

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# 3a. What information is represented at the Positional level?



5 min ex.

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4. Phonetic level

4a. Info at PhL  
4b. PhL to ArtL  
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# 3a. What information is represented at the Positional level?

Now we have syntactic information!

We represent the **sentence frame**, and **lexemes which are phonetically invariant** (i.e. their pronunciation is similar whatever phonological context they occur in)

5 min ex.

5 min ex.

Modes of sent. prod

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2a. Info at FL

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PosL to PhonL

4. Phonetic level

4a. Info at PhL

4b. PhL to ArtL

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### 3a. What information is represented at the Positional level?

NB

(1) I'd know one if I heard it ⇒

(2) I'd hear one if I knew it

Verb form is conditioned by syntactic context

5 min ex.

5 min ex.

Modes of sent. prod

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1b. ML to FL

2. Functional level

2a. Info at FL

2b. FL to PosL

The linking problem

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3a. Info at PosL

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4. Phonetic level

4a. Info at PhL

4b. PhL to ArtL

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## 3b. How do we get from the Positional level to the Phonetic level?

We **retrieve** (a) segments, and (b) metrical structure

We assemble a phonological sequence (consisting of segments, combined with metrical structure).

5 min ex.

5 min ex.

Modes of sent. prod

The model

Garrett's model

Levelt's model

1. Message level

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1b. ML to FL

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## 3b. How do we get from the Positional level to the Phonetic level?

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5 min ex.

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1. Message level

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2. Functional level

2a. Info at FL

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3a. Info at PosL

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4. Phonetic level

4a. Info at PhL

4b. PhL to ArtL

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### Positional to Phonetic level “Phonological assembly”

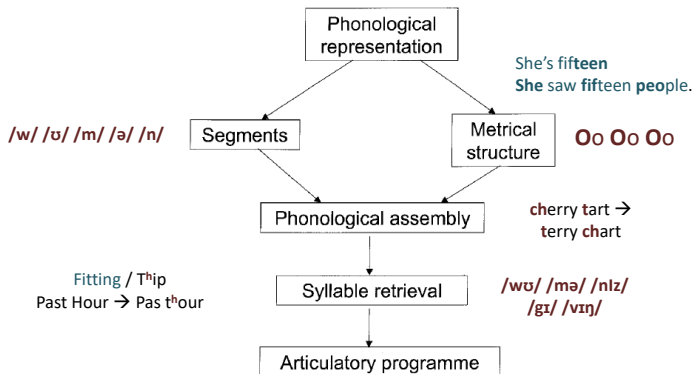


Figure 3. Levelt et al.'s (1999) model of speech production.

## 3b. How do we get from the Positional level to the Phonetic level?

Evidence that segments and metrical structure are stored separately:

### 1. Stress shift

1.1 She's **fif-teen** / I saw **fif-teen men**.

1.2 Five o'**clock** in the after-**noon** / We had **after-noon tea**.

1.3 It was ca-ta-**stroph-ic** / It was a **ca-ta-strophic failure**

### 2. Evidence from aphasia (Nickels & Howard, 1999)

2.1 Aphasic individuals often produce phonemes in correct order, but not correct stress pattern

2.2 Are much better at naming items with more frequent stress patterns, e.g. **co-tton** *versus* bam-**boo**

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Mods of sent. prod

The model

Garrett's model

Levelt's model

1. Message level

1a. info at ML

1b. ML to FL

2. Functional level

2a. Info at FL

2b. FL to PosL

The linking problem

Errors in children

3. Positional level

3a. Info at PosL

PosL to PhonL

4. Phonetic level

4a. Info at PhL

4b. PhL to ArtL

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### 1. Message level

1a. info at ML

1b. ML to FL

### 2. Functional level

2a. Info at FL

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The linking problem

Errors in children

### 3. Positional level

3a. Info at PosL

PosL to PhonL

### 4. Phonetic level

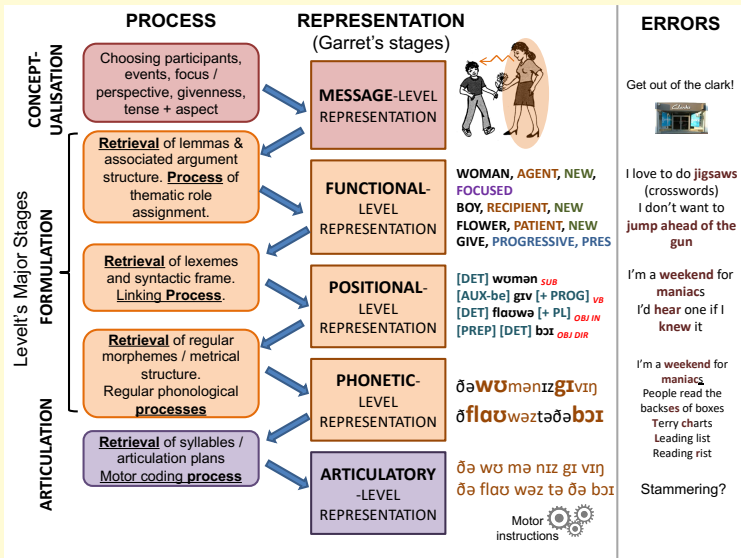
4a. Info at PhL

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# 4a. What information is represented at the phonetic level?



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## 4a. What information is represented at the phonetic level?

A phonological sequence consisting of segments, and information related to metrical structure (e.g. word stress).

**Phonetically-variant** lexemes/phonemes are realised at this level, e.g.

1. DETERMINER: A book / **An** elephant
2. DETERMINER: The (ðə) man / The (ði:) essay  
(tongue is retracted for second)
3. PARTICLE: I want **to** (tu:) eat / I want **to** (tə) drink  
(second is longer and involves more lip rounding)

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## 4a. What information is represented at the phonetic level?

A number of errors may occur at this level including

1. Swapping errors, e.g. cherry tart  $\Rightarrow$  terry chart
2. Anticipation errors, e.g. cherry tart  $\Rightarrow$  terry tart
3. Perseveration errors, e.g. cherry tart  $\Rightarrow$  cherry chart

NB these errors respect syllabic position, so perhaps they occur later at the syllable retrieval stage?

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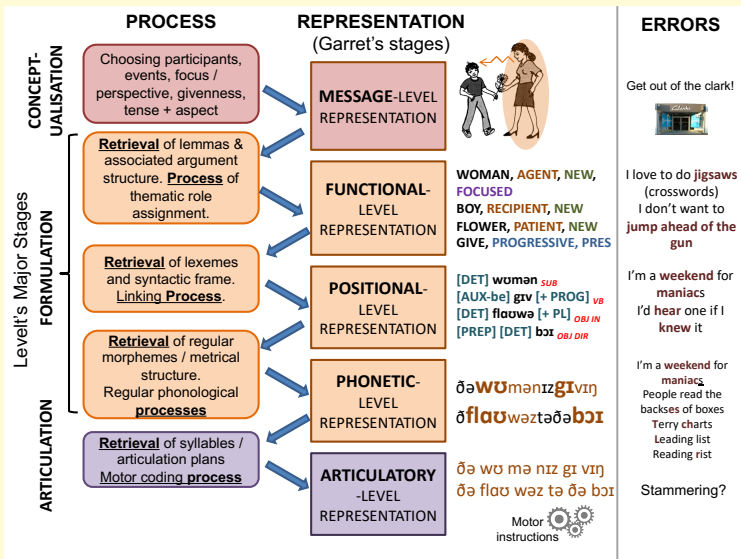
4b. PhL to ArtL

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# 4b. How do we get from the Phonetic level to the Articulatory level?



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1. Message level

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1b. ML to FL

2. Functional level

2a. Info at FL  
2b. FL to PosL  
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4a. Info at PhL  
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## 4b. How do we get from the Phonetic level to the Articulatory level?

We **retrieve** syllables, along with their articulation plans.  
We **assemble** motor instructions.

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5 min ex.

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2b. FL to PosL

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(a) Liaison (epenthesis)

Beer and chips → bIə fən tʃIp s...

CVV CVC CVC C...

Why are you sad? → wɑI jɑ: ju: sæd

CVV CV CVV CVC

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## (b) Resyllabification

A book → ...ə buk  
...V CVC

An elephant → ...ə ne lə fənt  
...V CV CV CVCC

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## (b) Resyllabification

1. Foot**t**ball → fʊ**t** bɔl (syllable **final**)
2. **t**ipping → **t**<sup>h</sup><sub>I</sub> pɪŋ (syllable **initial**)
3. Glass **t**ower → gla:s **t**<sup>h</sup>au wə (syllable **initial**)
4. Last **t**hour → la:s **t**<sup>h</sup>au wə (syllable **initial**)

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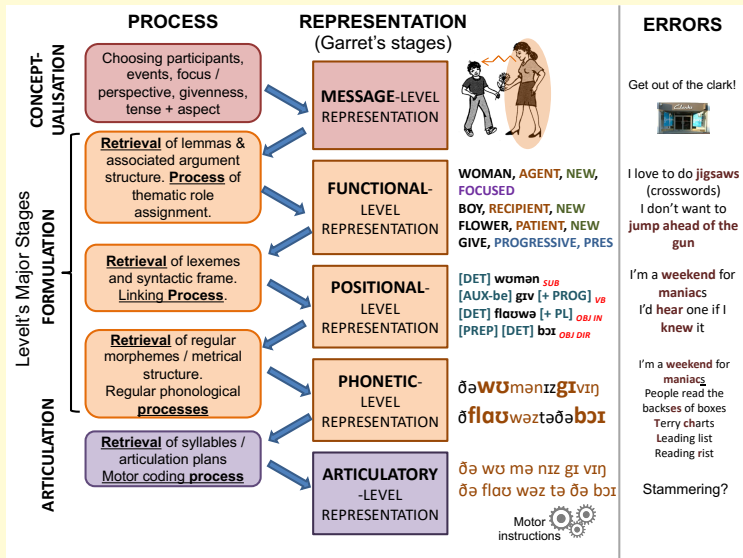
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ワ wa	ラ ra	ヤ ya	マ ma	ハ ha	ナ na	タ ta	サ sa	カ ka	ア a
	リ ri		ミ mi	ヒ hi	ニ ni	チ chi	シ shi	キ ki	イ i
	ル ru	ユ yu	ム mu	フ fu	ヌ nu	ツ tsu	ス su	ク ku	ウ u
	レ re		メ me	ヘ he	ネ ne	テ te	セ se	ケ ke	エ e
ヲ wo	ロ ro	ヨ yo	モ mo	ホ ho	ノ no	ト to	ソ so	コ ko	オ o

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