A Performance Account for Medial Wh-Questions in Child English

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1. Introduction

In this study, we investigate children’s production of long distance wh-questions, such as (1).

(1) Who do you think [ Mary saw ___ ]?

In languages like English, this type of question involves movement of the wh-word from its base position to the matrix [Spec, CP]. However, in some other adult languages of the world, such as German, in addition to this possibility, one can also pronounce the wh-element in intermediate position, as shown in the examples below (example (2) taken from Hiemstra, 1986: 99 and example (3) taken from Klepp 2002: 111/112):

(2) Wen glaubst Du [ wen sie getroffen hat]? (Wh-copying)

   Who think you who she met has
   ‘Who do you think she met?’

(3) Was glaubte Miró [welches Bild Picasso t gemalt hatte]? (Partial wh-mov)

   What think Miró which Picture Picasso t painted had
   ‘Which Picture does Miró think that Picasso painted?’

In example (2), called "wh-copying", two identical wh-elements are produced, one in the intermediate [Spec, CP] and another one in the matrix [Spec, CP]. In structure (3), called "partial wh-movement", a wh-element appears in matrix [Spec, CP] and a different one appears in intermediate [Spec, CP]. In these structures, the wh-element in matrix [Spec, CP] is an unmarked wh-word, usually used to ask questions about propositions (like was in German - analogous to what in English), whereas the wh-element in intermediate [Spec, CP] can be any wh-phrase. Answers to the question always specify values for the embedded wh-element.

Studies on the acquisition of long distance wh-questions in a variety of languages have already been conducted. Thornton (1990), for example, elicited...
long-distance wh-questions from 20 children acquiring English between 2;10 and 5;5 years of age. All children interviewed produced long-distance wh-questions, such as ‘What do you think that bears like to eat?’ (Thornton 1990: 278, 279). However, in addition to structures such as this one, some of the children produced structures that are not found in the target language: precisely questions with a wh-word in intermediate position:

(4) a. Who do you think who's in the box?
    b. What do you think who's in that can?

Other studies in child English have found the same behavior (see Thornton 1995, de Villiers et al. 1990, McDaniel, Chiu, Maxfield 1995, among others). Other languages have also been investigated and the same pattern of behavior is found: children are successful in producing long-distance wh-questions, but in some of their productions, questions with a wh-element in intermediate position are produced (for Dutch, see Van Kampen 1997; Jakubowicz & Strik 2008, for Spanish, see Gutierrez 2006, and for French, see Oiry 2006, Jakubowicz & Strik 2008, Demirdache & Oiry 2008, inter alia).²

This uniform pattern of behavior of children acquiring different languages can be analyzed in several ways. Although such structures are not present in the input to these children, they are possible in some languages of the world, such as German and Hindi, as shown above. This means that these structures are available in Universal Grammar. Therefore, it can be hypothesized (as most researchers working in the field do) that children go through a stage of linguistic development in which these structures are generated by their grammars. We will call this type of proposal ‘non-target grammar’ accounts.

Another possibility for analyzing for such productions, which is what this research has proposed to investigate, is to postulate that they are not generated by children's grammars but are due to cognitive difficulties that arise in structures with long distance dependencies. According to this hypothesis, to be detailed in section 3 below, the production of medial wh-questions results from children’s difficulty in inhibiting the pronunciation of items with a high activation level in the structure. That is, it is a proposal that differs from those mentioned above because it does not recognize such productions as due to an immature grammar. We will call this proposal the ‘target-grammar + inhibition difficulties’ account. In the following section, we detail the problems faced by the ‘non-target grammar’ accounts. In section 3, our proposal is exposed in detail. In section 4, we bring some evidence to this analysis. In section 5, our experimental study is presented. Section 6 is the discussion. Finally, section 7 concludes the paper.

² We will refer to children’s productions as ‘medial questions’. Questions found in adult languages, such as in German and Hindi, will be referred to as wh-copy or partial wh-movement.
2. Problems Faced by ‘Non-Target Grammar’ Accounts

The vast majority of studies on wh-questions in children's languages postulate that medial wh-questions reflect a period of grammatical development in which such questions are actually generated by children's grammar. These analyses are based on the fact that questions with two wh-elements are found in several adult languages, such as German, Frisian, Hindi, Afrikaans, etc. Children's behavior would therefore be a stage on the way to adult language. In general, the evidence used as support for these analyses are children's medial productions themselves and independent evidence is not available.

McDaniel, Chiu & Maxfield (1995), for example, propose that adult grammars that allow wh-copying and partial wh-movement do not have [pred] feature (Rizzi (1990)), which differentiates [Spec, CP] in relative clauses from other [Spec, CPs]. Children would be born with the parameter set in this value and later, if they are acquiring a language like English, they change to the value that provides a grammar that includes the [pred] feature. This would be the explanation of how children stop producing such medial questions. This hypothesis predicts that children with this parameter setting should produce high rates of medial questions. However, as we shall see later, children who produce medial questions do not produce them at high rates.

Another proposal is put forth by Thornton (1990), who observes that different lexical forms express agreement in C⁰ in English, depending on the construction. In the case of subject long-distance wh-questions, such agreement must be expressed by a null element (cf., *who do you think ___/*that fell?). In the case of direct object wh-questions, both null C⁰ and 'that' are possible (cf., *what do you think (that) Mary bought ___?). In the case of relative clauses, 'that' is mandatory in subject relatives, but optional in object relatives (cf., *this is [the man *___/that fell]', *this is [the man (that) I saw ___]*).

Given this complexity of possible forms in C⁰, Thornton proposes that wh-elements appearing in medial position in wh-questions are in C⁰ and not in intermediate [Spec, CP] and indicate the child's attempt to fill this position to express agreement. The problem is that they still do not know which lexical items express such agreement and end up inserting items like wh-words and wh-phrases in that position. Although this analysis could account for the English data, it could not be extended to languages like Brazilian Portuguese, where intermediate C⁰ is always filled by the open complementizer ‘que’ ('that'), both in embedded sentences selected by verbs like ‘achar’ (‘think’), and in relative clauses. That is, in languages like this, it is not possible to explain the production of medial questions as being due to the delay in the acquisition of forms of agreement of the complementizer.

A third analysis, by Roeper and de Villiers (2011), proposes that children blindly obey the locality principle which, in the case of long-distance wh-questions, requires that wh-words be moved, pronounced and/or interpreted at the edge of the first phase (that is, in the embedded [Spec, CP] and not in matrix [Spec, CP]). However, in adult grammar, this principle is not always
satisfied, since wh-movement must occur up to the matrix [Spec, CP] as required by formal features present in the intermediate [Spec, CP] that force the wh-word to keep moving. It is only when children reach complete knowledge about such formal features (involving point of view) that they cease to blindly apply the locality principle. This proposal predicts that children who have not yet acquired the relevant formal features should produce only medial wh-questions, since the locality principle would require the pronunciation of the wh-word in intermediate [Spec, CP]. However, as pointed out above, this is not what is observed in the data.

One aspect that we find worrisome about these ‘non-target grammar’ accounts is the fact that they take the existence of wh-copying and partial wh-movement in adult languages as sufficient argument in favor of their analyses. The problem is that there is no consensus in the literature for a unifying analysis for wh-copying and partial wh-movement in different adult languages. For some authors, the relationship between the two wh-elements present in the question is direct (for example, the features of the element in the subordinate [Spec, CP] move to matrix [Spec, CP] and are spelled out as a neutral word, as was in German, see Barbiers et al., 2008; Cheng 2000; Hiemstra 1986; Sabel 1998, among others). Other authors have argued that the relationship between them is indirect (for example, Dayal 1994 argues that was is generated as the object of the matrix verb and moves to matrix [Spec, CP]. The wh-word in embedded [Spec, CP] originates in the embedded clause and there is no relationship between the two, as two distinct chains would be formed).

The whole discussion in the literature of these languages makes it clear that it is not possible to account for the variability in adult languages in this domain with a single parameter. Most likely, there is an interaction of specific rules of particular languages working together to give rise to the different profiles found. If it is not possible to explain this phenomenon in different languages with a single parameter setting, then it should not be possible to unify what is observed in children's languages as being due to a single aspect of children's grammar either.

Finally, we note that if medial constructions reflected children’s grammatical knowledge as such theories propose, these constructions would be expected to respect the constraints to which such constructions are subject in adult languages. However, this is not the case. Thornton (1995) notes that the children in her study produced structures that are not possible in adult languages, such as questions with a wh-phrase in matrix [Spec, CP] (e.g., which animal do you think what really says 'woof woof?'). In McDaniel et al.’s study, the children who accepted medial questions accepted them in infinitives, something that is not possible in the adult languages that have wh-copying and partial wh-movement. In de Villiers, Roeper & Vainikka (1990)’s study, children interpreted both finite and infinitive sentences as medial constructions.
3. A ‘Target Grammar + Inhibition Difficulties’ Account

These data from different child languages indicate that children’s productions do not conform to any adult language studied so far, leading us to pursue a distinct approach. Our proposal does not analyze children’s medial productions as due to their developing grammars. Such productions do not necessarily correspond to the output of any particular language. They would be due to difficulties in other cognitive processes involved in sentence production. Children's grammars would be on target with respect to wh-questions. Our proposal is that wh-words are pronounced in two different places in the structure because children have difficulty inhibiting the pronunciation of items with a high level of activation during the process of sentence production.

This proposal attempts to relate two facts that are independently reported in the literature, namely, the production of medial questions and individual differences in children's inhibition control capacities, which have never been related before. In order to appreciate our proposal, let us consider first the processes involved in sentence production and then aspects of inhibition control.

In what follows, we assume Dell (1986)'s spreading activation model for sentence production, which postulates that items that will enter the derivation are selected among those with high level of activation. Dell's theory has an explanation for cases of slips of the tongue, which, as we shall propose, have similarity to the phenomenon of children's medial questions.

Slips of the tongue are pronunciation errors, such as 'blue bug' pronounced as 'blue blug' or 'beef noodle' pronounced 'beef needle'. Dell notes that there is no error in any of the processes involved in sentence production in the case of slips of the tongue. They are natural consequences of the theory. A slip occurs when a wrong item is more active than the correct one and is selected. However, for this wrong item to be selected, it must be a member of the same category as the correct item: Words can only replace words, roots replace roots, prefixes replace prefixes, and so on.

In addition to being able to involve different units (words, morphemes, sounds), lapses may be of different types. Some errors, called syntagmatic or contextual errors, involve elements that will be pronounced, but end up being pronounced in places other than the original. Non-contextual errors involve the pronunciation of items that should not be in the structure.

Dell’s work does not address wh-questions, but we can formulate an analysis for these cases based on his theory. In long-distance wh-questions, the wh-word has a high level of activation and is pronounced in first position. After being pronounced, it cannot have its activation level diminished, since it will be needed later to establish a relation with the verb of the embedded clause (what do you think [that Mary bought <what>]). With its high level of activation, it may end up being pronounced twice, in a kind of perseveration error. The wh-word would not be pronounced at random locations of the structure, but in positions where wh-words (or their features) belong, such as embedded [Spec, CP] or in situ. As seen above with slips of the tongue, segments and words can be pronounced in exchanged places, but they are always places where they are
allowed in the language. In the case of wh-words, we know that they can appear superficially in places such as their thematic position, in embedded [Spec, CP] selected by verbs like know and in matrix [Spec, CP]. That is, the medial questions would be a type of slip of the tongue.

However, this high level of activation does not cause adults to make such an error. Our next discussion, then, should answer the following question: Why do only children make this mistake? The answer lies in the difference between children and adults regarding their executive control capacities, more specifically, inhibition control, which is discussed next.

Inhibition control is one of the executive functions of the brain. Diamond (2013) notes that it is inhibition control that allows us, for example, to control attention, behavior, thoughts, and emotions to ignore an internal predisposition or an external distraction, and instead do what is most appropriate or necessary.

Focusing specifically on cognitive inhibition control, Harnishfeger (1995) defines inhibition control as the process of actively suppressing previously activated cognitive processes or content. Items to be inhibited enter into working memory, are evaluated as irrelevant to the objectives of the process tasks, and are then marked as irrelevant in the working memory and suppressed from future attempts of recall. The executive functions of children (including inhibition control) are not fully developed until adolescence. In inhibition control tasks reported in the literature, rates near 100% of accuracy are reached only by the age of 20 years.

Considering that: (i) the processes involved in sentence production involve inhibition control, and (ii) children present difficulties in several inhibition control tests, the hypothesis to be tested in this study is that children produce medial wh-questions because they are not able to inhibit the tendency to pronounce the wh-element (or its features) with a high level of activation in medial position.

4. Evidence

The difficulty in inhibiting the pronunciation of items with high level of activation occurs not only in the case of long-distance wh-questions but also in other cases of long-distance dependencies, such as the production of NP resumptives in relative clauses (such as ‘I choose the girl that the dog is licking the girl’) and in topic-comment constructions (such as ‘this ring, I want to get this ring’). The corresponding adult languages do not make productive use of resumptive NPs, but this type of element is commonly found in children’s productions (Botwinik, Bshara & Armon-Lotem 2015; Labelle 1990, 1995; inter alia). It is possible that they are pronounced in their base position because of their high level of activation.

In English, the production of double auxiliary questions (such as ‘does it doesn’t move?’ or ‘why did you did scare me?’, from Stromswold 1990) can also be considered an instantiation of the phenomenon analyzed here. Hiramatsu (2003) found out that children produced 2Aux questions in a production
experiment, but did not judge them grammatical in grammaticality judgment task. Our proposal would analyze 2Aux questions as being due to difficulties with executive control and not to children’s grammar. Similarly to what Hiramatsu found, we predict that children who produce medial questions will not judge them grammatical.

5. Experimental Study

Given the discussion above, the purpose of our study was to investigate the production of long-distance wh-questions in child English. Our working hypothesis is that there is a relationship between children's inhibition control capacities and the production of medial questions. This hypothesis predicts that children with more limited inhibition control will tend to produce more medial constructions than those with more inhibition control capacities.

In order to test this hypothesis, 4 experiments were conducted: (a) a linguistic experiment, designed to elicit wh-questions and detect the children who would produce medial questions; (b) a motor inhibition control test; (c) a cognitive inhibition control test; (d) a motor ability test, conducted to observe the success rate of children in a task not related to language or inhibition control.

The literature in the area of child executive control presents a wide variety of tests to measure their inhibition control capacities. However, studies investigating the relationship between inhibition and language are rare. Thus, we could not rely on the literature to define which tests would be most appropriate to test our hypothesis. That is the reason why we decided to conduct two inhibition tests, a motor one and a cognitive one. The motor inhibition test was chosen because it has clear developmental effects (Davidson et al (2006)). The cognitive inhibition test was chosen because it requires a task that resembles the one performed in the case of long-distance wh-questions, namely participants must inhibit the pronunciation of an item with a high level of activation.

This battery of tests was divided into two parts and applied on two different days for each child. On the first day of testing, the language test was applied and lasted an average of 20 minutes. After a few days, the other three tests were applied in one session, which lasted on average 10 minutes. In what follows, we present the four tests.

5.1. Methods

Linguistic Experiment. The method was an elicited production task adapted from Thornton (1990). Children watched videos on an iPad while a puppet was hidden and could not see the video. After the 30 second video was finished, the puppet appeared and the child was encouraged to ask him questions about events that had taken place in the story. As an illustration, let's take a look at the procedure for a session with the children:
(5) Experimenter (whispering): We know that the boys cut the rope using scissors, but Snuggle doesn’t know that's how they did it. Ask him how he thinks!
Child: How do you think the boys cut the rope?
Puppet: With their teeth!
Child: Wrong!

The materials were 18 wh-questions elicited from each child: 6 were subject wh-questions, 6 were object wh-questions and 6 were adverb wh-questions (3 with 'where' and 3 with 'how').

**Experiment on Motor Inhibition Control (Inhibition Test 1).** The experiment was conducted following Davidson et al. (2006)’s procedure. The test was applied on a Sony Vaio laptop, using the PsychoPy2 platform (Peirce 2009) for stimulus presentation and recording responses. Participants pressed keys on the laptop keyboard, depending on the position of a stimulus on the screen.

The experiment had three conditions. The ‘congruent’ condition involved pressing the key that was on the same side as the stimulus on the computer screen. No inhibition control is required, since the required behavior is exactly the one that matches the predominant response (responding on the same side of the stimulus). The task was explained as follows: "we are going to see a heart on the screen. It can appear on this side (show right side) or on this side (show left side). You must press the key on the same side where it appears (shows the screen and the button on the same side)". Prior to test application, items for familiarization appeared on the screen. After the child performed 4 of these items correctly, the test started. When the child pressed one of the keys (regardless of whether it was correct or not), the stimulus disappeared and a new one was presented. If the child did not press any key, the stimulus would disappear after 2500 ms (time used in the study by Davidson et al (2006)).

The ‘incongruent’ condition measured children’s inhibition capacity, since they have to inhibit the tendency to press the key on the same side as the image appears. The instructions were presented as follows: "Now we will see a flower on the screen. When you see the flower, press the key on the opposite side (showing opposite keys and sides on the screen)". Familiarization items were presented and occurred until the child performed 4 items correctly.

Davidson et al. note that participants respond faster and more often correctly when the stimulus and response are on the same side as when they are on opposite sides. This is called the 'Simon effect', which signals the tendency to respond on the same side of the stimulus. Given that the incongruent task requires subjects to go against this tendency, it involves inhibition control.

Finally, in the third 'mixed' condition, half of the stimuli were hearts and half were flowers, which appeared on the screen in random order. This condition was the most challenging one, since inhibition has to be activated in only half of the items (flowers). According to Davidson et al, the task of activating and reactivating inhibition in some items and not in others is more difficult than maintaining inhibition all the time. Alternate paradigms like this one aim to test
the ability to change from one mental state to another in a flexible way. It overloads both working memory and inhibition. Subjects cannot 'turn on automatic' and do the same thing because periodically they have to change.

The materials were: 12 congruent items (hearts), 12 incongruent items (flowers) and 16 mixed items (8 hearts and 8 flowers). We measured the percentage of correct answers in each condition.

Experiment on Cognitive Inhibition Control (Inhibition Test 2). The method was a task of naming objects, applied following the method presented in Kipp & Poppe (1997). The child is asked to name objects seen in a children's book. In the first part of the 2-minute test, the child is told that she should not name distracting items, which in our case were animals. If an animal were pointed out in the book, the child should not name it. S/he should name all other things pointed out, such as people, vehicles, plants, etc. In the second part of the test, also lasting 2 minutes, the child could name all the items pointed out, including animals. Before starting the test, a 30-second training session was applied to teach children the task and make them comfortable.

In this task, the child should consciously inhibit the tendency to pronounce the names of the animals s/he sees in the book. The words that cannot be named have a high level of activation since the child sees the corresponding pictures in the book and probably names them internally. We chose this task because we hypothesized that the inhibition required here bears some resemblance to the inhibition required in the case of long-distance wh-questions. The only difference is that, in the case of questions, the inhibition of words with a high level of activation is not conscious. In the case of the naming of objects from the book, it is a conscious activity, since this is the rule of the game that the child has to follow.

We observed if the child pronounced the distractors in the first and second parts of the test.3

Motor Control Experiment. We follow the method used in Carlson & Moses (2001). A children's piano keyboard with 4 colored keys is shown to the child. The experimenter touches each key in sequence and repeats it one more time. The child is asked to do as the experimenter, making the sequence for 10 seconds as fast as s/he can. We measured the number of correct sequences completed in 10 seconds, without touching the same key twice or skipping a key. The success rate in this task must be independent of the behavior in the

3 In Kipp & Poppe (1997)'s study, the number of items named in the first and second parts of the test was measured and then subtracted from each other to arrive at a 'score'. Initially, we also measured the number of named items in each phase of the test, but we soon realized that such a measure was not reliable. Children presented very different rhythms in the activity, which resulted in great variability in the number of named items per subject. To get a clearer view of the data, we therefore decided to measure only which children would name the distractors in the first phase and which would not.
other tests. The goal is to show that children who failed the inhibition tests did not do so due to a global problem in performing tasks.

5.2. Results

Subjects. 32 children between 3;7 and 6;2 years of age, with mean age of 4;8. All children are native speakers of English. They were interviewed at the Center for Young Children, a preschool located at the University of Maryland.

Linguistic experiment. The method for eliciting questions proved quite efficient. All children interviewed produced long-distance wh-questions, even the youngest ones. 39 medial wh-questions were produced. Most of them were subject questions (29 out of 39). 5 were object questions and 5 were adjunct questions. Some examples are shown below:

(6) a. Which kid do you think who got him out of the water? (AL, 6;0)
   b. What do you think where the girl was walking? (SZ, 4;7)
   c. Who do you think who kissed the boy? (MM, 4;0)

Inhibition task 1. The table below shows the average of correct answers for the total group of children for each of the three conditions:

<table>
<thead>
<tr>
<th>Condition</th>
<th>% correct (standard error)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congruent</td>
<td>82% (3.92)</td>
</tr>
<tr>
<td>Incongruent</td>
<td>66.4% (5.13)</td>
</tr>
<tr>
<td>Mixed</td>
<td>58% (3.81)</td>
</tr>
</tbody>
</table>

Compatible with what was found by Davidson et al (2006), the congruent condition had the highest rate of correct responses, followed by the incongruent condition, followed by the mixed condition.

Separating the participants into two groups, we have 14 children who produced medial questions (‘medial group’, ranging in age from 3;8 to 6;0) and 18 who did not (‘non-medial group’). Graph 1 shows their rates of correct responses for each of the three conditions. In general, the medial group had lower rates of correct responses on the 3 conditions, although only the rates for the 'incongruent' condition were reliably different (two-tailed T-test: p = 0.0453).5

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4 At the moment, we do not have an analysis for why medial wh-questions would be more common in subject extractions than object or adjunct extractions. We leave this puzzle for future research.

5 A 2x3 ANOVA did not yield an interaction between group and condition. We suspect that this is due to a lack of power. A larger sample is currently being collected.
Inhibition test 2. The results for the object naming test are presented in the contingency table below:

Table 2. Object naming task vs. Wh-question production task

<table>
<thead>
<tr>
<th>Produced Medial Questions?</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Named the distractor?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>9</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>No</td>
<td>5</td>
<td>14</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>18</td>
<td>32</td>
</tr>
</tbody>
</table>

Nine children produced medial questions and named distracting objects in the first part of inhibition test 2. Five children produced medial questions but did not name distracting objects in the first part of the test. Of the children who did not produce medial questions, 4 named the distracting objects and 14 did not. These differences are statistically reliable (two-tailed Fisher's exact test, p = 0.0293). Despite the relatively small number of participants, we can observe that children who did not produce medial questions tend not to name 'forbidden' objects in the naming test. The ones that produced medial questions are those that tend to pronounce the distractors.

Motor test. Children in the medial group had an average of 1.76 correct sequences performed in 10 seconds. The non-medial group had 2.77 correct sequences. The difference between the groups is not statistically significant, as we predicted. This suggests that the children who produced medial questions do not behave homogeneously in relation to other activities that do not involve inhibition control or language.

6. Discussion

Our results show that the production of medial questions is not confined to a specific age group. The phenomenon is observed in some children, but not in
others. This fact supports our hypothesis that the production of medial questions is not a behavior to be found in all children, but only in those with more limited inhibition capacity. It is also important to note that the children who produced medial questions did not produce them 100% of the time. On average, each child produced 2.7 medial questions, out of a total of 18 questions produced by each child.

If such productions are like slips of the tongue, which reflect a lower capacity for inhibition control, we expect to find such behavior only in a portion of the children, namely, those who showed lower capacity in the inhibition tests, as our results suggest. We do not expect such children to produce 100% of medial questions, however. Medial questions will arise sporadically in cases of more difficult processing.

Let us now discuss how the production of the wh-word in medial position would arise. Consider the productions below:

(7)  
a. **Who** do you think **who** was chasing the boys? (ER, 4;6)  
b. **Which kid** do you think **who** got him out of the water? (AL, 6;0)  
c. **What** do you think **where** the girl was walking? (SZ, 4;7)

In (7)a, identical copies of the wh-word are pronounced in the two [Spec, CP]s. The high level of activation of 'who' causes the child to repeat this item in intermediate [Spec, CP]. As we mentioned above, intermediate [Spec, CP] is a position where wh-words can be pronounced, as in the case of indirect questions (eg, I do not know who Mary invited). Therefore, the presence of a wh-word in this position does not violate any UG restriction in this respect.

Remember that in cases of slips of the tongue discussed by Dell, words, morphemes and sounds can be pronounced a second time in cases classified as perseveration errors (e.g. ‘blue bug’ being pronounced as ‘blue blug’). Dell points out that the elements are always pronounced in positions that are legitimate. In this example, /l/, in 'blug', is pronounced in the same position as it occurred in the first word, the second position of a complex onset. This position is legitimate for such element in English. In the case of the medial questions, the wh-words occur in positions that are licit for them, in a similar way.

In addition to cases in which the word or sound is repeated, Dell also presents cases in which only features of phonemes are exchanged, as in the example ‘clear blue’ being pronounced ‘glear plue’, in which the initial consonant of ‘clear’ has its voicing feature changed from [- voiced] to [+ voiced]. ‘Blue’, in contrast, has the voicing feature on the initial consonant changed from [+ voiced] to [- voiced]. Cases like these would be similar to those in (7)b, where the wh-word pronounced in the intermediate [Spec, CP] is not an identical copy of the wh-phrase in matrix [Spec, CP], but keeps its [+ WH] and [+ human] features.

Another type of slip of the tongue observed is what Dell calls non-contextual errors and a particular case is substitution, as in ‘pass the pepper’ being pronounced ‘pass the salt’. In these cases, the activation of 'salt' is due to
its semantic relation to 'pepper', since they are items of related semantic fields. We analyze cases like (7)c in the same way. 'What' and 'where' are both interrogative words and the activation of one of them may increase the activation level of the other, although one of them should not be in the derivation. With a high level of activation, the incorrect wh-word may end up being pronounced in a case of non-contextual error.

7. Conclusion

The sentences that children produce reflect both their grammatical knowledge and properties of the production mechanisms that deploy this knowledge. When children produce sentences that are distinct from those of the language around them, it is important to properly diagnose the source of these errors. Are they due to grammatical structure or to the extralinguistic cognitive mechanisms that are engaged in a given act of speaking? Answering this question makes it possible to further specify the developmental processes that lead to these errors and those that will allow children to eliminate them from their productions. In this paper, we have argued that in the case of medial wh-questions, children's behavior is best understood as being caused not by their having acquired a grammar different from their community, but rather by the interaction of correct grammatical knowledge with an immature production system. Specifically, we have shown that the inhibitory processes associated with executive function are causally connected to children's errors in this domain. This finding relieves us of the burden of explaining (a) how children acquired a grammar distinct from their community and (b) what factors lead them to reanalyze the grammar. Instead, an explanation of development in this domain will require a more precise formulation of the role of inhibition and executive function in sentence production and the path of development that these mechanisms undergo.

References


