CHAPTER 5

RESULTS AND DISCUSSION OF HESITATIONS

5.1 Introduction

This chapter addresses the first part of the first research question (see 1.5), the type of hesitation devices that speakers use. This is based on the premise that hesitation devices such as silent pauses, filled pauses and prolonged segments are a reflection of the process of self-monitoring in speech production. Their presence in speech is often regarded as reactions to prearticulatory or postarticulatory error-detection (see Figure 1.1 and Chapter 2). It has even been suggested that repair-planning may be ongoing during hesitation (see Chapter 3). In view of these, the hesitations used in the data are examined in terms of their frequency of occurrence and more importantly their context of occurrence, that is, the extent to which they co-occur with repairs and the type of words they typically precede.

The analysis of hesitations in this chapter is divided into three main parts. The first part presents an overview of hesitations found in the data. The second part presents the results and discussion of the different forms of hesitations (filled pauses, silent pauses and prolongations) found in possible-repairs. The third part reports on and discusses hesitations found in self-repairs.

5.2 Overview

The speech of 67 callers was analysed according to the procedures outlined in Chapter 4. Only hesitations and/or repairs that occurred within an utterance (see 4.3) were taken into account for purposes of analysis. The data yielded 377 instances of such cases, of which 264 of the utterances were interrupted by three forms of hesitation: silent pauses, filled pauses, prolongations or various combinations of any of these forms of hesitations. Of these, no repair was made after the hesitation in 138 instances. These will be referred to as 'possible-repairs' (see 4.3). The other 126 instances that were interrupted by some form of hesitation were regarded as instances of self-repair. This is because these utterances were found to be instances of deletions, insertions, repeats or substitutions. Another 113 of self-repairs did not have any form of hesitation. Thus, in total there were 239 self-repairs, comprising 131 repeats and 108 overt repairs (deletions, substitutions and insertions), and 138 possible-repairs found in the data.

Figure 5.1 shows the number of possible-repairs and self-repairs (with and without hesitation) found in the data.

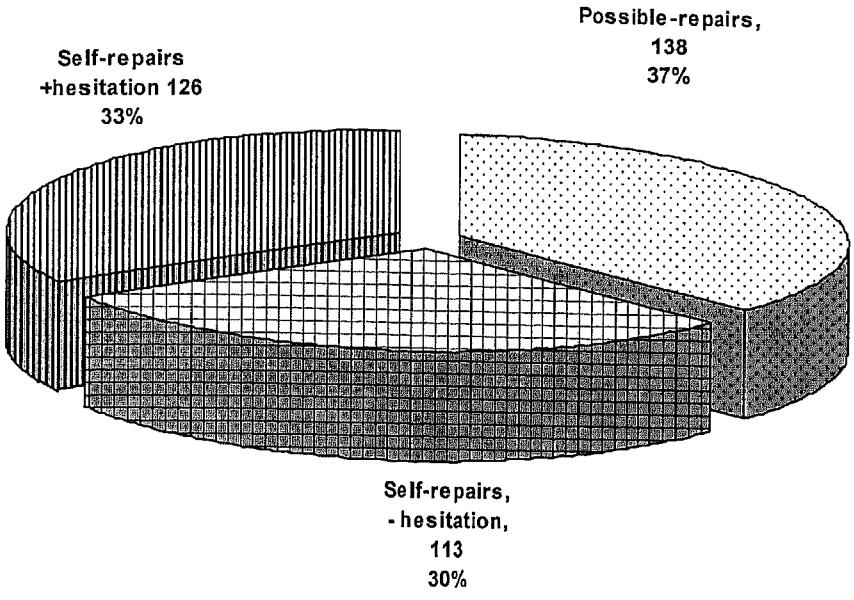

Figure 5.1

Number of Possible-Repairs and Self-Repairs (With and Without Hesitation)

A total of seven instances could not be classified as a particular type of repair. This is because the interruption point was followed by a fragment. Thus, it was not possible to determine what kind of repair was being made.

5.3 Possible-Repairs

In instances where only hesitation was present, but not any overt sign of items being deleted, inserted or substituted, we can only presume that the item/s following the prolongation, silent and filled pauses may form a repair to a prearticulatorily detected error. This is considered as instances of *possible-repairs* in this study, rather than covert repairs, as in other studies, such as Levelt (1983). This is because since it cannot be

determined which segment or word actually constitutes the repair, it therefore, is difficult to ascertain if the presence of hesitation actually indicates that covert error detection and repair have taken place (see 2.8.2). The hesitation could simply be a conversational device or occur due to other unrelated reasons. In this study, possible-repairs have been identified only because of the occurrence of hesitation, and subsequently, only regarded as 'possible' indications of prearticulatory error-detection and repair-planning.

As explained in the previous chapter, in such repairs, the interruption point (IP) is considered to begin from the offset of the word preceding the hesitation being used (1 in Figure 5.2), while the onset of the presumed repair begins immediately after the offset of the hesitation (2 in Figure 5.2). In cases where there was a prolonged segment, but no overt error and repair, the offset of this segment is deemed to be the interruption point. The probable structure of possible-repairs is shown in Figure 5.2.

C13
what happened that day was(1):**845**(2)those tow truck operators(1):**803**(2)said
IP IP
(1)**er :239**(2)I wasn't the owner of the car
IP

C1
<and> have **a:**(1)(2)clean teeth that's all.
IP

Figure 5.2

Structure of Possible-Repairs

The examples in Figure 5.2 also show that if the forms of hesitation that cause the break in fluency were to be removed, the utterance would proceed smoothly:

C13
what happened that day was those tow truck operators said I wasn't the owner of the car

C1
<and> have a clean teeth that's all.

In other words, nothing else in the utterance needs to be changed or deleted in any way, which in turn means that overtly, no 'error' is discernable. In relation to this, even if the speaker has prearticulatorily detected his 'error', there is no way of knowing which portion following the perceived interruption point constitutes the repair.

5.3.1 Hesitations in Possible-Repairs

Three forms of hesitations were categorized within utterances in the data:

- filled pauses
- silent pauses
- prolongations.

As explained previously, in such cases, speakers continued their utterance after the hesitation without repeating, or making any alteration after the hesitation, such as shown in the following extract:

C10
you cannot make it **IP ah** other than *cenderamata* ((souvenir)).

There were a total of 138 of such instances, which will be referred to in this study as *possible-repairs*. A large percentage of these possible-repairs were interrupted by silent and/ or filled pauses (85.5%). A total of 13 of these pauses followed prolongations,

which were present in 24% (33) of these repairs. Table 5.1 summarizes the types of hesitations found in possible-repairs.

Table 5.1

Hesitations in Possible-Repairs

Hesitation	Number (Total=138)	Percentage %
Filled Pause only	43	31
Silent Pause only	37	27
Prolongations only	20	14
Combinations of hesitations	38	28

5.3.1.1 Filled Pauses in Possible-Repairs

Almost half of the 138 (52.8%) possible-repairs were interrupted by a form of filled pause. The majority of the filled pauses in these repairs were unlexicalized forms such as *ah* /ɑ/, *ahm* /ɑm/, *er* /ə/ and *m* /m/ (see 2.9.1.2). Such unlexicalized filled pauses occurred in half of the possible-repairs, and in 31% (43) instances, they were the only form of hesitation. Table 5.2 shows the frequency of the types of unlexicalized filled pauses occurring as the only form of hesitation in possible-repairs, where it can be seen that the filled pauses *ah* and *er* occurred most frequently.

Table 5.2

Unlexicalized Filled Pauses Occurring as the Only Form of Hesitation in Possible-Repairs

Type of Unlexicalized FP	Number (Total =43)	Percentage %
ah	21	49
ahm	3	7
er	15	35
ah ah	1	2
er ah	1	2
m ah	1	2
er er er	1	2

(FP = Filled Pause)

As shown in Table 5.2, there were only two occurrences of unlexicalized filled pauses being repeated (*ah ah* and *er er er*), and two occurrences where one form of filled pause followed another (*er ah* and *m ah*). In 19 of the utterances, unlexicalized filled pauses occurred either before and/or after silent pauses, as illustrated by the following utterances from the data:

C13
...my daughter's friend was **IP :128 er** driving to visit her...

C15
...my senior asked me to buy a cup of this **IP ah :673** soft drink...

C45
...I think **IP er :823 er** we all have to appreciate...

The various combinations of filled pauses and silent pauses are shown in Table 5.3. There was no obvious pattern of combination of filled and silent pauses, with 10 filled

pauses occurring after silent pauses, 6 before silent pauses, and 3 before and after silent pauses.

Table 5.3

Combinations of Filled Pauses and Silent Pauses in Possible-Repairs

Combination of FP and SP	N(Total = 19)	Percentage %
er :	2	11
ah :	4	21
: er	4	2 1
: ah	5	26
: ahm	1	5
er : er	1	5
ahm : ahm	1	5
ahm : ah	1	5

(FP= Filled Pause; SP= Silent Pause; ':' indicates a silent pause)

Apart from unlexicalized filled pauses, the data also comprised lexicalized filled pauses (see 2.9.1.2), also referred to as "explicit editing terms" (Bell, Eklund & Gustafson, 2000) or "lexical editing terms" (Lickley, 1998). Similar to other studies (Bear, Dowding, Shriberg & Price, 1993; Clark and Wasow, 1998; Lickley, 1998; Rose, 1998), among the expressions found in the data were *you know* and *I mean*, the former being the most commonly used expressions. Another three other forms of lexicalized filled pauses were found in the data: *what, what you call this* and *what is this*. All three basically carry the same meaning, similar to expressions like *what's it called* or *whatsit* or *whatchamacallit* (*Cambridge International Dictionary of English*, 2001) and have been found to be devices used by speakers to buy planning time.

However, lexicalized filled pauses were not used as frequently as unlexicalized filled pauses, occurring in only 10 of the possible-repairs. An analysis of these fillers shows that 9 of these occurred after another hesitation, where 6 occurred immediately after a filled pause or a combination of silent and filled pauses, 2 occurred after a prolongation and one after a silent pause. Examples of such use of lexicalized filled pauses are as follows:

C17
...[w*] IP **which**(REP) not IP **:246 ah what you call this** properly filtered.

C49
...they **say: IP you know** men are not controlled by women.

C53
and **IP ah I mean :412** cleanliness womanlah.

C56
to make **the: IP you know** other side happy that's all.

The occurrence of such filled pauses after other forms of hesitation reinforces their function as a hesitation device. In relation to this, these filled pauses, like *I mean*, *what* and *you know*, seem to verbalize a speaker's search for an item. These verbalizations do not contribute to the semantic content of the utterance, and if they, like the other forms of hesitation, are deleted, the utterance is able to flow coherently as demonstrated below, using the same examples given previously. These examples show that no alterations need to be done to the utterance, and thus there is definitely a case for them to be considered as a type of hesitation and also as part of the editing phase of a repair.

C17
...[w*] IP **which**(REP) not IP **:~~246 ah what you call this~~** properly filtered.

C49
...they **say~~: IP you know~~** men are not controlled by women.

C53
and IP ~~**ah I mean :412**~~ cleanliness womanlah.

C56
to make ~~**the: IP you know**~~ other side happy that's all.

An examination of these lexicalized fillers also showed that speakers tend to successfully continue their utterance after such fillers. It could be that they may have conceptualized what they wanted to say and perhaps even accessed the necessary lemma but encountered problems at the later stages of speech production, such as phonologically encoding it, resulting in the word or words not being ready in time for articulation (see TOT phenomena in 2.2). This could have resulted in the occurrence of the fillers to buy time for the speaker to successfully encode and produce the item the item. It could also be possible that an error had been detected prior to its articulation (see 2.8.2), hence the use of hesitation devices to correct it.

5.3.1.1.1 Location of Filled Pauses in Possible-Repairs

All occurrences of filled pauses in possible-repairs were examined to see if they were located before lexical or function words (see 2.9.1.2.1). Instances where unlexicalized filled pauses occurred as the only form of hesitation were also examined separately to see if the results would be similar to all instances where filled pauses occurred. Similar to Maclay and Osgood (1959), there were more instances of filled pauses occurring before lexical words than function words in both cases. However, no statistical tests were carried out to test whether the occurrences were significant as the numbers involved were too small for function words. The number of occurrences of filled pauses before lexical and function words is shown in Table 5.4.

Table 5.4

Number of Filled Pauses before Lexical and Function Words

Categories	All Occurrences of FP		Unlexicalized FP	
	No (Total = 73)	%	No (Total = 45)	%
Lexical Words	67	92	42	93
Function Words	6	8	3	7

(FP= Filled Pause)

Since filled pauses are seen as "planning" (Goldman-Eisler, 1972, Levelt, 1989; Maclay and Osgood, 1959) or "warning" devices (Clark and Wasow, 1998; Fox Tree, 2001; Fox Tree and Schrock, 1999), their presence suggests that the speaker is encountering a problem at this point, especially as most of them occurred before lexical words. This is because, as suggested by Maclay and Osgood (1959, p. 30 & 41), lexical words are thought to be cognitively more demanding to produce compared to function words (see 2.9.1.2.1).

The use of filled pauses in combination with silent pauses and prolongations, which occurred in 24 possible repairs (see Table 5.1 and Table 5.5) could be taken as further evidence that these forms of hesitation are used as such devices. This is because if we assume that that filled pauses are evidence of prearticulatory detection of errors, the fact that more than one form of hesitation is used suggests that the speaker perhaps needs extra time to produce the repair.

5.3.1.2 Silent Pauses in Possible-Repairs

There were a total of 69 occurrences of silent pauses in possible-repairs. The distribution of the duration of the silent pauses found in possible-repairs is shown in Figure 5.3. The mean duration of the 69 silent pauses was 471msec, with a median of 414msec, a mode of 257msec and a standard deviation of 264.13msec. The duration of the pauses ranged from 108msec to 1257msec. Figure 5.3 shows that long silent pause durations were not common in possible-repairs. As a result the graph is positively skewed. In fact approximately half of the durations were between 280-595msec.

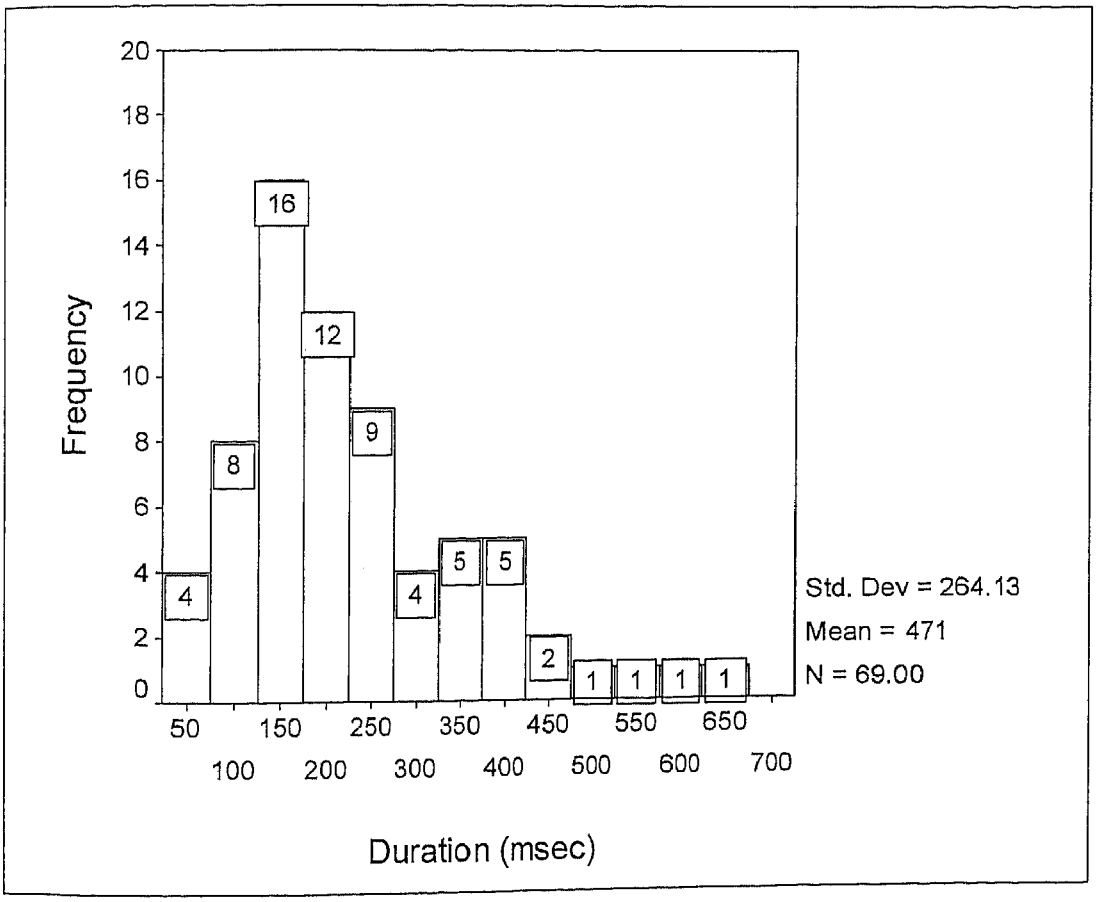

Figure 5.3

Frequency Distribution of Pause Duration in Possible-Repairs

Thus, as can be seen from Figure 5.3, all the silent pauses were less than 2 seconds, which is similar to other studies (see 2.9.1.1.1), such as in Goldman-Eisler (1968), Grosjean and Deschamps (1975) and Lickley (1994) and Arim, Costa and Freitas (2003). Although none of the silent pauses were less than 100msec (compared to Lickley, 1994), 5.8% (4/69) of these pauses were between 108-150msec. Approximately 13% (9/69) of the silent pauses were below 200msec, and 17.4% (12/69) were below 250msec. Although this is not a big percentage, it shows that non-phonetic silent pauses can be shorter than 250msec, especially so as none of these pauses were stop closures or occurred at breath intake points. Therefore, using pre-determined cut off points to distinguish silent pauses used as hesitation devices from other periods of silence is not be advisable. Instead, as done in this study, all silent pauses should, firstly, be taken into account and then, secondly, be examined for acoustic and contextual properties to eliminate, for example, phonetic stops, as was done by Lickley (1994) and Kirsner, Dunn and Hind (2003). This will ensure that all hesitation pauses are included, rather than only those that are above a particular pre-determined durational range.

Of the 69 silent pauses that occurred in possible-repairs, about 50% of them occurred as the only form of hesitation. In 9 occurrences, a silent pause followed a prolongation (compared to no filled pauses immediately following a prolongation) such as shown in the following example.

C7
...I just want **to: IP :111** say something...

Silent pauses also occurred before, after or between filled pauses as shown in the following examples:

C14
there's a lot of cars stopping **IP :558 er to: IP** have **a: IP** look.

C53
and they are better in **IP ah :163** <treating the children^>

Table 5.5 shows the various combinations of silent pauses and other forms of hesitation found in possible-repairs.

Table 5.5

Combinations of Silent Pauses in Possible-Repairs

Combinations	No (Total = 69)	Percentage %
SP only	36	53
Prolongation + SP	9	13
Prolongation + SP + FP	1	1
SP + FP	9	13
FP + SP	6	9
FP + SP + FP	3	4
SP+ Lexicalized FP	1	1
Other combinations of SP and FP	4	6

SP = Silent Pause; FP = Filled Pause

The combined use of silent pauses, filled pauses and prolongations, suggests that a speaker is having problems continuing the utterance. As pointed out earlier, it is possible that the combination of hesitations is a device used by speakers to buy time or hold on to the floor, while the rest of the utterance is being planned. This is especially so because

the use of silent pauses and filled pauses have been associated with thinking processes (Goldman-Eisler, 1968, p. 58).

5.3.1.2.1 Location of Silent Pauses in Possible-Repairs

The locations of the 36 silent pauses that occurred as the only form of hesitation were examined to determine if they occurred more frequently before lexical or function words (see 2.9.1.1.2). Since the silent pauses that were used in combination with filled pauses were already included in a similar analysis on filled pauses, they will not be included here. Similar to Maclay & Osgood (1959), there were more silent pauses immediately before lexical (adjectives, adverbs, nouns, verbs) rather than function words (articles, modifiers, preposition and conjunctions) in possible-repairs. Because of the small numbers involved, no statistical tests were conducted to compare the frequencies of occurrences. Table 5.6 shows the raw scores for the frequency of silent pauses that occurred before lexical and function words.

Table 5.6

Frequency of Silent Pauses Before Lexical and Function Words in Possible-Repairs

Position of Silent Pause	No (Total = 36)	Percentage %
Before Lexical Words	22	61
Before Function Words	14	39

Silent pauses, like filled pauses, occurred more frequently before lexical rather than function words, which again, may be a reflection of the extra planning time needed to retrieve and formulate lexical words (see Figure 3.1). Perhaps, this has something to do

with the range of choices available. For lexical words, a speaker may have to retrieve the most appropriate lemma from a bigger selection of lemmas from the mental lexicon. In comparison, the range of grammatically-related choices, such as the correct use of prepositions and articles, may be more restricted. Moreover, speakers may also be more concerned with lexical choices as these tend to contribute more towards making the meaning of the utterance clearer compared to function words.

Table 5.7 shows the mean, median, mode, standard deviation and skewness of the duration of silent pauses before function and lexical words. However, a *Mann-Whitney U-Test* showed that there was no significant difference between the duration of silent pauses before lexical and function words, U (N1 = 22, N2 = 14) = 118, $p > 0.05$, *n.s.*

Table 5.7

Statistical Description of the Duration of Silent Pauses Before Lexical and Function Words in Possible-Repairs

	Before a Lexical Word	**Before a Function Word**
Number	22	14
Mean	504.09	401.14
Median	364.00	346.00
Mode	280	257
Standard Deviation	291.6	241.6
Skewness	1.4	0.53
Minimum	201	108
Maximum	1257	845

5.3.1.3 Prolongations in Possible-Repairs

A total number of 33 prolongations were found in the possible-repairs. They were identified auditorily, that is, they were perceived as being produced longer than in fluent contexts. To confirm this, the duration of the same word uttered by the same speaker was measured and compared to the duration of the auditorily perceived prolongation (see 4.3.1.3).

The word that was most frequently lengthened was *the* (8 occurrences). Overall, the durations of prolonged *the* were all above 200msec, ranging from 203-934msec compared to *the* in fluent contexts (see 4.3.1.3), which were all under 100msec, ranging from 35-97msec, as can be seen in Table 5.8, which shows the difference in durations between prolonged *the* (8 occurrences) and *the* in fluent contexts (10 occurrences). Prolonged *the* had a mean of 579msec, a median of 600msec, a mode of 203msec and a standard deviation of 223.2msec. In comparison, the fluent *the* had a mean of 60msec, a median of 58msec, a mode of 36msec and a standard deviation of 16.7msec.

Table 5.8

Durations (msec) of Prolonged and Fluent *the* in Possible-Repairs

Caller	Prolonged *the* (msec)	Fluent *the* (msec)
12	517	36 56
17	934 659	97
31	745	53 59
51	613	49 60
56	203	51 62
65	586	77
44	373	

n.b. Some speakers may have produced more than one *the* in fluent contexts, as indicated by more than one value in the columns, and the shaded box means the speaker did not utter a *the* in a fluent context.

Figure 5.4 compares the distributions of the fluent and prolonged *the*, where it can be seen that the longest duration produced in a fluent context was shorter than the shortest duration produced in a prolonged context. Half of the durations in the prolonged contexts were between 409 to 723msec compared to 50.5 to 65.5msec in the fluent contexts. In other words, the prolonged tokens were obviously longer than the fluent ones.

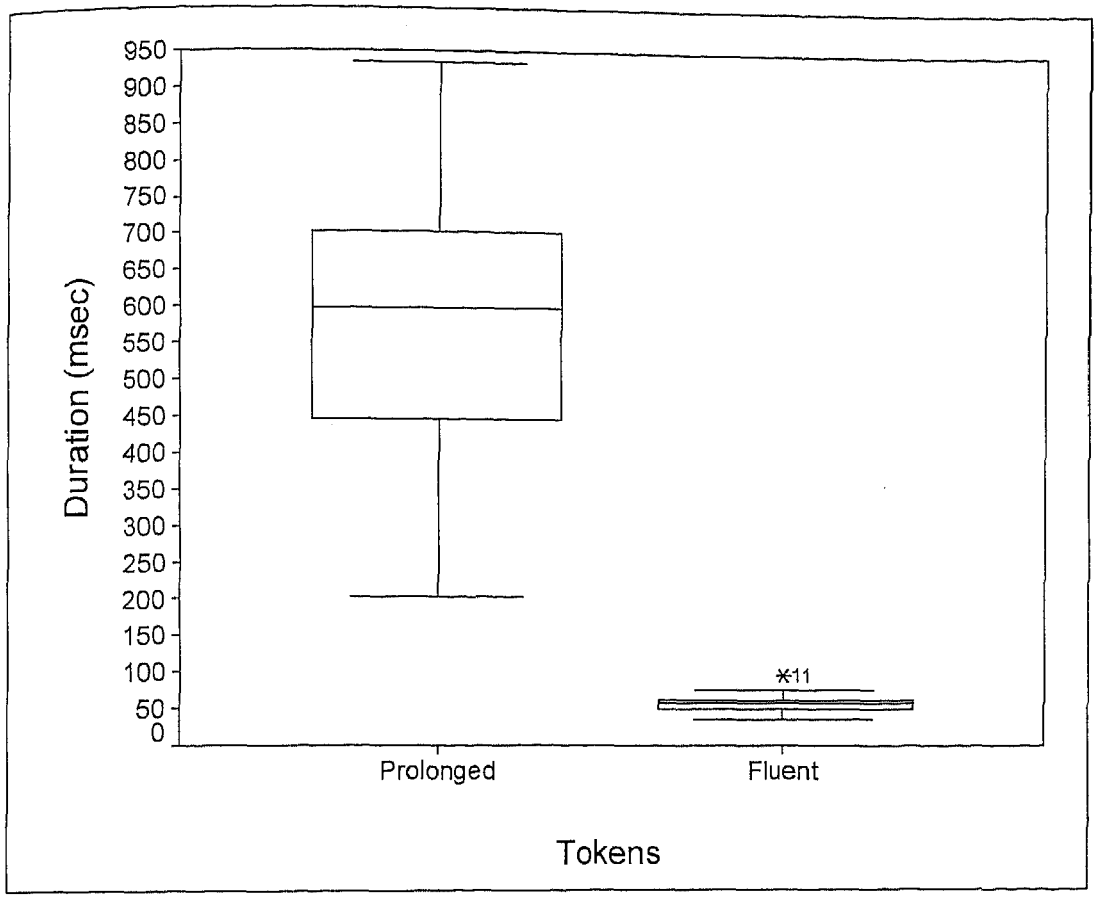

Figure 5.4

Boxplots Comparing the Durations of *the* Produced in Prolonged and Fluent Contexts

Another word that was prolonged in possible-repairs was the word *to* (7 occurrences). As can be seen in Table 5.9 the duration of the prolonged tokens ranged from 260 to 719msec, while those produced in fluent contexts (8 occurrences) had much shorter durations ranging from 39msec to 79msec.

Table 5.9

Durations (msec) of Prolonged and Fluent *to* in Possible-Repairs

Caller	Prolonged *to* (msec)	Fluent *to* (msec)
7	719	27
17	683	39 58
31	260	54 65 79
66	566	70
67	491	75
8	447	
14	309	

The prolonged *to* had a mean duration of 496msec, a median of 491msec, a mode of 260msec and a standard deviation of 174.5msec, while the *to* produced in fluent contexts had a mean of 58msec, a median of 62msec, a mode of 27msec and a standard deviation of 18msec. The longest duration for *to* produced in a fluent context (79msec) was shorter than the shortest duration for the prolonged token (260msec). *Figure 5.5* compares the distribution of the prolonged and fluent tokens of *to*. As in the case of *the*, it is clear from this figure that the fluent tokens were consistently shorter than the prolonged ones.

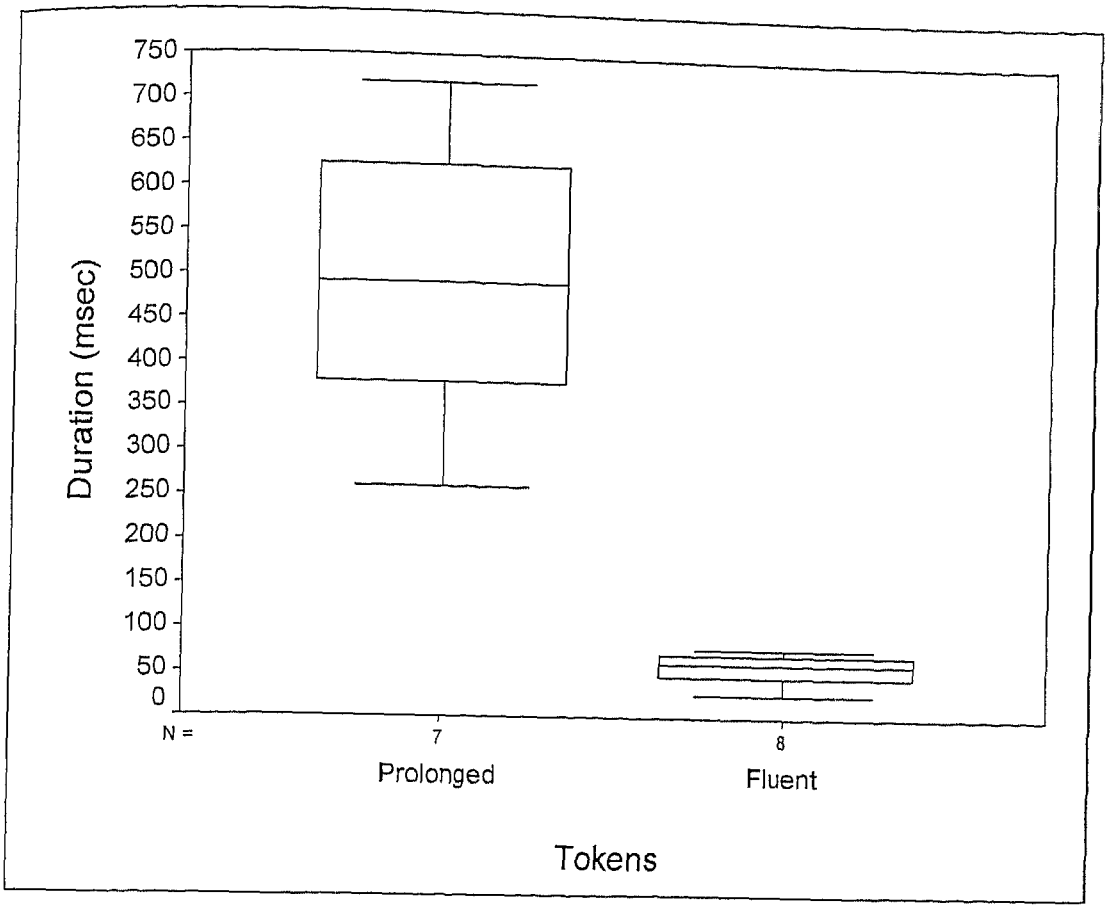

Figure 5.5

Boxplots Comparing the Durations of *to* Produced in Prolonged and Fluent Contexts

Apart from *the* and *to*, another word that was prolonged was *a* (5 occurrences). The duration of the prolonged *a* ranged from 247msec to 784msec, while the fluent tokens ranged from 54msec to 66msec as can be seen in Table 5.10. Again, similar to the other two words, *a* which was produced in prolonged contexts were much longer than those produced in fluent contexts, where prolonged *a* had a mean of 390msec, a median of 323msec, a mode of 247msec and a standard deviation of 223.5msec, while fluent *a* had

a mean of 60msec, a median of 60msec, a mode of 54msec and a standard deviation of 6msec.

Table 5.10

Durations (msec) of prolonged and fluent *a* in Possible-Repairs

Caller	Prolonged (msec)	Fluent (msec)
14	247 336	66
32	261	54 60
1	784	
4	323	

The other words that were perceived to be prolonged did not occur frequently enough for statistical analysis. However, based on the durations of the prolonged and fluent occurrences by the same speaker, the former appear to be considerably longer than the fluent ones as can be seen in Table 5.11.

Table 5.11

Durations (msec) of Prolonged Words Compared to Fluent Words in Possible-Repairs

Caller	Word	Prolonged (msec)	Fluent (msec)
7	*and*	441	144
15	*I've*	365 590	150 180
17	*then*	498	287
30	*I*	598	80

There were nine other instances of perceived prolongations that could not be measured against the same word in a fluent context as the speaker only used the word once.

5.3.1.3.1 Locations of Prolongations in Possible Repairs

The 20 prolongations that occurred without an editing phase in possible-repairs were also examined to determine if they occurred immediately before lexical or function words. Like filled and silent pauses, the raw scores indicate that they occurred more frequently before lexical words, with only one of the prolongations occurring before a function word. Since prolongations function like filled pauses, such a result is to be expected (see 5.3.1.1.1 and 5.3.1.2.1). Therefore, it appears that all the three forms of hesitations found in possible-repairs have a tendency to be produced immediately before lexical rather than function words, which once again suggests the possibility that the selection of the lexical words involves more complex cognitive processing compared to the selection of function words. As discussed in earlier in this chapter (see 5.3.1.2.1), this can be attributed to the lexical choices that are available to a speaker compared to the more restricted choice of function words.

5.4 Hesitations in Self-Repairs

Approximately 53% (126/239) of the self-repairs, had some form of hesitation. Similar to the types of hesitations found in possible-repairs, the hesitations found in self-repairs were either silent pauses, filled pauses, prolongations or a combination of these hesitations, as illustrated in the following examples.

C1
...**[most m*] IP :364** <u>**most men**</u>(REP) smell stink.

C2
[I'm calling from:](DEL) **IP** actually I'm driving.

C12
mostly **the: IP ah** <u>**mostly the:**</u>(INS) **IP** *bus sekolah* ((school bus)) student always throw the rubbish...

C52
whatever **[they] IP :251** <u>**whatever you**</u>(SUB) do...

Table 5.12 shows the breakdown of the different forms of hesitations used in each of the self-repairs.

Table 5.12

Hesitations in Self-Repairs

Repair Type (239)	SP only	Unlex FP only	LFP only	Unlex FP & LFP	Prol only	Other Comb	Total
Repeats (131)	11	2	0	0	49	18	**80 (61%)**
Deletions (53)	5	6	3	4	2	4	**24 (45%)**
Substitutions (36)	5	3	0	0	0	4	**12 (33%)**
Insertions (19)	5	4	1	0	0	0	**10 (53%)**
Total	26	15	4	4	51	26	**126 (53%)**

SP=Silent Pause; Unlex FP=unlexicalized filled pause; LFP=lexicalized filled pauses; Prol= Prolongations; Comb=combination. Number in parenthesis shows the total number of that particular item, except where % is indicated.

It can be seen from Table 5.12 that hesitations were present in 61% of repeats, 53% of insertions, 45% of deletions, and 33% of substitutions. However, if prolongations that

occurred as the only form of hesitation are not taken into account, given that they are produced before the interruption point (IP), then only about 31% (75/239) of the self-repairs actually had silent and/or filled pauses. The transition from the offset of the 'error' to the repair, without any hesitation in the editing phase, implies that in these instances the repair was ready for articulation at the point of interruption. This, in turn, supports the view that the detection of the 'error' and planning of the repair must have taken place before the interruption was made.

The analysis of the hesitation devices used in self-repairs shows that 29.2% (70/239) of the self-repairs had fragmented cut offs (see 2.9.1), such as in the following utterances from the data.

C8
I'm **[so f*] IP :126** **so funny**(REP) about the bell boy...

C26
do you mind **[let*] IP :236** **just letting**(INS) me to have a look at it?

This is another factor which appears to support prearticulatory error-detection and repair-planning. As pointed out in Chapter 2 (see 2.8.1), the presence of fragmented cut offs have been reported in other studies (Bear, Dowding & Shriberg, 1992; Levelt, 1983; Lickley, 1993; Nakatani and Hirschberg, 1994). The fact that speakers stop themselves mid-word or even as they begin the articulation of a word, suggests that the 'errors' in their utterance have been prearticulatorily detected. Following the Main Interruption Rule (see 2.7), upon error-detection, the signal to interrupt speech will be given, resulting in speech being halted soon after that.

5.4.1 Filled Pauses in Self-Repairs

An examination of the filled pauses used in self-repairs shows that the types of filled pauses found in self-repairs were the same as the ones that occurred in possible-repairs, that is *ah*, *ahm*, *er*, and *m*. Table 5.13 shows the number of occurrences of the types of unlexicalized filled pauses found in the data. Similar to possible-repairs, the most frequently used filled pauses were *ah* and *er*.

Table 5.13

Unlexicalized Filled Pauses in Self-Repairs

Repair Type (239)	***m***	***er***	***ahm***	***ah***
Repeats (131)	1	4	-	-
Deletions (53)		8	1	4
Substitutions (36)	1	-	-	5
Insertions (19)		2	2	1
Total	2	14	3	10

The lexicalized filled pauses used in self-repairs, that is, *you know*, *what you call it*, *I mean*, were also similar in both types of repairs, suggesting that these may be language-specific. In other words, different languages seem to have particular ways of vocalizing and verbalizing hesitation. As in possible-repairs, lexicalized filled pauses did not occur very frequently: only 10 self-repairs had a lexicalized filled pause, with half of them occurring after an unlexicalized filled pause and/or silent pause.

Filled pauses (including those in combination with silent pauses and/or prolongations) were found in only 14% (33/239) of the self repairs. This contrasts with possible-repairs, where they were found in 52.8% of the repairs. Although the percentage of filled pauses found in self-repairs is more than the 9.4% found by Nakatani and Hirschberg (1994), the figure still indicates that self-repairs tend to occur without filled pauses (see 3.5.2). The implication of this is that repairs were ready for articulation soon after the production of the 'error', once again pointing to the possibility of prearticulatory error-detection and repair-planning.

Further, as Table 5.14 shows, similar to Nakatani and Hirschberg (1994), filled pauses occurred more often in non-fragment repairs than fragment repairs (see 2.9.1.1.2). In fact, filled pauses that occurred as the only form of hesitation only occurred six times in fragment repairs (4 in deletions, 1 each in insertions and repeats). Examples of such occurrences are as follows:

C39
I told you *kasawari* is **IP er [i*]**(DEL) **IP ah what you call that** ostrich.

C67
[the b*] IP er <u>the <big</u>(REP)> breakfast

This could, as suggested but not confirmed, by Nakatani and Hirschberg (1994), be attributed to the possibility that the error had already been detected and corrected prior to its production in fragment repairs, and thus speakers did not need to use filled pauses to buy repair-planning time.

Table 5.14

Unlexicalized and Lexicalized Filled Pauses in Self-Repairs

Repair Types	After Fragment	After Non-Fragment	Total
Repeats (131)	1(34)	4 (97)	5 (131)
Deletions (53)	6(24)	10(29)	16 (53)
Substitutions (36)	0 (5)	7 (30)	7 (35)
Insertions (19)	1 (5)	4 (15)	5 (20)
Total	8 (68)	25 (171)	33 (239)

Figures in parenthesis indicate the total number of that item

5.4.2 Silent Pauses in Self-Repairs

As the only form of hesitation in the editing phase, silent pauses occurred in 17% (41) of the self-repairs compared to filled pauses, which were found in only 10% (24) of the self-repairs. This contrasts with possible-repairs, where silent pauses occurred only slightly less frequently than filled pauses (28% compared to 32%) as the only form of hesitation in the editing phase. Most of the silent pauses in self-repairs occurred in repeats, with 16 of them occurring immediately after the first token in a repeat (R1) that was prolonged. The higher frequency of silent pauses in self-repairs could be indicative of on-going cognitive activity, since silent pauses are linked to such activity as suggested by Goldman-Eisler (1961) (see 2.9.1.1.2).

An analysis of silent pauses that occurred as the only form of hesitation in self-repairs shows that, similar to filled pauses, only 26.9% (11/41) of these silent pauses occurred

after fragment repairs (7 in repeats, 3 in deletions and 1 in insertions). The following extracts show the occurrence of a silent pause after a fragment (C18) and non-fragment repair (C51).

C18
then **[I w*] IP :90 I was**(REP) shocked you know.

C51
....**[their make the] IP :73 they make the**(SUB) decisions also.

In other words, a speaker interrupts his speech in the midst of articulation but produces a repair immediately or soon after the interruption. As suggested previously in this chapter, the lack of pauses after fragments implies that both error-detection and repair-planning were done prearticulatorily.

The mean duration of all the 52 silent pauses that occurred in self-repairs was 328.2msec (compared to 471.3msec for possible-repairs), while the median was 271.5ms (compared to 414msec for possible-repairs). A total of 7 of the silent pauses were less than 100msec (compared to none in possible-repairs), while the longest pause duration was 1098msec (c.f. 1257msec for possible-repairs). The distribution of the duration of the silent pauses found in self-repairs is shown in Figure 5.6, which shows that the majority of the pauses (77%) were under 400msec. On the other hand, most of the pauses in possible-repairs (67%) were under 500msec (see Figure 5.3). Thus, on average, the duration of silent pauses in self-repairs was shorter than those in possible-repairs.

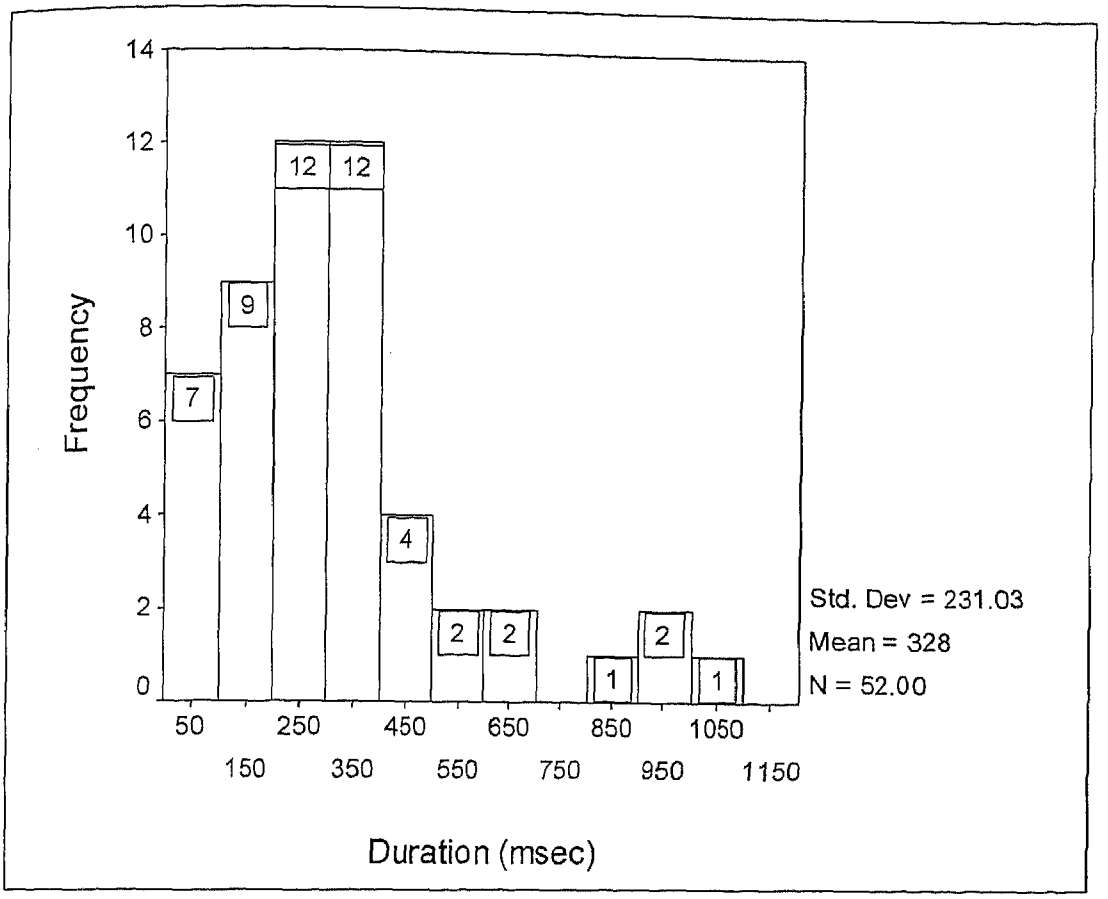

Figure 5.6

Frequency Distribution of Pause Duration in Self-Repairs

This difference in duration is illustrated in Figure 5.7, which compares the distribution of the duration of silent pauses in possible and self-repairs. It can be seen that most of the durations in self-repairs tend to be shorter that those in possible-repairs.

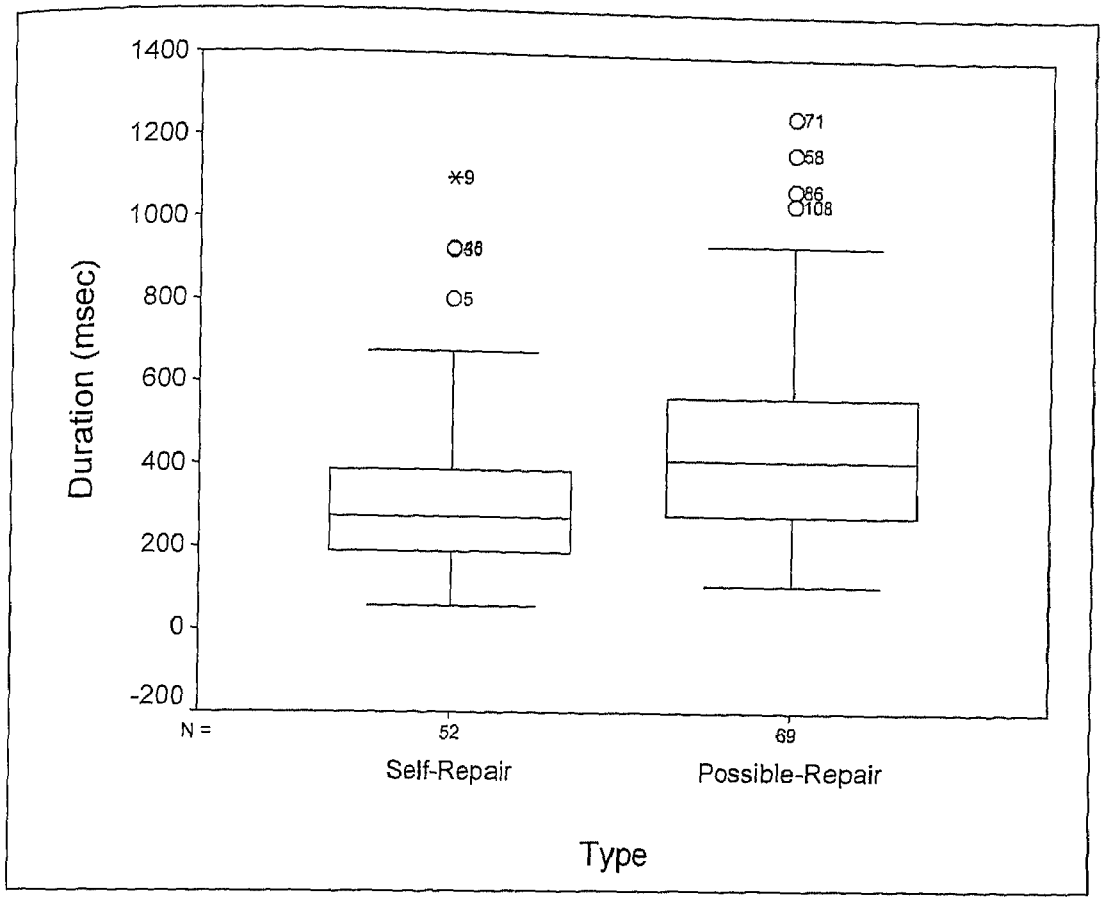

Figure 5.7

Boxplots Comparing the Durations of Silent Pauses in Self-Repairs and Possible-Repairs

A *Mann-Whitney U* test shows that there is a significant difference between the duration of the silent pauses in self-repairs and possible-repairs, $U(N_1 = 69, N_2 = 52) = 1121, p < .001$. If the presence of hesitation in possible-repairs is attributed to covert self-monitoring and repair-planning, the longer pause duration in these repairs could be due to this process taking place. The assumption here is that an error had been prearticulatorily detected, and is therefore, not overtly produced. The detection of an error causes speech production to be interrupted, and the utterance is also marked with hesitation, presumably to enable repair-planning to begin or continue. In contrast, the

shorter silent pause duration in self-repairs suggests that although the error had been produced in part or in total, repair-planning must have begun prior to interruption enabling the repair to be produced soon after the hesitation.

5.4.2.1 Silent Pauses After Fragments and Non-Fragments

Like filled pauses, silent pauses tended to occur more frequently in non-fragment repairs. In an analysis of the silent pauses that occurred as the only form of hesitation in self-repairs, only 26.9% (11) of these 41 silent pauses occurred after fragments (7 in repeats, 3 in deletions and 1 in insertions). Table 5.15 shows the mean, median and standard deviation of silent pauses after fragments and non-fragments, while Figures 5.8 and 5.9 show the frequency distributions of the silent pauses after fragments and after non-fragments respectively.

Table 5.15

Duration of Silent Pauses after Fragments and after Non-Fragments in Self-Repairs

Position of Silent Pause (SP)	Mean (msec)	Median(msec)	s.d. (msec)
SP after fragments (11)	202.3	185.0	104.0
SP after non-fragments (30)	385.2	311.6	227.6

Figures in parenthesis indicates total number of occurrences

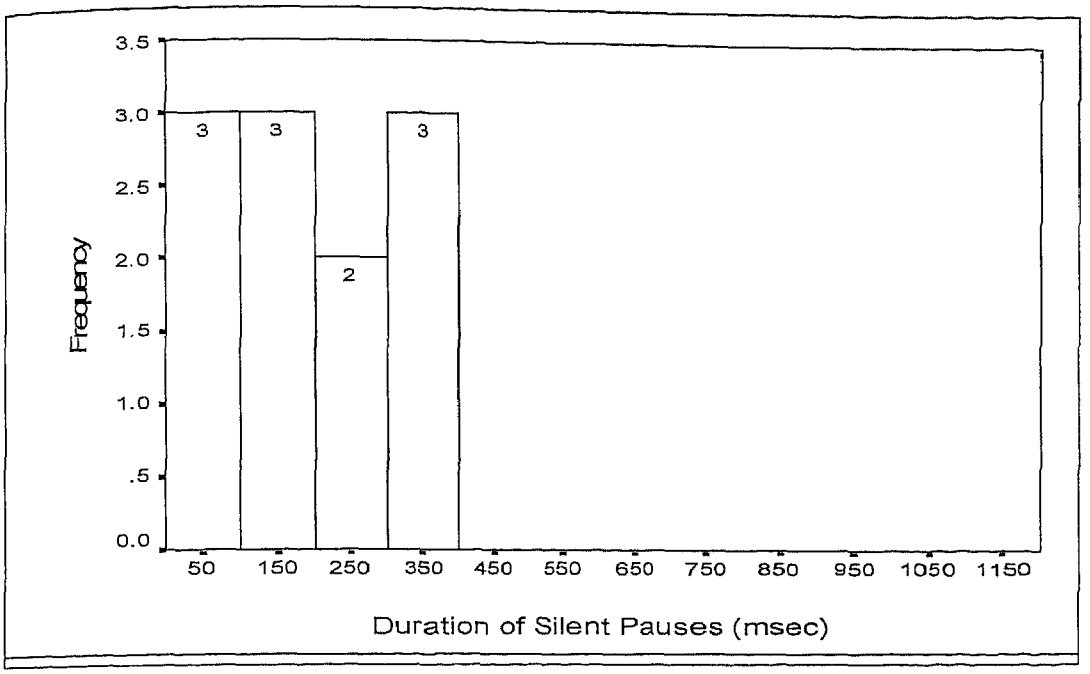

Figure 5.8

Duration of Silent Pauses After Fragments in Self-Repairs

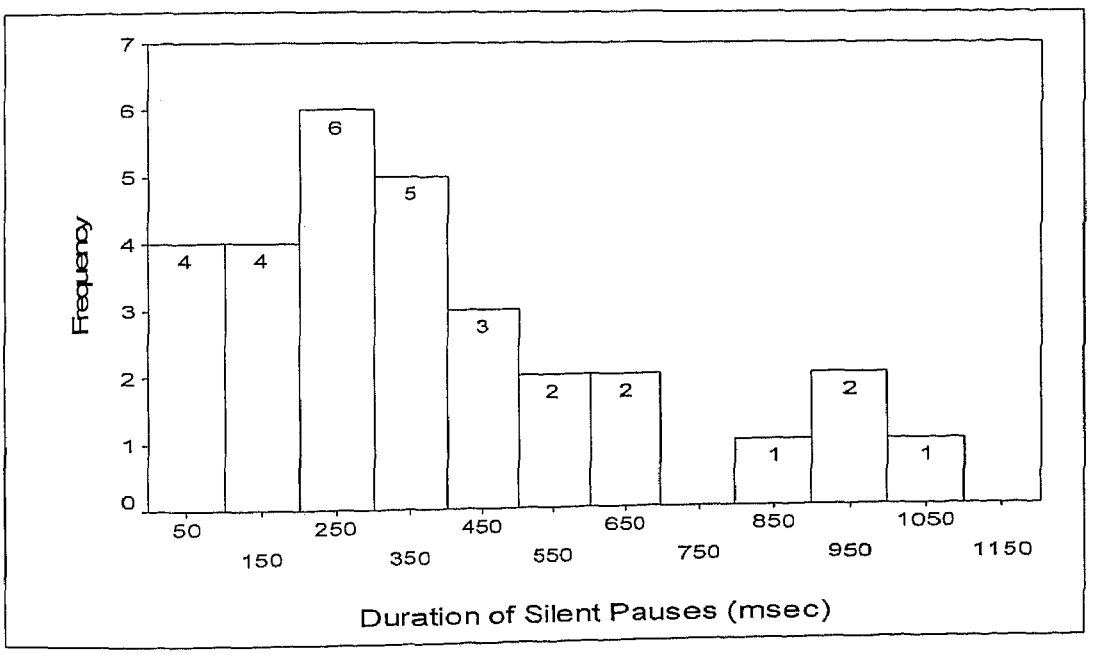

Figure 5.9

Duration of Silent Pauses After Non-Fragments in Self-Repairs

Figures 5.8 and 5.9 show that the distributions of the duration of silent pauses in both the groups are not normal. Most of the durations after non-fragments were 400msec and below, while all the durations after fragments were under 400msec. Figure 5.10 clearly shows that the durations after non-fragments were more spread out compared to the durations after fragments, which cluster around the shorter range.

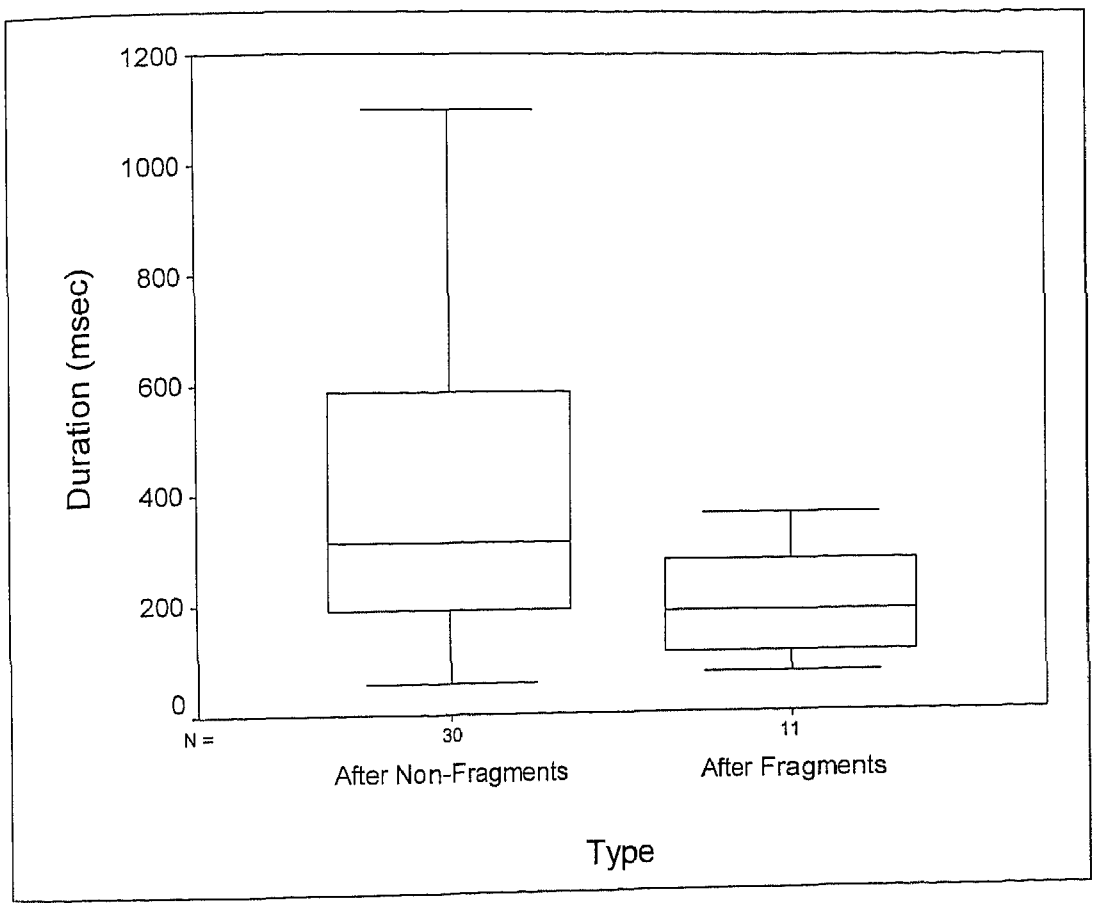

Figure 5.10

Boxplots Comparing the Durations of Silent Pauses after Fragments and after Non-Fragments in Self-Repairs

A *Mann-Whitney U* test shows that there is a significant difference between the durations of these silent pauses, U ($N_1 = 30$, $N_2 = 11$) = 98.5, $p < 0.05$. The implication of this difference in duration is that when speakers stop themselves mid-word, they

appear more likely to use shorter silent pauses, or go straight into the repair without using any filled pause or other forms of hesitation. One possible reason for this is that error-detection activates both the process of interrupting speech and the planning of the repair almost simultaneously, as suggested by Hartsuiker and Kolk (2001), since the decision to interrupt speech is followed by the repair almost immediately after the mid-word interruption (see 3.5.2.1).

5.4.3 Prolongations in Self-Repairs

Prolongations were the most commonly used form of hesitation in self-repairs, occurring in 51 of the 239 self-repairs as the only form of hesitation (see Table 5.12). The majority of the prolongations that were found in self-repairs were used in repeats (see Table 5.12), where about 50% of the words preceding the interruption point were found to be prolonged when compared to the words occurring in the repair. Prolongations in repeats will be dealt with in more detail in the next chapter.

Apart from repeats, only 5 other instances of prolongations were found in the other self-repairs: 4 in deletions and 1 in substitutions. Unlike repeats, where there were at least two token of the same word, no comparisons between the prolonged and fluent tokens could be made in the other self-repairs. However, these words were auditorily perceived to be prolonged and measurements of their durations (based on waveforms and spectrograms of the item), as presented in Table 5.16, show that they were longer than if produced in fluent contexts.

Table 5.16

Duration of Prolonged Tokens in Self-Repairs

Caller	Word	Duration (msec)
2	*from*	505
11	*the*	523
30	*I*	598
47	*I*	574
19	*to*	472

In general, prolongations were more likely to be followed by silent pauses than filled pauses. In repeats, there were only 2 instances, where a prolonged word was followed by filled pause compared to 15 instances when a silent pause followed it. In deletions, 2 of the 4 prolongations were followed by another form of hesitation: one by a silent pause and filled pause and the other by a silent pause. The prolongation in substitution was followed by a filled pause. This is similar to what was found in possible-repairs, where 30% of the prolongations (10/33) were followed by silent pauses, whereas only 9% (3/33) of them were followed by a filled pause.

The reason that prolongations are followed more frequently by silent rather than filled pauses could be related to the fact that, unlike silent pauses, they are a vocalized form of hesitation, like filled pauses (see 2.9.1.3.1). In such cases, an error could have been detected, but the repair may not have been ready for production, and hence, function like filled pauses, as suggested by Eklund (1999; 2001), Shriberg (2001); van Donzel and Koopmans-van Beinum (1996). Prolongations, therefore, buy time for speakers either to allow speech processing to continue and/or to hold on to their speaking turn. This might

explain why there was a tendency to use a different type of hesitation, hence the more frequent use of silent pauses.

An examination of prolongations also show that 72% of the prolongations in self-repairs, and 61% (20/33) of the ones in possible-repairs were not followed by an editing phase, which means that prolongations tend to occur on their own. This finding in self-repairs could be attributed to the fact that most of the prolongations occurred in repeats, which also can be regarded as another form of vocalized pausing device themselves. In such instances, hesitation is already being marked twice, by repeating a token and by prolonging the R1, making it less likely for another form of hesitation to be used, unless the speaker needs more repair-planning time. All this might explain why prolongations are, firstly, less likely to be followed by filled pauses, and secondly, by any other form of hesitation.

5.4.3.1 Prolongations in the Structure of Repairs

Perceiving prolongations as markers of hesitation can pose a problem in determining where it fits into the structure of repairs (see 2.9.1.3.1). This is because unlike silent and filled pauses, the prolonged segment is part of a word that contributes to the content of an utterance, which makes it difficult to consider it as part of the Editing Phase (see Figure 2.6). In some cases, the prolongation may be part of the erroneous part of the utterance and in others, especially in repeats, the prolongation may be the 'error' itself as shown in the following examples.

C2
[I'm calling from:](DEL) **IP** actually I'm driving.

C15
no [that's:] IP <u>that's</u>(REP) only for those who **IP** are ragging us and all that.

C50
...**ah [I:]**(DEL) **IP** this is P.

At the same time, prolongations act as a hesitation device, similar to filled pauses, hence the tendency for it not to be followed by filled pauses. However, a prolonged word, while signalling hesitation like filled and silent pauses, cannot be considered as part of the editing phase because unlike these pauses, it carries lexical meaning in the utterance concerned. If we take into account the dual function of prolongations, that is, as a marker of hesitation and as being part of the reparandum or the 'error' itself, prolongations have to be considered as part of the reparandum preceding the interruption point, and not part of the editing phase following the interruption point.

Thus, the offset of the prolonged word can be taken as the beginning of the interruption point, while the onset of the word following the end of the prolongation or silent and or filled pauses, if an editing phase is present, can be considered to be the beginning of the repair. Therefore, although prolongations are categorized as a type of hesitation, their position in the structure of self-repairs precedes the interruption point (IP), whereas silent and filled pauses follow the IP, as shown in Figure 5.11.

Table 5.17

Prolongations in the Structure of Self-Repairs

Reparandum/Error	**IP**	**(Editing Phase)**	**Repair**
... prolongation	**IP**	**(filled/silent pauses)**	**Repair**
I'm calling **from:**	IP		actually I'm driving
that's:	IP		that's ...
six **to:**	IP	erm	four to ...
I:	IP		this is P

5.5 Summary

This chapter has shown that similar to other studies, the same forms of hesitation devices were found in both possible-repairs and self-repairs, that is, silent pauses, filled pauses and prolongations. It was shown that there is a problem underlying the classification of prolongations as hesitation because they are content based unlike silent and filled pauses. Thus, prolongations were shown to differ from the other two forms of hesitation as they appeared to occur before, and not after, the interruption point. In relation to possible-repairs, all three hesitation devices occurred on their own or in various combinations without any overt evidence of errors and related repairs. Such occurrences of hesitation suggest the possibility of ongoing processes of self-monitoring and self-repair, even if there is no direct evidence of these processes. Due to the absence of auditorily overt evidence of errors and repairs, it is suggested that they be referred to as possible rather than covert repairs. In contrast, in cases where there was indication of self-repair, only about half of these had any form of hesitation. This strongly indicates that hesitation is not a necessary phenomenon in self-repairs. Speakers are capable of producing repairs without needing to buy time for producing the repair. This point is made even more salient considering that there was no editing phase in most fragment repairs. Thus, speakers cut themselves off mid-utterance and proceeded to produce the self-repair. If the cut off segment was the error, this also means that it is not a prerequisite to auditorily discern one's own error before being able to repair it. All these observations point towards the possibility of prearticulatory error-detection and repair-planning, and will be discussed in further in Chapter 7 in relation to error-to-cut off, cut off-to-repair and error-to-repair intervals.