Finding Your Train of Thought - where it isn't supposed to be:

Priming in non-contextual word substitutions

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Abstract
This paper discusses the causes behind a previously unclassified type of non-contextual word substitution speech errors, in which a speaker erroneously replaces a lexical unit with a lexical unit recently mentioned in the discourse. The leading theories of speech production are first explained. William Levelt's theory (1989, et al.1999) is adopted as the basis for the speech error discussion. The tendency towards production of a previously processed or produced word is explained through the cognitive psychology concepts of PRIMING and its associated memory systems, and the linguistic concepts of discourse models and discourse topicality. A hypothesis for the cause of this type of error is made based on the classification of the type of priming and memory system involved, as well as the characteristics of the words involved in non-contextual word substitutions in general and the priming type in particular.

1. Introduction

Speech errors are relatively uncommon considering the amount of speech that each of us produces everyday. According to Bock (1991, cited in Viglocco and Hartsuiker 2002), speech errors occur only about once or twice every 1,000 words. However, all of us, every so often, make a mistake, with often-humorous results (I find the error in (1) below particularly amusing). Speech errors are an example of the failing of speech production, and thus they can tell us something about its underlying mechanisms. They have been studied extensively in the context of proving or disproving theories of speech production, but there has been less emphasis given to their underlying causes.

2. Speech Error Categories

There are many different types of speech errors. Several researchers have come up with speech error classification systems, although there is at least one type of speech error that has not been put into a category, as will be argued below.

Dell (1986) delineated some categories of speech errors, which are exemplified below. The erroneous utterance is in bold, and the target utterance, i.e. what the speaker meant to have said, is listed on the second line. All examples are from the author's personal speech error corpus unless otherwise indicated.[1]

Dell (1986) first divides speech errors into misordering errors, which all involve linguistic information from within the sentence, and non-contextual substitutions, which involve information from outside the sentence. He then identifies four subcategories of misordering errors, and four subcategories of non-contextual errors. Both misordering and non-contextual errors share the following categories:

(1) substitutions

(2) additions

(3) deletions

There are two categories misordering and non-contextual errors do not share, and these are:

(4) shifts

(5) blends

Shifts are specific to misordering errors, and blends are specific to non-contextual errors.

Dell (1986) further divides misordering substitutions and additions into several subcatagories. Misordering substitutions have the categories

(1a) anticipations

(1b) perseverations

(1c) exchanges

Misordering additions are divided into

(2a) anticipations

(2b) perseverations

[1] The author's personal speech error corpus appears in full in Appendix B

2.1 Category Descriptions

Misordering substitution anticipations are errors in which a linguistic unit is mistakenly repeated, replacing a corresponding linguistic unit which was meant to appear earlier in the utterance, as the word "smile" does to the word "muscles" in (1) below.

(1)

Speaker A: Did you know that it takes more **smiles** to frown than it does to smile?

Target: muscles

Misordering substitution preservations are errors in which a linguistic unit replaces a linguistic unit which appears later in the utterance, as in (2) below, where the syllable rime-onset phonemes [əg] in “Carnegie” replace the second [l] in “Mellon”. One could argue there is only one [l] in “Mellon”, in which case [əg] would not be replacing a linguistic unit. If [əg] does not replace a linguistic unit, then it is an example of a misordering perservatory addition.

(2)

Speaker A: Carnegie **Melligan**.

Target: Mellon

Misordering substitution exchanges are errors in which two linguistic units exchange places in an utterance, as the words "snot" and "river" do in (3) below.

(3)

a. Speaker A: I'm running a **snot** of **river**.

Target: river of snot

Misordering anticipatory additions are errors in which a linguistic unit is mistakenly repeated earlier in the utterance, as is the syllable onset consonant cluster in (4) below, from Dell (1986).

(4)

Speaker A: **steerie stamp**

Target: eerie stamp

Misordering perservatory additions: see (2) above.

Misordering deletions are errors in which a linguistic unit is mistakenly omitted from the utterance, as is the phoneme [t] in "state" in example (5) below, from Dell (1986), from a contextual influence, i.e. the absence of a [st] consonant cluster in "same."

(5)

Speaker A: **same sate**

Target: same state

Misordering shifts are errors in which a linguistic unit is not repeated and does not replace another unit, but is simply inserted in the wrong place in the utterance, as is the syllable onset phoneme [l] in example (6) below, from Dell (1986).

(6)

Speaker A: **Back bloxes.**

Target: black boxes

Noncontextual substitution errors are errors in which a linguistic unit from outside the utterance replaces a corresponding unit in the utterance. The word "symphony" replaces the phonologically similar word "sympathy" in (7) below.

(7)

Speaker A: I might have a pang of **symphony** for him then.

Target: sympathy

Noncontextual additions are errors in which a linguistic unit from outside the utterance is inserted into the utterance, as the morpheme "-ed" is in (8) below, from Dell (1986).

(8)

Speaker A: To **strained** it.

Target: strain

Non-contextual deletions are errors in which a linguistic unit is deleted from the utterance without contextual influence, as the morpheme "–ed" is in (9) below.

(9)

Speaker A: I've **smoke** here.

Target: smoked

Non-contextual blends are errors in which two conceptually similar linguistic units combine, as the phrase "first year seminar" and the word "intro" do in example (10) below. They cannot be called morpheme substitutions because they do not occur necessarily at morpheme boundaries, and the speaker of error often has a sense that they couldn't decide which word they wanted to say, not that they substituted a part of a word for another by mistake.

(10)

Speaker A: My next class is a **firstro**.

Target: first year seminar, intro

Speech errors can involve different categories of linguistic units, as seen above, except for non-contextual blends, which only occur with words and phrases. The linguistic units involved in speech errors Dell lists are: phrases, words, inflectional morphemes, stem morphemes, consonant clusters, and phonological features. He cites a figure from Bock's (1991) analysis of a large speech error corpus, the London-Lund corpus, which indicates that speech errors involving words and phonemes are the most common errors, with morphemes a close third. Speech errors involving types of linguistic units other than these three encompass less than 5% of all total speech errors. (Bock 1991, cited in Dell 1989)[2]

2.2 Primed non-contextual word substitutions

This paper will be mainly concerned with non-contextual substitutions involving word-sized units. The target and error words in non-contextual word substitutions can be either semantically or phonologically related (or both), (e.g. Harley and MacAndrew 2001). Phonologically related substitutions are conventionally called 'malapropisms' after a famous character in an eighteenth-century play named Mrs. Malaprop, who made those type of errors unusually frequently (Hofstader and Moser 1989). Semantically related substitutions are conventionally called 'Freudian slips'), after the famous psychologist, who thought that the error word was representative of the speakers subconscious desires or intentions (Dell 1989). However, no category has been made to distinguish the type of non-contextual word substitution involving a so-called prime, i.e. a previous presentation of some form of sensory input that is identical or very closely related to the erroneous word, which, presumably, infiltrates speech production to produce the error. Examples (11)-(14) are speech errors of this type.

(11)

[2] See Appendix A, Fig. 1

Speaker A: But I don't have hooves, I have Converses.

(Some more talk for approximately 40s, silence for approximately 1 minute)

Speaker A: What's that noise?

Speaker B: It's the **Converse** dance.

Target: Cloisters

(12)

Speaker A: What are those tweezers doing in there?

Speaker B: Oh I was using them to get a **tweezer** out of my foot last night.

Target: splinter

(13)

(Speaker A is discussing Swat for several minutes, then Speaker A changes the topic)

Speaker A: I have to go to **Swat**.

Target: Haverford

(14)

(Speaker A is talking about the wine to be had at a reception, then changes the topic)

Speaker A: I need to give you an update on the **wine**.

Target: honors examiners

Non-contextual word substitutions occur due to the strong associations between the target and error words, as will be explained further below. The type of error exemplified above is a non-contextual substitution involving a word-sized lexical unit, but it is important to distinguish them because they have an additional cause of error, the prime. This type of error will be referred to in this paper as primed non-contextual word substitutions.

Primed non-contextual word substitutions can be further divided into auditorily primed non-contextual word substitutions, which are exemplified above, and visually primed non-contextual word substitutions, as in (15) and (16) below.

(15)

(Speaker A is looking at a bookbag because her friend had just mistaken the boy wearing it for one of their mutual friends)

Speaker A: Did you return those **bookbags** to Ray yet?

Target: sliders

(16)

(Speaker A is talking to Tyler)

Speaker A: Do you think you could get me and **Tyler** in to meet the cast?

Target: Heather

The cause of these errors will be differentiated from the cause of errors with auditory primes in the analysis below. This paper will be concerned mainly with auditorily primed speech errors and unless specified in the text a reference to primed non-contextual word substitutions will be referring to auditorily primed non-contextual word substitutions.

3. Theories of Lexical Access

The study of speech errors has been used to develop theories on lexicalization, or lexical access, the process of retrieving words from the brain. Speech errors occur when some part of lexicalization fails, and so they can tell us something about what parts of the process are separate from others, and to what degree the parts interact with each other. Since the work of creating lexical access theories has been done already, now the tables can be turned, and explaining how speech production is supposed to happen is the best way to explain how it can go wrong. Thus the current theories of lexical access are outlined below.

3.1 One-stage and two-stage theories

There are several categories of lexicalization theories, and many variations within the categories. Theories of lexical access can first be broken down into one-stage and two-stage theories. In one-stage theories, (e.g. Caramazza and Miozzo 1997), the concept that the speaker wishes to express is mapped directly onto its semantic/syntactic/morphophonological representation, the individual phonological segments are accessed, and the word can then be articulated.

In two-stage theories, (e.g. Levelt 1989, et al. 1999, Dell 1986) the concept that the speaker wishes to express is mapped onto an intermediate lexical item, often called a LEMMA, which contains the word's syntactic and semantic information. Once this lemma is accessed, the corresponding morphophonological representation, often called the LEXEME, can be accessed. Then, as in the one-stage theory, there is a final level of lexicalization where the phonemes are accessed, and then the word can be articulated.

The empirical evidence for the two-stage model is very strong, including tip-of-the-tongue (TOT) states, where semantic/syntactic information can be accessed independently of the phonological representation. Another very strong piece of evidence for the two-stage model is from non-contextual word substitutions, which will be discussed below. Most current theories of lexical access adopt some version of the two-stage model (Harley and Brown 1998). Consequently, the two-stage model will be the one adopted for the remainder of this paper.

3.2 Spreading activation

Another concept that is part of many lexicalization theories (and other types of theories as well) is that of SPREADING ACTIVATION, a concept which will be adopted in this paper. Spreading activation is a process that occurs during the entire lexicalization process. In each stage of the process, when an element is selected, it is the most highly activated element at that time, and it spreads activation to its corresponding part in the next stage of the process.

Spreading activation is more clearly explained by describing how it works during the selection of the lemma and of the lexeme. The following is a simplistic explanation, since as will be described below the lexeme has several levels to its production, which each have their own spreading activation process, but it is sufficient for our purposes here. Each lemma and each lexeme are selected from their respective sections of the

LEXICON, which is the store of lemmas and lexemes that a speaker has in their memory. All the lemmas and lexemes in the lexicon are connected through a network in which they are each a 'node'. Lemmas that are more closely related in meaning have more closely connected nodes, and lexemes that are more closely related in form have more closely connected nodes. When a lemma or lexeme node is activated through the speech production system, it spreads a proportion of its activation to those lemmas or lexemes directly connected to it in the network, and they spread a proportion of their activation to the lemmas or lexemes connected to them. Thus the amount of activation passed on to the next lemma or lexeme node decreases proportionally to the node's distance from the originally activated node(s) until it reaches zero.

Most theories account for an exponential decay in each node's activation, thus preventing all nodes in the immediate network from being activated at once. The lemma or lexeme that is chosen is the one with the highest level of activation. For example, a speaker wants to convey the message **candle**. The lexical concept **candle** will activate the lemma for candle, and that lemma would spread a proportion of its activation to associated lemmas, which might include the lemmas for **flame, match**, **incense**, **light**, or **wax**. Each of these lemmas would spread a proportion of its activation to its associated lemmas, for example **flame** would spread activation to **fire** and **heat**, and **match** to **stick** and **box**, etc. Usually **candle** is the lemma with the strongest activation, and this is the lemma that is picked.

The same process occurs to pick the lexeme. If the lemma picked is **candle**, this lemma will activate the lexeme **candle** and associated lexemes, which might include the lexemes **candy**, **candor**, **handle**, or **candid**. After lemma and lexeme are chosen, the phonemes and their order are chosen[3].

In some theories, such as Dell's (1988, et al. 1993, cited in Levelt et al.1999), whatever lemma or lexeme has the highest level of activation at a certain time will be chosen, and the timing of activation spreading and decaying is orchestrated such that the right lemma or lexeme usually has the highest level of activation at the right time. Levelt et al. (1999) instead propose an additional component that checks the connection between the selected element of each stage of processing to make sure that it corresponds with the node above it. The exact nature of this component is not clear, however, and neither is its allowance for error or its compatibility with the no-feedback principles of the rest of Levelt's theory (et al. 1999) and thus we will tentatively reject Levelt's (et al. 1999) explanation in favor of Dell's (1988, et al. 1993, cited in Levelt et al. 1999).

3.3 Interactive and non-interactive theories

A second classification of lexical access theories is between interactive and non-interactive theories. In interactive models, the lemma and lexeme processes can affect each other. This happens when information from both processes is available at the same time, e.g. the choice of lexeme could affect the choice of lemma. In Dell's lexical access model (1986, Dell, Burger, and Svec 1997, cited in Vigliocco and Harsuiker 2002), the lexeme spreading activation can occur before the lemma is chosen, and information about the retrievability of the lexeme can aid the lemma retrieval process. This means that information can flow forwards or backwards between the levels of lexicalization. This accounts for the statistically significant frequency of mixed phonological and semantic

[3] See Appendix A, Fig. 3

non-contextual word substitution errors (Dell and Reich, 1981, cited in Schriefers, Meyer, and Levelt 1990), such as (14) below.

(14)

Speaker A: Start thinking of some examples in your **hands**.

Target: heads

Non-interactive theories allow only a forward information flow, with only the minimal input from one process to the other. In Levelt (1989), he specifies that each process only takes one type of input, i.e. the lemma selection process only takes a pre-lexical concept as its input, and the lexeme selection process only takes a lemma as its input. Additionally, although the lexeme selection process takes a lemma as its input, the syntactic and semantic information is available to the lexeme processor only for morphological encoding, not for phonological encoding, which accounts for the fact that in a statistically significant amount of exchange errors involving phonologically related linguistic units below the word level the exchanged units are of different syntactic types (Schriefers, Meyer, and Levelt 1990).

Vigliocco and Harsuiker (2002) address the tension between the two types of lexicalization theories by noting that they each explain how the process protects the speaker from a different type of error: the interactive theory can protect against lack of information, such that would produce a TOT state for example, by informing the lemma selector about the accessibility of the corresponding lexeme. The non-interactive theory can protect against too much information, such that would produce blend errors, for example, by requiring that only one lemma be activated before the lexeme can be activated.

It is very difficult to prove the interactive theory over the non-interactive theory, and vice versa. Speech error data is often used to provide evidence for one or the other type, but there is generally a way to explain the data using either theory, as in the discussion above, where TOT states can be explained through non-interactive theories and blend errors through interactive theories. In any case, neither theory has been conclusively proved or disproved.

3.4 Levelt's Non-interactive Theory of Lexical Access

The lexical access theory that will be mainly referred to by this paper is Levelt's non-interactive type theory (1989, et al 1999). The motivation for this is that he has a very clearly laid-out and well-supported theory and, although his evidence does not completely exclude other theories, the finer distinctions between other non-interactive theories are not relevant to the discussions in this paper.

The production process in Levelt's theory (1989, et al.1999) is, of course, uni-directional, and it proceeds as follows: [4]

1. The mechanism Levelt terms the "conceptualizor" is put into action. Here the message to be generated is conceptualized in the speaker's mind in terms of language-specific lexical concepts. The message is divided into word-sized concepts, for example **female** and **horse** could be turned into **mare**, but **female** and **elephant** would stay separate since there is not a single lexical concept that denotes both properties in English. The lexical concept is additionally denoted

because of pragmatic concerns, for example an elephant could be referred to as an animal or an elephant, depending on the context and purpose of the message. A lexical concept is selected for further processing.

2. The lexical concept is input into what Levelt terms the "formulator". The lexical concept indicates the location of its corresponding lemma in the lemma lexicon. A lemma is chosen based on activation of its meaning, and then its syntactic properties are accessed, such as syntactic category, e.g. "main verb in the sentence", grammatical information such as the grammatical function of a verb lemma's required arguments, and diacritical information such as tense, mood, number, person, and pitch accent.
3. The chosen lemma indicates the location of its corresponding lexeme in the lexeme lexicon. A lexeme is chosen based on activation of its morphological structure.
4. Each morpheme's metrical tier, or syllable-specific stress pattern, is accessed. The syllable tier is accessed as well, but this is not separated by morpheme like the other lexeme specifications, because syllabification does not always respect morpheme boundaries. Each morpheme's so-called "skeletal tier" (Levelt 1989 page 291) is accessed as well. The skeletal tier is a serial ordering of slots where phonemes will be placed. Syllabification involves the organization of the slots in the skeletal tier into syllables, and the specification of onset and rime for those syllables. Some theories assert that the high-sonority slot (i.e. the vowel) is specified in the skeletal tier. The skeletal tier allows access to the segment tier, where the distinctive features for each slot are specified.

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[4] See Appendix A, Figs. 2 and 3

5. The distinctive features of the metrical slot indicate phonemes, which are accessed from memory. Now the word has all its information up to the plan for articulation. At this stage the word is what is referred to colloquially and in linguistics as "internal speech". This internal speech is fed into the speech perception system to be monitored for accuracy.
6. The articulatory gestures are accessed.
7. Articulation occurs. This overt speech is fed into the speech perception system to be monitored for accuracy.

So where do speech errors fit in with this theory? Basically, speech errors occur when the wrong information is accessed, which in the case of a non-contextual word substitution, occurs when the "wrong" lemma or lexeme is the one with the highest amount of activation, and thus is the one which is picked as input for the next process.

Non-contextual word substitutions offer substantial proof for the lemma-lexeme distinction because their two main categories distinguish between the two processes.

The target and the error word in non-contextual word substitutions can be either semantically or phonologically related, as shown by examples (17) and (18).

(17)

Speaker A: They are twins but they aren't **fraternal** twins.

Target: identical

(18)

Speaker A: I was **living**, I was learning in my book.

Target: learning

The target and error words in (17) are closely related semantically, while the target and error words in (18) are closely related phonologically. If there were only one stage then we would expect that all substitutions would be both semantically and phonologically related. However as mentioned earlier, there is a class of errors that are both semantically and phonologically related. Dell (1986) explains this through a model that is the same as Levelt's (1989, et al. 1999), except that information flows in both directions, from lemma to lexeme level, and from lexeme to lemma level. An erroneously activated phonological representation can spread activation to its corresponding lemma, and if the lemma is already activated then it will become very highly activated, and thus more likely to be picked over the correct lemma.

3.4.1 Self-monitoring mechanism

Levelt is able to explain this phenomenon without feedback, using the self-monitoring mechanism he proposes in Levelt (1989) [5]. Internal speech and overt speech are monitored through the speech perception system, which has access to the same lexicons as the speech production system, but in the opposite order. The phonological segments and their order are matched to phonemes in the phoneme inventory, and then the lexeme can be accessed from the lexeme lexicon. The lexeme indicates the location of its related lemma in the lemma lexicon, and finally the word is fed into the conceptualizor, which checks to make sure the word matches the intended message. A

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[5] See Appendix A, Fig. 2 for a simplistic representation of this process.

speech error is more likely to pass through undetected the more closely related it is to the correct lexical item.

4. Causes of non-contextual word substitutions

However, the above explanations of non-contextual word substitutions still don't explain why the wrong lemma or lexeme would be picked. Even though there are lemmas and lexemes related to the target, why would they ever have a stronger activation than the correct lemma/lexeme?

4.1 Properties of target and error words

Harley and MacAndrew (2001) offer insight into this question by observing trends in IMAGEABILITY (the degree to which a word is associated with a visual image), frequency, and word length in target and intrusion (error) words. They examined a large corpus of spontaneous non-contextual word substitutions and found that targets for semantically related substitutions are significantly more imageable than control words, and significantly less imageable than the intrusion words.

They also found that targets for phonological substitutions are significantly less frequent and longer than control words, but not significantly less frequent or longer than intrusion words, which they state is a surprising finding. As Levelt (1989) discusses, higher frequency words are generally thought to have lower ACTIVATION THRESHOLDS, in other words, they can become activated more quickly and from less activation spreading than lower frequency words. As Harley and MacAndrew (2001) note, it is difficult for any theory of lexicalization to explain their results and an explanation will not be undertaken here.

Harley and MacAndrew (2001) showed experimentally that words with aberrant levels of certain properties are more likely to be the target of a non-contextual substitution, which in keeping with the lexicalization theory adopted here probably means that those levels of those properties give those words a higher activation threshold. Their findings do not predict much about what words are likely to be error words other than that error words in semantically related substitutions are more likely to be very imageable.

4.2 Priming

It seems obvious that the errors in primed non-contextual word substitutions were caused by the previous mention of the intrusion words, but how exactly this happened is another question. The answer to this question comes from the phenomenon of PRIMING. Priming is the effect whereby exposure to a stimulus significantly affects the response to the same or an associated stimulus in comparison to the response without exposure to that stimulus (Ratcliff and McKoon 1996).

Priming effects have been tested many times with many different methods. Schriefers, Meyer, and Levelt (1990) performed a type of priming experiment typical of the priming experiments used to elicit speech errors. Although the study uses visual stimuli, it is still relevant to the auditory domain that this paper is concerned with, since, as Levelt et al. (1999 page 7) state, "there is phonological activation in visual word recognition."

In the study, the researchers engendered three conditions in which subjects were presented with a series of pictures of common objects over which a distractor word (the prime) was superimposed at a certain time interval. In the first condition, the distractor word was semantically related to the word represented by the picture (i.e. cat-dog). In the second condition, the distractor word was phonologically related to the word represented by the picture (i.e. log-dog). In the third condition, the control condition, the distractor word was neither semantically nor phonologically to the word represented by the picture. They found that semantically-related distractors presented before the picture or at the same time inhibited picture naming when compared to neutral distractors and semantically-related disctracors presented after the picture. Phonologically-related distractors presented after the picture facilitated picture naming when compared to neutral distractors and phonologically-related distractors presented before or at the same time as the picture (Schriefers, Meyer, and Levelt 1990).

This finding is consistent with the two-stage model where semantic processes occur before phonological processes. Although there are studies which contradict the timing constraints in this finding, (e.g. Jescheniak and Schriefers 2001), the point remains that these experiments show that speech input affects speech output in a measurable way. Levelt et al (1999) accounts for priming in his lexicalization model by positing that the processes of speech production and perception are identical in form; they overlap from the lemma level upward, and below the lemma level the corresponding stages can affect each other (i.e. morphemes in perception can affect morphemes in production).

This type of priming is only observed when the distractor is presented in a very short time period before or after the target, usually plus or minus 400ms (Levelt et al

1999), meaning that this effect only occurs when speech perception and production virtually coincide. This type of priming, called SHORT-TERM PRIMING by Schacter and Church (1992), can probably explain the visually primed non-contextual word substitutions in (15) and (16). Instead of the target being a visual stimulus, the intrusion is a visual stimulus, but the effect is the same because the prime is presented at the same time as the speaker is trying to utter the target.

However, short-term priming surely cannot account for errors such as (11), where the prime occurred at least a minute before the error. It cannot even account for errors such as (12), since there are three words comprehended and eight words produced between prime and error, and the average time it takes to utter a single one-syllable word is alone about 500 ms (Klapp et al. 1973, 1976, cited in Levelt 1989). Indeed, Schacter and Church (1992) state that it is unlikely that short-term priming involves the same process as types of priming in which the effect is observed over a longer time period.

5. Memory

Obviously, since the priming effect of non-contextual word substitutions is observed over a significant period of time, it involves memory. Memory theory is a large part of cognitive psychology, and there are many classifications of memory systems. Virtually all priming effects do involve memory (the one above is the only apparent exception I have come across), and priming effects are often associated with a certain type of memory or differentiated based on the type of memory they affect. Thus a classification of the type of priming observed in non-contexual substitutions should involve discovering the type of memory it involves.

5.1 Implicit vs. explicit memory

A main distinction of memory is between IMPLICIT MEMORY, which is unconscious, and EXPLICIT MEMORY, which is conscious. It is a matter of debate whether the two types of memory involve different memory systems; under the multiple memory systems (MMS) view explicit and implicit memory are separate storage systems, but according to the transfer appropriate processing view (TAP), they involve the same storage system but are differentiated by the type of information encoding and retrieval involved (Thapar and Rouder 2001). However, both theories agree there is some difference, since there is strong evidence for the distinction based on the two types of memory task. The distinction was first proposed due to amnesiacs' differentiation of performance on certain memory tasks, and Ratcliff and MacKoon (1996) write that it has been shown in a variety of experiments that amnesiacs who cannot even remember being in the experiment still show priming effects on implicit memory tasks. Implicit memory is tested by tasks such as picture naming, word-stem completion, or lexical decision tasks, while explicit memory is tested by recall and recognition tasks (Schacter and Church 1992).

Primed non-contextual word substitutions involve reproduction of a previously encountered word, which could be conceived of as analogous to a recall task, which involves explicit memory. Reproduction actually would seem to involve even more of explicit memory than recall does. A recall task could involve a recollection only of the phonological information, as in Schacter and Church's PRS, or pre-semantic representation, model (1992), and conversely, a previously encountered word can affect only the phonological aspect of reproduction; but there are non-contextual substitutions in which the target and error word are semantically and not phonologically related, as in

(4c), and in all the non-contextual word substitution errors observed, the target and error were of the same syntactic class, which would require access to the lemma level of speech perception and production. This means that the memory must include the semantic representation.

Priming in explicit memory was observed in an influential experiment performed by Jacoby and Dallas (1981, cited in Medin Ross and Markman 2005). In this experiment, subjects were presented with a list of 60 words and asked one of three types of questions about each word. The subjects were presented with a word list of 60 words and asked one of three types of questions about each word. The first type of question required the subjects to think about the semantic representation of the word, i.e. "Is this word a type of flower?", the second about the phonological representation of the word, i.e. "Does this word rhyme with 'weight'?", and the third about the orthographic representation of the word, i.e. "Does this word have a 'k' in it?".

After this, the subjects performed a recognition task on 80 words, 60 of which were the previously studied words, 20 of which were not. The words were presented one at a time and the subjects were asked to indicate if the word was one of the 60 words previously presented. The subjects correctly identified 95% of the words about which they had been asked semantic questions as words that were previously presented. They correctly identified 65% of the words about which they had been asked phonological questions, and 51% of the words about which they had been asked orthographic questions.

The subjects went through the speech perception process for each word, but for some words they had to re-access knowledge up to the lemma level (for the semantic questions), for some words they had to re-access knowledge up to the lexeme level (for the phonological questions), and for some words they only had to re-access knowledge up to the phonological segment level (for the orthographic questions). These results show that explicit memory was stronger the higher the level of speech perception/production the subjects had had to repeat.

That result makes a prediction for primes of word substitution errors. Primes should be more likely to be words that the speakers have not only heard recently, but also have reproduced recently. There are not enough errors in the data set to determine if this is a statistically significant trend, but in about 80% of the examples of auditorily primed non-contextual word substitutions, the speaker had in fact produced the intrusion word in the near past.

Speech production might not actually be analogous to a recall task, however. It is usually an automatic process. There are situations where one tries consciously to think of a word, such as remembering a person's name or a term one is being tested on, but in a natural discourse setting words are generally accessed without conscious effort. It would seem that speech production could be a process involving implicit memory, which would mean that the natural reproduction of previously encountered words also involves implicit memory, and thus the priming effect observed in non-contextual word substitution errors would involve implicit memory.

5.1.1 Repetition Priming

REPETITION PRIMING is the major type of priming associated with implicit memory. Repetition priming involves an influence of a previously presented prime on response to a stimulus when the prime and the stimulus are identical. In word stem completion tasks the stimulus contains less information than the prime, but nevertheless the information the stimulus does contain is identical to information contained in the prime, so it is still considered a repetition priming effect. Repetition priming effects have been observed to persist over very long time periods, three weeks in a classic experiment done by Leeper (1935, cited in Ratcliff and McKoon 1996), which makes it compatible with the type of priming observed in non-contextual word substitutions. Typical tasks that measure repetition priming are word-identification, word stem completion, and picture naming tasks (Ratcliff and McKoon 1996). Repetition priming can also be measured in so-called subliminal priming experiments where the prime word is masked to ensure the participant is not exercising their conscious recollection of it when they encounter the stimulus (Kouider and Dupoux 2005).

The Jacoby and Dallas study discussed above (1981, cited in Medin, Ross and Markman 2005) included a word-identification experiment exemplifying priming in implicit memory. The subjects went through the same initial process as in the explicit memory experiment: they were presented with a list of 60 words and asked one of three types of questions about each word. The subjects were presented with a word list of 60 words and asked one of three types of questions about each word. They then performed a word identification task on 80 words, 60 of which were the previously presented words and 20 of which were not. The 80 words were presented one at a time for 35ms, a short enough time to make the word perception process difficult. A strong repetition priming effect was found in this test: 80% of the words which had been previously presented were identified correctly, compared to 65% of the words which had not been previously presented, meaning that recognition time for the word had been enhanced by previous exposure to the stimulus. The type of question asked about the prime word did not have an effect.

Word identification tasks are not very similar to speech production in natural discourse, but there are implicit memory tasks more analogous to speech production, such as the two tasks performed in an experiment by Thapar and Rouder (2001). Thapar and Rouder had subjects first study a word list, as in the Jacoby and Dallas (1981) study, but one of the tasks was to answer general knowledge questions, so the subjects were producing speech. The other task was also to answer general knowledge questions, but the subjects had to choose the answer from two presented words.

In both tasks some of the words that the subjects studied were the correct answers to some of the questions, and some were semantically related but incorrect answers, and some were not related to the answer words at all. The subjects were aware of this basic situation. This kept the response relatively free of contamination from explicit memory, because knowing that some of the words were wrong answers ensured the subjects did not produce an answer based on the fact that it was a previously studied word. The results showed that the subjects were significantly more likely to respond with the correct answer to a question if they had studied the answer word previously. The subjects were also significantly more likely to respond with the incorrect but semantically related alternative word if they had studied that word previously. There was no effect on performance if the subject had studied both the correct answer and the alternative answer, which Thapar and Rouder (2001) interpret as a bias cancellation effect.

5.2 Perceptual vs. conceptual memory

The difference between word identification tasks and the types of tasks performed in Thapar and Rouder (2001) exemplifies another memory classification, the difference between perceptual and conceptual memory. Word-stem completion and word identification tasks involve perceptual memory. Forced-choice experiments can involve perceptual memory as well. In a study by Ratcliff and McKoon (1997), subjects were told to study a word list just as in the studies previously discussed. They were then given a forced-choice word identification task where they were presented with two words and they had to decide which one they had previously studied. In this study, unlike in the Thapar and Rouder study, the variable condition was phonological association, not semantic association, in keeping with the perceptual/conceptual distinction.

The distinction corresponds with the disassociation between form and meaning in two-stage lexical access theories. Priming in perceptual memory is affected by changes in physical characteristics between prime and stimulus. In a study of auditory priming by Church and Schacter (1994), implicit priming effects were significantly reduced when the voice of the person presenting the prime word was changed.

Priming in conceptual memory is affected by changes in meaning association between prime and stimulus. Conceptual memory is certainly the domain for semantically related prime/targets in non-contextual word substitutions. Perceptual memory would seem to be the domain for phonologically related prime/targets in non-contextual word substitutions, however there were no prime/target pairs collected that were just phonologically related; only mixed type errors. We will follow the lead of Harley and

MacAndrew (2001) and classify these mixed type errors with the semantic errors, explaining their prevalence

5.3 Short-term vs. long-term memory

Further exploring the way the prime word in non-contextual word substitutions gets from memory to the utterance we explore classification in another binary distinction of memory, that between short-term or WORKING MEMORY, and long-term memory. Working memory and short-term memory are often used as interchangeable terms, but short-term memory denotes the storage system only, while working memory includes the processes that store the information.

As in the implicit and explicit memory domain, there is debate over whether they are indeed separate systems. Cowan (2005) proposed that working memory is actually the representations in long-term memory that are activated at any given time. Again like in the implicit and explicit memory domain there is still a clear distinction made in these theories between the two concepts of memory, so we will discuss them as if they are separate.

5.3.1 Working Memory

Baddeley (1986, 1996, 2000,2001; Baddeley and Hitch, 1994, cited in Medin et al. 2005) created a popular theory of working memory. He defines working memory as a three-part mechanism that has a storage facility for recent phonological information and one for recent visuospatial information, and a central executive component, which coordinates the two storage mechanisms. The central executive chooses what information is to be used as output, and what information is to be further processed and stored in long-term memory. The shelf life of information stored in the phonological component in Baddeley's theory is about 2 seconds, which would seem to out-rule this type of memory for explaining the primes in non-contextual word substitutions based on the earlier observations that primes can affect utterances that are produced more than a minute after the prime. There are theories that give short-term memory a longer storage capacity, but almost all of them cite the capacity as about 30 seconds or less, which is still not long enough to account for our priming effect.

Information in short-term memory can be refreshed by conscious repetition (Medin et al. 2005), but speakers do not generally repeat certain words from their conversation to themselves while they are engaging in discourse, and in any case, the ability to repeat words would be mostly or completely undermined by the discourse participation process, since it involves the production and perception of internal speech.

The central executive component of working memory is the key to solving this problem. Incoming information is temporarily stored in the short-term memory, and the central executive can decide to keep it there longer than the normal storage time if it decides that this information is an important enough concept to the current activities of the speaker. We could explain how discourse can be accessed from long-term memory if it is posited that primes tend to be a crucial part of what Levelt (1989) calls the discourse model. This is the speaker's knowledge of the content of the previous discourse, i.e. the perspective, the mentioned referents, what has been stated or implied about those referents, and the discourse topic. Every new utterance in the discourse adds or changes something in the discourse model so the topic is fluid throughout discourse, but the speaker always maintains knowledge of the topic because unless it is appropriate for her to change it, she must make reference to the discourse topic in order to keep the conversation cohesive and cooperative (Levelt 1989). The discourse topic must not be confused with the topic of each individual utterance, what Levelt terms the speaker topic (1989).

Important concepts to the speaker's current discourse include the discourse topic, the most recent speaker concept and the most recent new information, which Levelt (1989) calls the "focus" of the discourse. Levelt (1989) describes the focus as the part of the discourse which the speaker is attending to at any given moment in the discourse. She keeps track of this pertinent information using her short-term memory capacity. A hypothesis for the nature of primes, then, could be that they tend to be a recent focus of the discourse. However, the focus by definition is virtually always constantly changing from sentence to sentence, so it is unlikely that an old focus would remain in short-term memory when there is a new focus to be attended to by the speaker. Consequently the same problem of the rapid decay of information short-term memory would arise as before.

5.3.2 Long-term memory

We must now examine the compatibility of the word substitution priming with long-term memory. Long-term memory is a concept familiar to all of us; it is our permanent memory. Long-term memory is actually the only sensible choice for the priming effect observed in the non-contextual word substitution errors.

Both word substitution errors and normal word production have been explained through the concept of activation spreading through meaning or form associates within the lexicon. The lexicon is a part of long-term memory, and so a prime's effect on its activation can only occur if the prime itself is activated in long-term memory. It is unlikely that enough verbatim discourse is stored in long-term memory that the occasional word would be substituted from previous discourse, considering the relative scarcity of any type of speech error, and the meanings of words are already in the lexicon, so there would be no reason for the central executive to store individual words in the long-term memory unless it was for some conscious purpose like memorization for a test.

However, although we have all had the experience of forgetting what we were just talking about, we can usually, if pressed, go back and remember the general progression of previous discussion, which indicates that some representation of the previous discourse is usually stored in long-term memory. In fact, Levelt (1989) states outright that memory of previous discourse is indeed stored in the long-term memory.

5.4 Semantic priming

For an explanation of a priming phenomenon through discourse models in the long-term memory we turn to Foss (1982). He discusses a type of conceptual priming he calls SEMANTIC PRIMING, which is a priming phenomenon where a word is more quickly processed when it is preceded by a semantically related word. Foss conducted two experiments where subjects were presented with two sentences at a time, and one experiment where subjects were presented with a list of the same words that made up the sentences in the first sentence condition experiment. The lists were divided and separated by a period at the same point that their counterparts in the sentence condition were to further mirror that condition. The subjects were instructed to press a button when they saw a particular word-initial phoneme, which was a measurement of the processing time of the sentences up to that point.

There were two versions of the sentence pairs that were identical except for two variable words in the first sentence. There was a 'critical word' in the second sentence. In one version of the sentence pair the two variable words were semantically related to the critical word (such as "programming" and "keypunching" for the critical word "computer") and in the other version the two words were approximately semantically neutral to the critical word (such as "proofreading" and "editing" for the critical word "computer"). The same variability was true for the list condition. The sentences and lists were constructed such that the designated word-initial phoneme appeared directly after the critical word, and so the processing time of that word was the variable being tested.

In the first sentence condition experiment, the critical word was separated from the two variable words by an average of about 12 words. In the list condition, the same distance and the same words separated the critical and variable words, but in a semi-random order. In the second sentence condition experiment, there were eight different conditions of distance between the semantic variable words and the critical word. The distance ranged from 1.5 to 16 words.

Foss (1982) found no semantic priming for the list condition, but he did find a semantic priming effect for both the sentence conditions: the reading times were faster for the semantically related condition than for the semantically neutral condition for every distance condition. Foss also found that the semantic priming effect did not decay over time for the sentence conditions; average response times were actually less for the higher-distance half of the conditions than for the lower-distance half of the conditions.

Foss explains his results using five assumptions about discourse models. He first assumes a widely accepted view, that the past discourses are stored in the long-term memory as a "semantic model" of conceptual entities and relations between them. His second assumption is that the core propositions of semantic models developed during discourse (i.e. propositions most related to the discourse topic), or alternatively propositions making up a focused-on substructure, might be similar to those in stored semantic models. Thirdly, he assumes that during the discourse process participants search through their memory of semantic models to find a similar model. His next assumption is that when a similar semantic model is found in memory, processing of further information is facilitated if it is compatible and consistent with that model. His final assumption is that those core propositions remain accessible in long-term memory as long as the topic remains the same, and thus they can facilitate processing of information related to the topic.

Foss (1982) is discussing speech perception, not speech production, but as discussed earlier, the perception and production processes use the same network of activated nodes in the lexicon, so presumably that would include network activation due to activated semantic models. Foss actually tried to avoid a direct effect on lexical access by explaining the faster processing of topic related information through its integration into the substructure rather than activation of specific lexical concepts. He was not very clear on the exact nature of this process and his only apparent reason for favoring it over one directly involving lexical access was to maintain the modularity of the production and perception processes, which is unwarranted in our model.

Foss's semantic priming (1982) involves priming of associated words, not identical words. Semantic priming probably explains priming effects in non-contextual word substitution errors such as (17) below, where the topic of the sentence primes the erroneous reference to then-Governor Bush as "General".

(17)

Speaker A: How would you go about as President deciding when it was in the national interest to use force, **General**?

Target: Governor

However, in the type of non-contextual word substitutions previously discussed, the priming effect is a repetition priming effect, in other words, the word which is primed is identical to the prime word. Ratcliff and McKoon (1998) state that faciliation between associated lexical entities has very different characteristics from repetition priming.

5.5 Conceptual priming and the bias effect

The conceptual priming effect observed in the previously mentioned study by Thapar and Rouder (2001) in which subjects underwent free response and forced-choice tasks involves repetition priming. Thapar and Rouder (2001) explain their results through application of the BIAS EFFECT proposed by Ratcliff and McKoon (1996, 1997), for perceptual priming, to conceptual priming. The bias effect is a theoretical explanation of priming whereby the prime leaves behind a trace which temporarily modifies the structures used to process it, rather than the representation in memory of the word itself as it does according to many other models. Ratcliff and McKoon (1997) defend their view by noting that altering a memory representation of a word would facilitate processing of that word relative to other words, but facilitation in forced-choice word identification processes was only observed between similar alternatives. Ratcliff and McKoon (1996) make the valid point that explaining which memory system a word is stored in does not explain the nature of the priming effect. Ratcliff and McKoon (1996, 1997) doubt the existence of several separate memory systems. It is more accurate and useful to distinguish types of priming by the memory systems that were putatively associated with them, which will be done in the remainder of this paper.

In Ratcliff and McKoon's counter model theory of the bias effect (1997), primed words gain more "evidence" than other words from the prime and thus are chosen, which is analogous to the idea of spreading activation. The priming effect observed in auditorily primed non-contextual word substitution errors seems to involve spreading activation due to conceptual implict priming and topicality of entities.

6. Topicality

What makes an entity a topical entity? There is an intuitive aspect to knowing which entities are in focus, but we should also look at how entities are marked for focus, and empirical findings for accessibility of entities. Both Levelt (1989) and McKoon, Ward, and Badderley (1993) state that subject entities are more topical than object entities.

McKoon et al. (1993) discuss the ability of speakers to access a pronoun's antecedent from previous utterances in the discourse. They propose that accessibility is due to a convergence of syntactic and pragmatic factors, those which make a discourse entity topical. They argue that a pronoun can only be "completely and correctly understood if its intended referent is sufficiently more highly accessible in the discourse model, relative to the pronoun as a cue, than all other discourse entities" (McKoon et al. 1993 page 62). They cite research done by Jarvella (1971) and Caplan (1972) which shows that discourse entities are more accessible when they have been recently mentioned. McKoon (1977) showed experimentally that discourse entities are recognized faster when they are closely related to the discourse topic. These results are consistent with the observation of primes as being topical and relatively recent, an observation that is supported by the speech error data that was collected: 86% of the primes in the auditorily primed non-contextual word substitution errors were topical entities in the previous discourse.

7. Conclusion

All the research cited in the above paragraph was testing accessibility in speech comprehension, but it is applicable to speech production as well, since according to the model of lexical access we have adopted, Levelt's (1989, et al. 1999), the speech production system uses the same mental store of lemmas and lexemes and the same conceptualizor mechanism as the speech comprehension system, meaning both processes have access to the same discourse model and the same state of activation of the nodes in the lexical network. However, syntactic factors such as grammatical role are only accessed after the lemma is chosen, so they would not affect the lemma selection process.

Levelt (1989) observes that intended topicality in the speech production process is active at the message level. This indicates that instead of the lemma or lexeme selection process being affected by the activation of a word identical to the prime, the lexical concept selection process could be affected by the prime. The lexical concept would be selected based on topicality. This hypothesis is possible in Levelt's model, since there is a selection process based on activation at the lexical concept level in his model.[6] This discourse model approach to the activation of lexical concepts is supported by the conception of the discourse model adopted by McKoon et al. (1993). McKoon et al. (1993) describe the discourse model as a network of related conceptual entities, not a series of propositions as in Kintsch (1974, cited in McKoon et al. 1993).

If this is the case, the activation from the discourse model would be at the conceptual level, meaning that the lexical concepts for topical entities would be more accessible, not their lemmas or lexemes. This view would explain why the primes were semantically related to the targets in all of the primed non-contextual word substitutions observed. Further data collection and analysis would have to be done to see if there were a statistically significant amount of mixed semantic and phonologically related errors, which could pose a problem for the theory. Although, such a finding could be explained in the same way that Levelt et al. (1999) explain the statistically significant amount of mixed non-primed non-contextual word substitutions, which is through the self-monitoring mechanism[7].

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[6] See Appendix A, Fig. 3

[7] See 3.4.1 for further discussion.

The hypothesis that topicality effects at the lexical concept level highly activate a prime's lexical concept is not contradicted by the theories adopted in this paper, and it seems to be supported by the data collected so far, although there is not enough data for a statistically significant analysis. This hypothesis remains to be proven by further research and analysis.

Appendix A: Figures

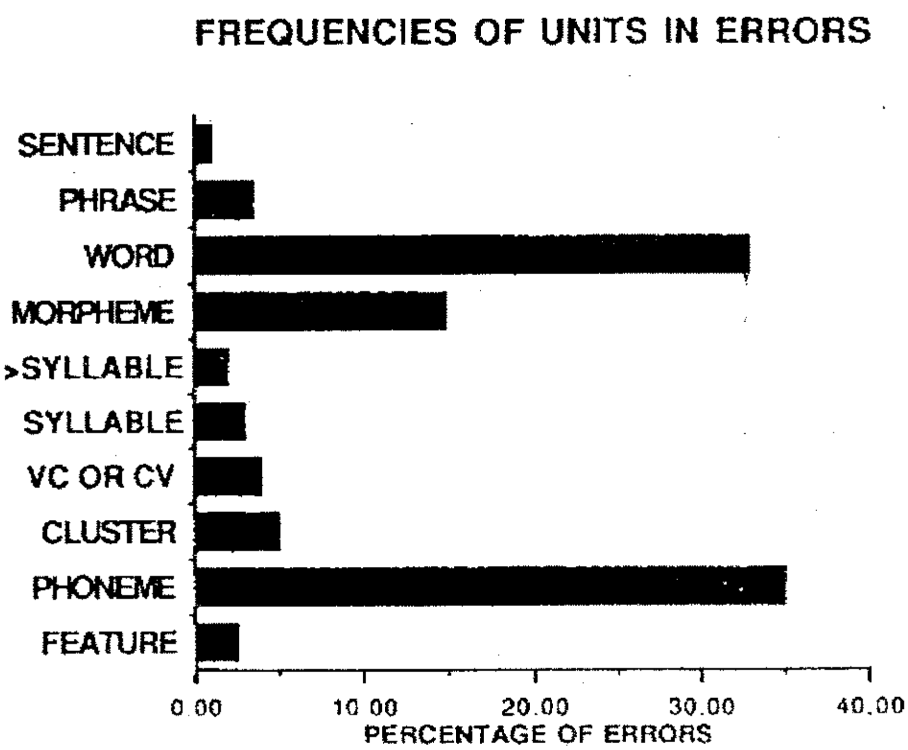

Figure 1: Frequency of linguistic units in speech errors (Bock 1991, taken from Dell 1989)

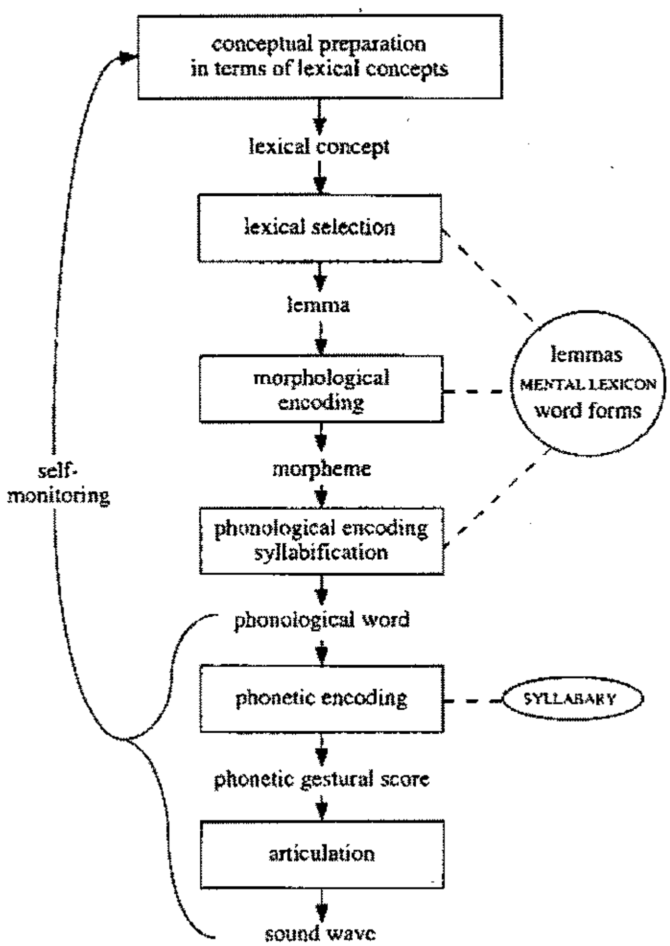

Figure 2: Levelt's theory of lexical access (Levelt et al. 1999)

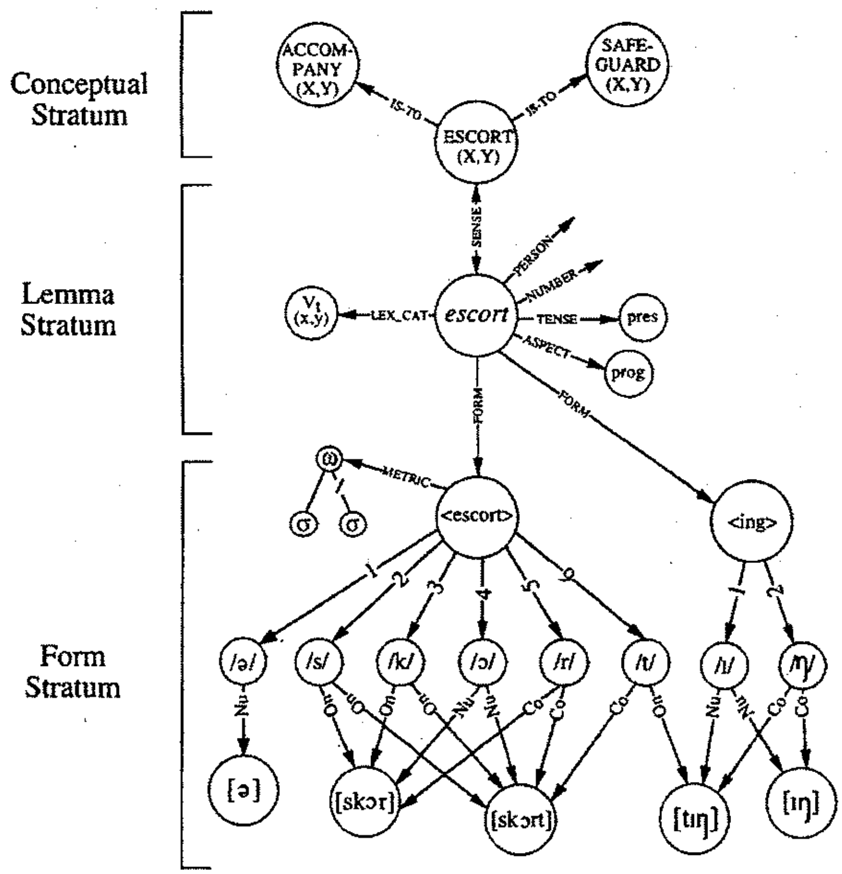

Figure 3: Fragment of the lexical network for "escort" (Levelt et al. 1999)

Appendix B: Speech Error Corpus[8]

Primed Non-contextual Word Substitutions

Auditory Prime

(1)

(Speaker A and others are discussing Swat and Swat students for approx. 10 minutes. Speaker A changes the topic)

Speaker A: I have to go to **Swat**.

Target: Haverford

(2)

(Speaker A is telling the story of a guy she knew who wrote a song for his girlfriend and proposed to her in the song. She then switches topic to start telling a story about a commercial she auditioned for.)

Speaker A: That's the point of this **song**…story.

Target: story

(3)

(Speaker A is talking about the wine to be had at a reception, then switching the topic)

[8] The categories and order of their presentation is taken from Dell, G. S. (1986). A spreading activation theory of retrieval in sentence production. *Psychological Review*, *93*, 283-321, excepting primed non-

Speaker A: I need to give you an update on the **wine**.

Target: honors examiners

(4)

(Speaker A is discussing the movie *King Arthur* with a couple friends. Silence for approx. 10 seconds, Speaker A points at a magazine article about the movie *King Kong*)

Speaker A: *King* ***Arthur***. It looks really good.

Target: Kong

(5)

(Speaker A is eating a Greek salad while listening to a conversation about going to Egypt, then walks away from conversation, and)

Speaker A: This **Egypt** salad is spicy.

Target: Greek

(6)

Speaker A: (in a sing-song voice) wave o' babies

(Talk for approximately 2 minutes, discussion turns to the ancient Picts)

Speaker B: So the image that you get is of a **wave** of tiny blue people with pointed sticks.

Target: horde

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contextual substitutions, which are listed first since they are the subject of the accompanying paper.

(7)

Speaker A: I could just get a whole jar of chicken bullion.

(Talk for approximately 2-3 minutes, Speakers B and C are discussing how Speaker B put water in her Cheerios instead of milk)

Speaker B: I just wanted something soggy!

Speaker C: We should really go get a **jar** of milk sometime.

Target: jug, gallon

(8)

Speaker A: What are those tweezers doing in there?

Speaker B: Oh, I was using those to get a **tweezer** out of my foot last night.

Target: splinter

(9)

Speaker A: I really like your hat.

Speaker B: Her friend gave it to me, he found it at a bar.

Speaker A: Those are the best kind of **hats** you get.

Target: things

(10)

Speaker A: What does Dean like?

Speaker B: He likes asparagus. What does Dean like? (to Dean's brother): What does your **Dean** like?

Target: brother

(11)

(Speaker A is talking to Viviaan about another girl and a boy named Henry. Speaker A had been thinking about a highschool classmate named Harry earlier in the day)

Speaker A: How did this come up?

Speaker A: As things progressed with **Harry**.

Target: Henry

Viviaan: You mean Henry.

Speaker A: Yeah.

Viviaan: What did she say?

Speaker A: She said that you said that you would talk to Viviaan.

Viviaan: Uh.

Speaker A: Ahh, I mean she said that you would talk to **Harry** (self-corrects), no I mean Henry!

Target: Henry

(12)

Speaker A: I am so going to get clip-on earrings.

(Speaker A shakes her head vigorously for about 3 seconds while the earrings hit her in the head)

Speaker A: You just have to make sure they don't fly off and hit someone in the **ear**. (gap then speaker self-corrects) I mean the eye.

Target: eye

(13)

(Speaker A is discussing Ling 1 sections, then the topic changes)

Speaker A: I want to talk to Alex for just a **session**.

Target: second

Visual/other Prime

(14)

(Speaker A sees many umbrellas on the way into a building, she is pressing the buttons on an elevator in that building)

Speaker A: I really need to get on the **umbrella train**.

Target: elevator?

(15)

(Speaker A is holding a DVD of *Crouching Tiger, Hidden Dragon*)

Speaker A: This was one of the greatest **animals** ever made.

Target: movies

(16)

(Speaker A had just finished lunch)

Speaker A: I've completely forgotten what I should be doing right now. Oh, the newscast, right.

Speaker B: Yeah, they might have sent it already

Speaker A: I should go check my **meal**

Target: mail

(17)

(Speaker A was thinking of the rain that had fallen and was still falling, and was looking at a railroad bridge)

Speaker A: And the **trains** are growing.

Target: trees

(18)

(Speaker A is talking to Tyler)

Speaker A: Do you think you could get me and **Tyler** in to meet the cast?

Target: Heather

(19)

(Speaker A is looking at a bookbag because her friend had just mistaken the boy wearing it for one of their mutual friends)

Speaker A: Did you return those **bookbags** to Ray yet?

Target: sliders

(20)

Speaker A: That's what I was telling **you**!

Target: her

<u>Misordering Word Anticipatory Substitutions</u>

(21)

Speaker A: Did you know that it takes more **smiles** to frown than it does to smile?

Target: muscles

(22)

Speaker A: So that's like the original Buffy the Vampire Slayer?

Speaker B: There were **Buffy** slayers (speaker self-corrects) vampire slayers before Buffy the Vampire Slayer, you know that right?

Target: vampire

<u>Misordering Syllable Rime Anticipatory Substitutions</u>

(23)

Speaker A: The company was originally called O'Brien **Hunting** (speaker self-corrects)

Target: Heating and Plumbing

Misordering Anticipatory Phoneme Substitutions

(24)

Speaker A: The **pirate** was really awesome, he pointed out Washington DC and Chesapeake Bay as we were flying over.

Target: pilot

(Note: Could also be a phonological non-primed non-contextual word substitution)

(25)

Speaker A: My mom and **dav** have.

Target: dad

(26)

Speaker A: There aren't any more sheets in the time **slit** slot.

Target: slip

(27)

Speaker A: Decide on one or the other as the **wight** way to read these things.

Target: right

(28)

Speaker A: We just bought a five **glallon** glass jug.

Target: gallon

(29)

Speaker A: The girl that I **spend**, I mean send, speech errors to invited me.

Target: send

(30)

Speaker A: four to **ape plages**.

Target: eight page

(Note: There is also non-contextual phoneme addition with [l])

(31)

Speaker A: The **unstructions** were completely worthless.

Target: instructions

<u>Misordering Perservatory Phoneme Substitutions</u>

(32)

Speaker A: We need to figure out how we're going to **oily** present it.

Target: orally

(33)

Speaker A: And **basiclai** that's what most people come up here to do.

Target: basicly

(34)

Speaker A: Ira **Fratlow**.

Target: Flatlow

(35)

Speaker A: Eric ends up marrying Ursula's alter-**eagle**.

Target: ego

(36)

Speaker A: Carnegie **Melligan**.

Target: Mellon

<u>Misordering Word Substitution Exchanges</u>

(37)

Speaker A: I'm running a **snot** of **river**.

Target: a river of snot

(38)

Speaker A: I don't think they realized that the people had that belief, that people valued **women** more than **men** (speaker self-corrects), I mean men more than women.

Target: men more than women

Misordering Phoneme Substitution Exchanges

(39)

Speaker A: But I **seel fo** tired!

Target: feel so

(40)

Speaker A: Now we will have a presentation by **Benna** and **Bell**.

Target: Bella and Ben

(41)

Speaker A: We went to the **Bottery Parn** this morning.

Target: Pottery Barn

Non-primed Non-contextual Word Substitutions

Phonologically Related

(42)

Speaker A: The **pirate** was really awesome; he pointed out Washington DC and Chesapeake Bay as we were flying over.

Target: pilot

(Note: This also could be a misordering anticipatory phoneme substitution from the [r] in "really")

(43)

Speaker A: I might have a pang of **symphony** for him then.

Target: sympathy

(Note: This also could be a misordering anticipatory phoneme substitution from the [f] in "for")

(44)

Speaker A: I was **living**…I was learning in my book…

Target: learning

(45)

Speaker A: Last week on the **Dairy Queen**, we got to play the calliope.

Target: Delta Queen

(46)

Speaker A: This structure is the **sipunculid**

Target: siphuncle

Semantic/Phonological

(47)

Speaker A: I put them in the **freezer**.

Target: fridge

(48)

Speaker A: Start thinking of some examples in your **hands**.

Target: heads

(48)

Speaker A: There was this weird girl in the computer console at **Cambrian**.

Target: Canaday

(Note: These are both buildings on the Bryn Mawr College campus)

Semantic

(49)

Speaker A: I **videotaped**, I mean photocopied, this lecture. (it was powerpoint-prime for visualness??)

Target: photocopied

(50)

Speaker A: There's a lot of **childs** who play videogames.

Target: kids

Speaker A: Oooh, **bunnies**.

Target: Trix

(51)

Speaker A: I really wish I would have played volleyball, it looks like so much fun.

Speaker B: Yeah, me too, I was never **short** enough.

Target: tall

(52)

Speaker A: And **Peyton** Manning completes the throw to the 15-yard line.

Target: Eli

(53)

Speaker A: And here you see Hurricane **Katrina**.

Target: Rita

(54)

Speaker A: They are twins but they aren't **fraternal** twins.

Target: identical

(55)

Speaker A: I think I'll go to **Mother Goose's Nursery Rhyme** and get some tea.

Target: Mrs. Bridges'

(Note: The semantic relation comes from the fact that Mrs. Bridges' is a quaint café and antique store and all the employees are old British women)

(56)

Speaker A: What's that from?

Speaker B: Guess.

Speaker A: That movie with the Irish **twins**.

Target: brothers

(57)

Speaker A: I just slip it into this **X-box** over here?

Target: Playstation

(58)

(Discussion of how Speaker B took Levitra, a male enhancement drug, by accident)

Speaker A: So you took **Viagra**.

Speaker B: They didn't tell me it was **Viagra**!

Target: Levitra

(59)

Speaker A: That Blues Askew we played last **night** was one of the weirdest on-stage experiences I've ever been a part of.

Target: time

(60)

Speaker A: I **died** a fish.

Target: killed

(61)

Speaker A: They've been reduced down to one lane much earlier than we **did**.

Target: were

<u>Non-contextual Morpheme Substitutions</u>

(62)

Speaker A: I don't see why **there's** be a price difference.

Target: there'd

(63)

Speaker A: The ultra**centrifuge** results look fine.

Target: sound

Non-contextual Phoneme Substitutions

(64)

Speaker A: He's very **affectuate.**

Target: affectionate

Non-contextual Phoneme Deletions

(65)

Speaker A: four to **ape plages.**

Target: eight page

(Note: There is also a misordering anticipatory phoneme substitution with [p])

Non-contextual Morpheme Deletion

(66)

Speaker A: I've **smoke** here.

Target: smoked

Non-contextual Phrase Blends

(67)

Speaker A: I've always wanted to have **green hair** and freckles.

Target: red hair, green eyes

(68)

Speaker A: Will, please order another **cookie**.

Target: copy of a book

Non-contextual Word Blends

(69)

Speaker A: It's one-oh-**foive**.

Target: four,five

(70)

Speaker A: How did they **come on** that name?

Target: come to have, decide on

(71)

Speaker A: My next class is a **firstro**.

Target: first year seminar, intro

(72)

Speaker A: I am feeling a little loopy now that **I mention** it.

Target: you mention it, I think about it

(73)

Speaker A: I **misunderheard** you.

Target: misheard, misunderstood

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