Derivational Complexity Effects in L2 Acquisition

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1. Introduction

Questions involving long-distance (LD) wh- movement, as in (1), have received significant attention in L1 acquisition (Thornton, 1990; van Kampen, 1997; Oiry & Demirdache, 2006; Gutierrez, 2004a, 2004b; Jakubowicz & Strik, 2008), and more recently in L2 acquisition (Wakabayashi & Okawara, 2003; Yamane, 2003; Gutierrez, 2005; Schulz, 2006).

(1) What$_i$ do you think t_i Mary is eating t_i?

It is commonly assumed that in such questions the wh- phrase goes through several intermediate steps in the derivation before raising to the left periphery of the matrix clause (Chomsky, 1981, 2001, 2005, among others). From an acquisition point of view, two interesting issues that arise are how language learners handle the complexity of moving a wh- element in intermediate steps and whether they resort to alternative, potentially less complex constructions, before they have fully acquired LD wh- movement.

The purpose of this article is to investigate the acquisition of complex wh- questions in L2 English from the perspective of the *Derivational Complexity Hypothesis* (Jakubowicz, 2004, 2005; Jakubowicz & Strik, 2008). While this hypothesis has previously been used only in L1 acquisition, I demonstrate that it also has strong potential in the L2 field. I argue that the DCH is particularly appealing because of its ability to make predictions about a wide range of constructions that may be attested in the context of a LD wh- movement production task. In what follows, I describe the DCH and review its predictions with regards to complex wh- questions. Then I report on a study designed to elicit spoken LD wh- questions from L2 English learners whose L1 is (Canadian) French or Bulgarian. I discuss the results in terms of the DCH and show that L2 learners resort to a variety of derivationally less complex alternatives to LD wh- movement which I call avoidance strategies.

2. The derivational complexity hypothesis

2.1. Background

Jakubowicz (2004, 2005) and Jakubowicz and Strik (2008) propose that language acquisition is affected by developmental and processing constraints such as working memory and the computational complexity of a given derivation. In essence, they argue that less complex derivations are correctly spelled out or pronounced before more complex ones (Jakubowicz and Strik, 2008: 106). In other words, all other things being equal, derivations that are less complex appear earlier in language development. The authors propose that derivational complexity can be measured by the metric illustrated in (2).

(2) Derivational Complexity Metric (DCM)
A. Merging α_i n times gives rise to a less complex derivation than merging α_i (n + 1) times.

* Many thanks are due to Nina Kazanina, Juana Liceras, María Luisa Rivero, Galina Dukova-Zheleva and the GALANA4 audience for useful feedback.

B. Internal Merge of α gives rise to a less complex derivation than Internal Merge of α+β. (Jakubowicz & Strik, 2008)

The above formulation states that the language learner is sensitive to the number of times a wh-element will be moved through the derivation and thus utterances with fewer (successive) applications of wh- movement will be preferred initially. Furthermore, the learner is also predicted to initially find derivations with movement of one element easier than derivations with movement of more than one element. Testing of the derivational complexity metric is still in its early stages but some acquisition studies have offered evidence for the validity of the metric (see Jakubowicz & Strik, 2008; Strik, 2009; Jakubowicz, to appear; Prévost et al., 2010, a.o.).

While the DCH was conceived in the context of child L1 acquisition, Jakubowicz and Strik (2008) indicate that the same principles apply in the context of L2 learning. Although the literature on processing and working memory constraints in L2 acquisition is relatively limited, some studies investigating such issues have appeared in recent years. For example, Schulz (2006) examined potential processing and working memory effects in relation to non-target wh- scope marking constructions in the L2 English of Japanese and German adult speakers. Juffs (2004) suggested that working memory effects may play a role in the online English L2 processing by Korean, Japanese and Spanish speakers. Wright (2010a&b) looked at wh- constructions and argued that working memory constraints play a significant role in the L2 acquisition process. Processing and working memory considerations are also a central concern in the emergentist framework and it is argued that they apply in similar ways in both L1 and L2 acquisition (see O'Grady, 2009, among others). Overall, while the exact role of working memory capacity and processing considerations in L2 acquisition is still not understood well, there is enough evidence that such considerations do have an impact. As such, extending the testing of the derivational complexity hypothesis to the L2 field is warranted and indeed a desired avenue of exploration.

The particular appeal of the DCH in the context of this article is that it is able to juxtapose complex wh- questions with a wide range of alternative productions and discuss them in terms of relative acquisition difficulty. Specific examples of some potential alternatives that are less complex than questions with LD wh- movement are provided below.

2.2. Predictions

Based on the derivational complexity metric, we can predict that biclausal questions involving long-distance wh- movement are more complex than monoclausal questions involving single wh-movement. This should not be surprising, considering that biclausal questions are typically longer than monoclausal ones. However, the DCM also allows for comparisons between questions of equivalent length. That is, biclausal wh- questions with long-distance wh- movement, as in (3), are predicted to be more complex than biclausal wh- questions with only short wh- movement, as in (4).

(3) What do you think Mary is eating?

(4) Do you know what Mary is eating?

The sentence in (3) involves a wh- phrase that originated in object position in the embedded clause and subsequently moved long-distance to the left periphery of the matrix clause. On the other hand, in the embedded question construction in (4) the wh- object has moved only locally, to the left periphery of the embedded clause. Since the former construction involves LD wh- movement and the latter only short wh- movement, the DCM stipulates that the former has higher derivational complexity than the latter.

It is also possible to compare wh- questions with yes/no questions in terms of derivational complexity. As shown in (5)-(8), this can be done with both monoclausal and biclausal pairs of

questions, matched for relative length.[1] According to the DCM, in each pair the former structure is considered more complex as it involves wh- movement. That is, all other things being equal, wh- questions are predicted to be more difficult to acquire than yes/no questions because the latter involve less movement.

(5) What is Mary eating?

(6) Is Mary eating pizza?

(7) What do you think Mary is eating?

(8) Do you think Mary is eating pizza?

Two other potential alternatives to target LD wh- movement include wh- scope marking, as in (9), and wh- copying, as in (10).[2]

(9) *What do you think where Mary is eating?

(10) *Where do you think where Mary is eating?

While such constructions are ungrammatical in English, they are licensed in other natural languages (e.g., German). Furthermore, such utterances have been attested in previous studies on the acquisition of English as L1 (Thornton, 1990) and L2 (Wakabayashi & Okawara, 2003; Yamane, 2003; Schulz, 2006). If we assume that the wh- scope marker 'what' in (9) is inserted in the left periphery of the matrix clause, and the wh- word 'where' in the embedded clause has moved only locally, this derivation should be considered less complex than target LD wh- movement, where the wh- phrase has moved through both clauses (Jakubowicz & Strik, 2008). In (10), on the other hand, LD wh- movement has taken place, but since a wh- copy appears in an intermediate position, it can be argued that the derivation is also somewhat less complex than target wh- movement with deletion of all intermediate copies (Jakubowicz & Strik, 2008). That is, it is assumed that the spell-out of an overt intermediate copy, a 'bridge,' or a filled gap, makes the derivation simpler.

3. The study

3.1. Research questions, hypotheses, and L1s

Consistent with the idea that derivational complexity may affect acquisition, the following research questions and hypotheses were formulated.

R1. Does the derivational complexity of a given utterance have impact on its L2 acquisition status?
R2. In a production context where questions with LD wh- movement are required, do L2 learners of English whose first language is (Canadian) French or Bulgarian resort to alternative productions with lower degree of derivational complexity?

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[1] An anonymous reviewer raises the question whether learners would be expected to commit more errors in the case of complex sentences in comparison with simple ones. According to the current formulation of the DCM, complexity is measured in terms of application of movement (i.e., long, short or no movement) and number of elements moved (i.e., move α, move α+β , and so on). Thus, complexity is not presented by the number of clauses in a sentence *per se*; nonetheless, in most cases a biclausal sentence would also involve more movement and more errors would be expected. This aspect was not specifically tested in the present study where the elicitation technique targeted complex wh- questions. However, the fact that some of the elicited responses (see section 3.3 below) involved simple questions offers some evidence that monoclausal structures are sometimes preferred.

[2] I use the term *medial wh-* to refer to both wh- copying and wh- scope marking. The term capitalizes on the similarity of the two constructions (i.e., a wh- word appearing in an intermediate position). Note that this term is used differently by Thornton (1990).

R3. Do L2 learners produce constructions which are not part of the L1 grammar or the L2 input, but are attested in other, typologically distinct languages?

With regards to R1, the DCH predicts that complex wh- questions would pose difficulty in the acquisition of L2 English, due to the successive cyclical application of wh- movement in such structures and the associated high degree of derivational complexity. Turning to R2, the DCH was conceived in the context of L1 acquisition and makes no explicit predictions about L2 learners and the potential effects of different L1 backgrounds. However, since complexity is measured by the number of movements, the DCH is expected to apply across the board; that is, similar derivational complexity effects are expected in L2 English from learners with different L1 backgrounds and both groups of participants in this study are predicted to resort to alternative constructions of lower derivational complexity. It is important to point out that the two groups of L2 participants (French speakers and Bulgarian speakers) were specifically chosen to represent typologically distinct L1 backgrounds so as to allow comparison of derivational complexity effects based on completely different L1s. Finally, with regards to R3, different types of medial wh- constructions were expected, based on the data available from previous L2 research. However, such constructions generally occur at low rates and only in limited subsets of participants, and thus their presence in the current study was also predicted to be relatively limited.

Before proceeding with more details on the participants and the methodology of the study, I will briefly outline the relevant properties of the learners' L1s with regards to complex wh- questions. French uses both wh- movement and wh- *in situ* mechanisms for question formation. In addition, complex wh- questions can also be formed by using the so called wh- + *ESK* construction, as in (11), and cleft structures, as in (12).

(11) Qui est-ce que tu penses qui lit des histoires?
who is it that you think that reads stories
'Who do you think is reading stories?'

(12) Tu dis que c'estoù que Marie va?
you say that it is where that Marie goes?
'Where is it that you say Mary is going?' (Jakubowicz & Strik, 2008)

Turning to Bulgarian, its system of complex wh- question formation is similar to English. That is, Bulgarian uses exclusively LD wh- movement, as in (13). However, despite having the same basic wh-movement mechanism, Bulgarian differs radically from English in that it licenses multiple wh-fronting, as in (14). That is, in the case of several wh- phrases, English raises only one to the left periphery while Bulgarian allows for several wh- elements to move to sentence-initial position.

(13) Koj misliš (če) Ivan e celunal?
who think.2sg (that) Ivan has kissed
'Who do you think (that) Ivan has kissed?'

(14) Koj, kâde, (koga) misliš (če) Ivan e celunal?
who where (when) think.2sg (that) Ivan has kissed
'Who do you think (that) Ivan has kissed where (and when)?'

To summarize, with regards to wh- question formation, both French and Bulgarian overlap with English in some respects and differ in others. This makes for potentially interesting transfer effects, in addition to the derivational complexity considerations discussed earlier.

3.2. Participants and Methodology

The number of participants in this study was 66, of which 26 were French speakers, 30 were Bulgarian speakers and 10 were English native controls. The French-speaking participants were enrolled in a summer immersion ESL program in Ottawa, Canada. Their age ranged from 15 to 18 years old (M=17) and they had had between 5 and 12 years of ESL instruction prior to testing. The Bulgarian-speaking participants were enrolled in an EFL program at Sofia University in Bulgaria. Their age ranged from 18 to 40 years old (M=24) and they had had between 5 and 20 years of EFL instruction prior to testing. Both groups were placed at the lower-intermediate level by written proficiency tests administered in their respective programs.[3] It should be noted that the Bulgarian participants were learning English in structured classroom environment and had little exposure to everyday spoken English. Thus, it was anticipated that their oral proficiency would be somewhat lower.

All learners were given a language background questionnaire designed to collect relevant demographic information, including questions about multiple L1s, parents' L1s, languages spoken at home, level of exposure to English, etc. The experimental task of the study was elicited production in the form of a guessing game. Such tasks have become standard in the L1 and L2 acquisition literature on LD wh- movement since Thornton (1990). The current experiment used a magnetic board with a hand-drawn picture of a house, and a set of magnets involving different characters, food, drinks and reading materials, as illustrated in figures one and two, respectively.

Figure 1. Elicited production task: magnetic board.

[3] Independent proficiency measures were not administered due to logistical considerations.

Figure 2. Elicited production task: magnets.

The participants met one-on-one with the researcher and were instructed to place the magnetic board on a stand in front of them, so that the researcher could not see it. The game involved different situations in which the characters were placed in different rooms and engaged in different activities (e.g., eat, drink, sleep, watch TV, talk on the phone, kiss someone, etc.). The participants were instructed to make the researcher guess where the particular characters were, and in what activities they were engaged in each situation (e.g., *What do you think John is eating/drinking/reading, etc.?)*.

The task involved 15 different situations (i.e., 15 complex wh- utterances were targeted). The targeted structures included object (what, who) and adjunct (where) wh- extractions.[4] All interviews were recorded digitally and all elicited questions were transcribed. Incomplete utterances were excluded from the analysis unless they were followed by spontaneous self-corrections, in which case only the self-corrected version was taken into account.[5]

3.3. Results

The main purpose of the English native control group was to ensure that the elicited production task did create a context in which LD wh- questions were the most appropriate utterance. The native speakers produced such questions consistently and with minimum variation (a total of 165 questions were elicited). Several participants occasionally produced a simple wh- question (e.g., *Where is John?*) or an imperative with an embedded wh- clause (e.g., *Guess where John is*), instead of a complex wh- question (e.g., *Where do you think John is?*). Following such utterances, some of these participants spontaneously self-corrected and produced a complex wh- question. Overall, however, the variation was very low and 94% of the total utterances in this group were target LD wh- questions; thus, the native speakers provided a steady baseline for comparison with the L2 learners and confirmed that the task did create a context which requires complex wh- questions.

The group of 26 English L2 learners whose L1 was French produced a total of 311 questions of which 260 (84%) were biclausal and 51 (16%) were monoclausal (8 fragments and incomprehensible utterances were excluded). As expected, the L2 learners showed a much higher degree of variation in

[4] Subject extractions were not targeted as such structures do not show non-target inversion in the second clause. This point will become relevant in the results section below.

[5] There were also two cases where learners completed a whole utterance and then self-corrected. In these cases both utterances were included because they were considered two independent full responses representing a learner grammar. This is only a minor point, since the overall percentages of the distribution of responses remained unaffected by the inclusion of these two extra utterances.

the types of questions produced. The total productions divided by type are shown in figure three. Examples of each type of production will be provided later in this section.

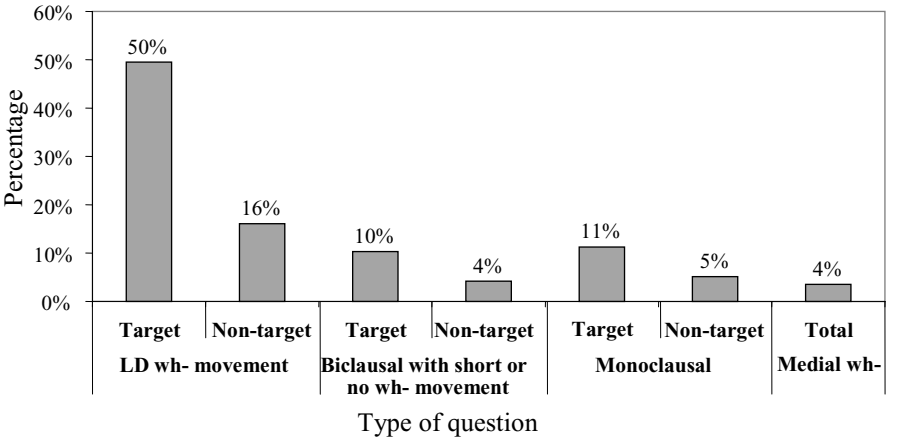

Figure 3. Total productions by type: French speakers, n=26, (total of 311 questions).

As indicated in figure three, four major categories of productions were identified: LD wh-movement (i.e., complex wh- questions); biclausal structures with local wh- movement or no wh-movement altogether; monoclausal (i.e., simple) questions; and medial wh- constructions. [6] Within each of these categories, the productions were further subdivided into target and non-target, except for the medial wh- category (see discussion below). Morphological, lexical, aspectual, etc., errors were not considered relevant, and thus, sentences with incorrect agreement, word choice, etc., were still classified as target. On the other hand, sentences with syntactic errors pertaining to inversion, *do support*, word order or complementation were designated as non-target.

The category containing LD wh- movement (both target and non-target) accounts for 66% of the total productions of this group. The remaining 34% represent constructions of lower derivational complexity where wh- movement is shortened, eliminated, or 'bridged' by an overt intermediate wh-element. Recall that the situations set up in the elicitation task were designed to create a strong bias for LD wh- movement. The native speaker control group performed as expected and consistently produced complex wh- questions. The fact that the L2 learners in this group also produced complex wh-questions most of the time suggests that they were aware on some level of the type of question most appropriate in the context of the elicited production task; at the same time, the fact that they also resorted to a number of alternative, derivationally simpler utterances, is a strong indication that LD wh- movement poses difficulty and is thus often avoided at this level of acquisition process.

Examples of productions from each of the four categories and their subcategories are provided below, beginning with target complex wh- questions, as in (15).

(15) <u>Target LD wh- movement (50% of all productions)</u>

a. What do you think she's reading?	(participant FR 24)
b. What do you think he drinks?	(participant FR 10)
c. Where do you think the newspaper are?	(participant FR 1)

The non-target LD wh- movement structures included missing *do support* in the matrix clause, incorrect subject auxiliary inversion (T-to-C movement) in the embedded clause and missing auxiliary *be* in the embedded clause, as in (16)a,b and c, respectively.

[6] The purpose of figure three is to provide a general picture of the results and categorize the utterances offered by the entire population of L2 learners. Analysis of the variability of the productions is not pursued here.

(16) Non-target LD wh- movement (16% of all productions)
a. Where you think the book is? (participant FR 3)
b. Where do you think is John? (participant FR 18)
c. Who do you think Mary call?[7] (participant FR 8)

Despite the fact that these productions are non-target, they still show a high degree of derivational complexity as LD wh- movement has taken place. Thus, such examples cannot be considered avoidance strategies.

Turning to the different LD wh- movement avoidance strategies, target biclausal utterances involving only local or no wh- movement are shown in (17).

(17) Target biclausal with short or no wh- movement (10% of all productions)
a. Do you know who buy eggs? (participant FR 2)
b. What do you think about the place I put the newspaper? (participant FR 2)
c. Do you think John's watching TV in the bedroom? (participant FR 19)

In terms of the DCM, all these productions are derivationally less complex than LD wh- movement. The example in (17)a is a matrix yes/no question with an embedded wh- question; as such, it involves only short wh- movement in the second clause. The example in (17)b, on the other hand, contains a wh- question in the matrix clause and a prepositional phrase complement as a second clause; thus, it involves wh- movement only within the matrix clause.[8] Finally, (17)c is a biclausal yes/no question with no wh- movement altogether.

The next category of avoidance strategies includes non-target biclausal structures with short or no wh- movement, as in (18).

(18) Non-target biclausal with short or no wh- movement (4% of all productions)
a. What do you think is Joanne or Christine Silvia call? (participant FR 18)
b. You think it's who go to the search butter? (participant FR 3)
c. You watch TV and you drink what? (participant FR 13)

In addition to having only local wh- movement or no wh- movement altogether, these productions show structural errors, such as incorrect object-subject word order, as in (18)a, a wh- cleft construction, as in (18)b, and *wh- in situ*, as in (18)c. The latter two are cases of transfer from the learners' L1, as wh- clefts and *wh- in situ* are both question formation strategies used in French. In the case of the former, it is less clear if the word order error is also due to transfer from a cleft question in French, or whether the learner is attempting a focalized structure, which could potentially be grammatical in English (e.g., *Is it Joanne or Christine that Silvia is calling?*). Overall, some of these productions may be the result of L1 transfer but are nonetheless classified as avoidance strategies because they also shorten or eliminate LD wh- movement (see further discussion below).

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[7] The intended utterance in this case was *Who do you think Mary is calling?*

[8] An anonymous reviewer raises the question whether this example belongs in this category of productions as it contains a relative clause, which could involve extra wh- movement. However, even if a movement analysis of the relative clause is adopted, it would still be only local and thus the sentence belongs in the category defined in (17). A further issue that arises is whether two local wh- movements should be considered more or less complex than one LD wh- movement. While the DCM does not make a clear prediction in this case, there is preliminary evidence that LD wh- movement is more complex. Dukova-Zheleva (2011) observes that native speakers of Bulgarian rate sentences with two short wh- movements as more acceptable than sentences with LD wh- movement, even though both constructions are grammatical in Bulgarian. Whether such findings can be replicated for other languages and whether they can be extrapolated to acquisition remains to be explored by future research.

The next category of alternatives to LD wh- illustrated in figure three involves monoclausal questions. Examples of target and non-target productions from this category are listed in (19) and (20), respectively. As illustrated, the non-target category involved errors with placement of the auxiliary *be.*

(19) Target monoclausal (11 % of all productions)
a. What food does she eat? (participant FR 3)
b. According to you, who is outdoor the house? (participant FR 5)

(20) Non-target monoclausal (5% of all productions)
a. Who John is kissing? (participant FR 17)

Monoclausal wh- questions are a derivationally less complex alternative to the LD wh- movement structures required in the elicitation task and as such represent avoidance strategies. The example in (19)b is particularly interesting because phrases such as *according to you* or *in your opinion* obviate the need to use the matrix clause *what/who do you think* as in complex wh- questions. That is, such phrases help avoid LD wh- movement and at the same time amount to a near-equivalent utterance to the target *Who do you think is outside the house?*. As such, this example demonstrates high creativity in LD wh- movement avoidance.

The last category illustrated in figure three includes medial wh- utterances. Examples of such productions are listed in (21). These consist of wh- copying, as in (21)a, and wh- scope marking, as in (21)b,c and d.

(21) Medial wh- (4% of all productions)
a. Who do you think who sent the butter? (participant FR 10)
b. What do you think where he watch TV? (participant FR 2)
c. What do you think where is Mary? (participant FR 18)
d. What do you think who is the person that John kiss? (participant FR 18)
e. [Ø] Do you think where is Mary? (participant FR 19)

It is important to point out that the productions in (21)c and (21)d contain subject-auxiliary inversion in the second clause. Thus, it could be that the learners were postulating two separate local wh- movements, as in sequential questions, which are licensed in English (*What do you think? ... Where is Mary?).* Alternatively, these utterances could still be analysed as wh- copying or wh- scope marking, respectively, assuming that the L2 learners who produced them sometimes over-invert in the embedded clause. Since the current study did not include an independent measure of the L2 participants' knowledge of inversion in English, it is impossible to decide which of the two representations should be assumed. Regardless of whether these utterances are examples of medial wh- or of sequential questions, they still represent derivationally less complex alternatives to target LD wh- movement in English, as defined by the DCM and discussed earlier. Thus, they are also classified as avoidance strategies.

Finally, consider the example in (21)e, which has a wh- word appearing in medial position, but no wh- word in the matrix clause. Essentially, this is a variation of the scope marking medial wh- structure, except the scope marker in the matrix clause is assumed to be unpronounced (marked as [Ø] above). Such questions are ungrammatical in L2 English but exist in other, typologically distinct, languages such as Bahasa Indonesia, Quechua and Kitharaka (see Saddy, 1991; Cole & Hermon, 1994; and Muriungi, 2004; respectively). Furthermore, such structures have also been reported in child L1 French (Oiry & Demirdache, 2006; Jakubowicz & Strik, 2008) and in adult L2 English (Wakabayashi & Okawara, 2003). Just as wh- scope marking with an overt wh- word appearing in the matrix clause, silent scope marking is also derivationally less complex than LD wh- movement, as per the DCM.[9]

Overall, the French speaking group showed a sufficiently high number of productions containing LD wh- movement (66%), showing that these learners can make use of it in L2 English. At the same

[9] Only one silent scope marking construction was attested in the French L1 group. However, equivalent utterances were produced at a higher rate by the Bulgarian participants.

time, unlike the native speaker control group, the French speaking participants also produced a wide variety of alternative productions with lower derivational complexity (34%). This indicates that LD wh- movement does pose difficulty and the learners frequently resorted to its avoidance.

The second group of participants, the Bulgarian speakers of L2 English, showed a similar pattern to the French speakers. They produced 416 questions in total, of which 331 (79%) were biclausal and 85 (21%) were monoclausal (9 fragments or incomprehensible productions were excluded). As figure four indicates, the utterances were also grouped by number of clauses, length of wh- movement and presence of medial wh-.

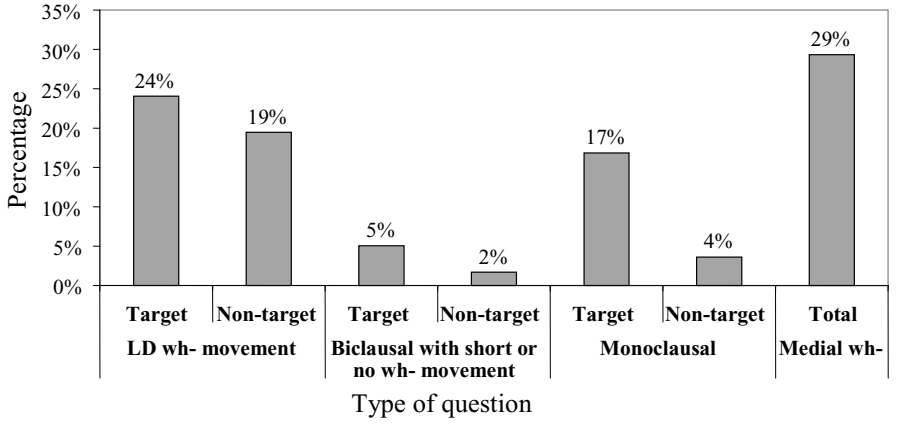

Figure 4. Total productions by type: Bulgarian speakers, n=30, (total of 416 questions).

As mentioned earlier, due to the nature of the acquisition setting, it was assumed that the Bulgarian participants were at a slightly lower level than the French group. This is confirmed by the fact that the total rate of utterances with LD wh- movement in the Bulgarian group is lower (43%), and the overall rate of the alternative productions (57%) is higher than in the French group (66% and 34%, respectively). A logistic regression revealed that these differences are significant ($p>0.0001$).

In terms of types of utterances, however, the Bulgarian group patterned very closely with the French speakers. Examples of the four major categories and their subcategories are listed in (22)-(28) below.

(22) Target LD wh- movement (24% of all productions)
a. Where do you think John is? (participant BG 7)

(23) Non-target LD wh- movement (19% of all productions)
a. Where you think John is? (participant BG 2)
b. Where do you think is she watching TV? (participant BG 5)
c. What do you think Silvia eating? (participant BG 9)

(24) Target biclausal with short or no wh- movement (5% of all productions)
a. Do you know where John is now? (participant BG 4)
b. Do you think John is at the kitchen? (participant BG 11)
c. What do you think does John like Silvia? (participant BG 1)
d. What do you think if John put a glass of water in the fridge? (participant BG 12)

(25) Non-target biclausal with short or no wh- movement (2% of all productions)
a. Do you know where is the newspaper? (participant BG 3)
b. What do you think John is kissing which? (participant BG 18)

(26) Target monoclausal (17 % of all productions)
a. Where is he? (participant BG 24)
b. Who did you go to the shop? (participant BG 21)
c. Does Silvia like pizza? (participant BG 7)

(27) Non-target monoclausal (4 % of all productions)
a. Who John is kissing? (participant BG 22)
b. What Silvia read? (participant BG 16)

(28) Medial wh- (29% of all productions)
a. What do you think what he's doing now? (participant BG 1)
b. Where do you think where John is watching TV? (participant BG 18)
c. What do you think who did Mary sent to buy some eggs? (participant BG 4)
d. What do you think where is John now? (participant BG 12)
e. What do you think who John kissing? (participant BG 22)
f. [Ø] Do you think who Mary sent to buy eggs? (participant BG 16)

As these examples illustrate, the types of complex wh- productions and LD wh- movement avoidance strategies attested in the Bulgarian group are very similar to the ones produced by the French speaking participants listed earlier in (15)-(21).[10]

Overall, the picture that emerges from the results of the two groups of learners is one in which both populations can use the target LD wh- movement mechanism with some success, but both also resort to a wide variety of avoidance strategies. The types of avoidance strategies across the two populations are remarkably similar. The rates of the different productions, on the other hand, differ in that the French speakers show a higher rate of LD wh- movement and of biclausal structures in general. Conversely, the Bulgarian participants show a higher rate in the use of avoidance strategies, particularly monoclausal structures and medial wh- structures. Individual results are not presented in this article but it is worth mentioning that the amount of utterances containing long-distance wh-movement and the types of avoidance strategies varied considerably at the individual level in both learner groups. Both populations had several participants who were able to use predominately long-distance wh- movement questions on the one hand, and several who used predominantly avoidance strategies on the other (further details on the individual results are provided in Slavkov, 2009).

3.4. Discussion

Overall, the results of this study generate support for the application of the derivational complexity hypothesis in L2 acquisition. The data showed that producing complex wh- questions poses difficulty in L2 English and thus the two learner populations resorted to a wide variety of alternative structures, which had a lower degree of derivational complexity and were called avoidance strategies. These included biclausal structures with local or no wh- movement, monoclausal structures with local or no wh- movement, and medial wh- structures. It is important to point out that even though the term strategy may imply a conscious choice, the avoidance structures discussed here are viewed as natural or spontaneous productions rather than premeditated responses.

In terms of the issue of L1 transfer, it was mentioned earlier that French and Bulgarian use the LD wh- movement mechanism in complex question formation. Thus, it is logical to assume that positive transfer, that is, transfer accounting for target-like L2 behaviour, played a role in the production of LD wh- movement constructions in the study. Recall that such constructions amounted to 66% for the French speakers and 43% for the Bulgarian speakers. On the other hand, negative transfer, that is,

[10] The number of medial wh- utterances in the Bulgarian group is significantly higher than in the French group. There is reason to believe, however, that this difference is misleading because a large number of the medial wh-utterances in the Bulgarian group can be analysed as sequential questions (i.e., two independent clauses with local movement). This issue is not discussed here in any more detail due to space considerations but see Slavkov (2009) for more details.

transfer of structures that are not licensed in the L2, seemed to play limited role in both groups. Structures with multiple wh- fronting were not attested in the L2 English of the Bulgarian speakers, despite their availability in the L1. Wh- cleft structures and *wh- in situ*, which are licensed in French in addition to LD wh- movement, were attested in the productions of the French speakers but their rates were very low (less than 4%).[11] In fact, *wh- in situ* was also attested in the Bulgarian group (less than 2%), despite the unavailability of such constructions in the L1 of these participants. Thus, it can be argued that *wh- in situ* appears not only because of L1 transfer but also because it is a derivationally less complex option (i.e., no wh- movement).[12] Overall, the data indicate that LD wh- movement avoidance strategies are less likely to result from L1 transfer than from derivational complexity effects.

With regards to constructions that cannot be accounted for in terms of either L1 transfer or L2 input, different types of medial wh- structures were attested in both L2 populations. The rates of such structures were quite limited in the French speaking group (4%). The Bulgarian participates had a seemingly higher rate of such productions (29%); however, as mentioned earlier, if such constructions are analysed as sequential wh- questions (i.e., What do you think?...Where is John?) their percentage would be comparable to the French group (see Slavkov, 2009, for a more detailed discussion of this issue).

Regardless of the low rates, medial wh- structures still pose an interesting acquisition question. That is, why do certain L2 learners resort to constructions not supported by the L1 or the L2 grammar, but available in other languages, of which they report no knowledge? The DCH assumes that such constructions may alleviate working memory load as they provide an overt intermediate "bridge" or a filled gap between the two clauses of a complex sentence. At the same time, it can also be argued that the underlying abstract grammatical competence of the L2 learners leads them to hypothesize that such constructions are in principle possible in the target language, despite the lack of any relevant L2 input or L1 influence. Within the framework of the DCH, such constructions are expected to appear at low rates because they are just one possible option of LD wh- movement avoidance. In fact, some of the other options, such as embedded wh- questions, yes/no questions, etc., must be viewed as more viable and more likely avoidance strategies, as they are licensed in both the L1s and the L2 of the two groups of participants and as such, there is relevant input for such constructions.

The approach adopted in this article assumes a tight relationship between grammatical processing and competence in L2 acquisition. On the one hand, the L2 development of complex wh- questions must be influenced by abstract grammatical principles operating in the L1 and the L2 and possibly extending beyond them. Such abstract principles must guide L2 learners in developing structures that correspond to the target grammar as well as structures that may deviate from the target grammar but are consistent with the options of the languages of the world; the latter being only a temporary deviation that presumably self-corrects with enough target input (see Schulz, 2006, among others, for discussion of the role of indirect negative evidence with regards to complex wh- questions). On the other hand, L2 development cannot be guided by grammatical principles only. It interacts with the learner's L2 processing resources, which are presumably more limited in the initial stages of acquisition and increase as acquisition progresses. Thus, LD wh- movement avoidance strategies result from pressures placed on the L2 learner by both their developing L2 grammatical competence and the gradual increase in their L2 processing resources. Note that such a close-knit relationship between grammar and processing has been assumed by previous literature, not necessarily concerned with acquisition (e.g., Phillips, 1996, a.o.).

4. Conclusion

This study represents a first attempt at applying the derivational complexity hypothesis to L2 acquisition. Overall, the results are promising in the sense that the hypothesis provides an explanation

[11] However, as an anonymous reviewer points out, it should be acknowledged that the distribution of *wh- in situ* in long-distance contexts is limited.

[12] In this article I abstract from the issue of why a higher percentage of *wh- in situ* utterances were not attested, considering that under the derivational complexity hypothesis such utterances might be expected to occur at higher rates. Possible explanations of this phenomenon are proposed by Strik (2009) and Jakubowicz (to appear).

for the otherwise unaccounted for variability in alternative productions to LD wh- movement. However, the DCH needs further development and empirical testing in the L2 field. For example, the current formulation of the hypothesis offers a general metric by which different structures can be classified in terms of relative complexity. This metric, however, does not offer specific predictions about exactly which types of productions should be expected at any given stage of acquisition. In addition, it is possible that the DCH needs to take into account not only movement, but other relevant derivational processes such as feature checking, agreement, etc., in computing complexity, and subsequently acquisition effects. Despite these challenges, pursuing the DCH has the potential of generating new insights in the study of L2 acquisition.

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