DOUBLING GRAMMARS:

Mandarin-English and Spanish-English Bilingual Children and
the So-Called Auxiliary Inversion Conundrum

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Abstract

In an increasingly multicultural society, understanding the process of multilingual acquisition is essential to building positive language ideologies. The overall linguistic goal of this study is to model how the natural acquisition of language(s) leads to the creation of multiple mental Grammars in multilingual children. In particular, we want to look at how the first language (L1) affects the subsequent acquisition of English within the natural acquisition window (open until adolescence). Park's (2011) Person Feature Auxiliary Movement (PFAM) Hypothesis claims that non-target productions of Auxiliary Inversion in questions for Korean-English bilingual children are the result of the ongoing stage-driven acquisition process of the PERSON feature and the particular *Spell-Out* conditions of the C-head in clausal structure. In this article, spontaneous speech of Mandarin-English and Spanish-English bilingual children was collected from eight participants clustered around two age groups (7–9 years and 11–14 years), after a 10-month exposure to English. This data was transcribed, and the *wh*- and *yes-no* question productions were coded for analysis. Of the questions produced, 85.7% were target. The remaining non-target 14.3% represented cases of the parameterization of extraneous operations stemming from the home-L1. Spanish-English presented T/V-doubling phenomena absent in Mandarin-English, while both groups show spurious DO in C. Human brains have the power to create multiple Grammars, simultaneously or sequentially. This research supports the hypothesis that the L1 does indeed mediate the sequential acquisition of a second Grammar, but does not impede it. More research is needed to fully characterize the intermediate stages preceding the final attainment of the target-state in the creation of subsequent Grammars.

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Keywords

linguistics, language acquisition, bilingualism, auxiliary inversion, Mandarin, Spanish, and T-to-C movement

INTRODUCTION

In a world in which diversity is increasing both globally and nationally, there is growing interest in the significance of multicultural communities within the United States. In light of this growth, the societal image of ethnicity and minority languages deserves positive reinforcement. Despite the cultural and cognitive advantages of bilingualism, negative ideologies have led to the loss of heritage language(s) in subsequent generations. Heritage language(s) refers to those languages acquired in the home, in addition to the language considered *dominant* within a society. In the United States, where English is the de facto dominant language, negative ideologies associated with bilingualism may hinder individuals from wanting to maintain and utilize their (first) heritage language. The majority of these ideologies involve the idea that a heritage language impedes the development of a second language (English), and that code-switching between the first and second languages corrupts language development.

As a result of these ideologies, many bilingual children find themselves placed in English as a second language (ESL) classrooms to receive special aid in the acquisition of English. While the goal of the ESL classroom is, in principle, to increase the bilingual child's proficiency in English, ultimately these classrooms are designed as *transitional*, not *developing*, systems: They favor the transition to a monolingual individual speaking only English, instead of developing speaking and literacy skills in both languages, thus playing against *bilingualism*. The foundation of these (negative) language ideologies is not based on science, and the underlying assumptions associated with bilingual/ESL programs for heritage language speakers are fundamentally driven by an unfounded logic.

From a purely linguistic point of view, the process of developing two distinct languages involves the creation of multiple *mental* Grammars, constituting a natural phenomenon in human development. A variety of milestones mark this process, some directly affected by the speaker's heritage language. While the shape of this acquisition process may manifest differently depending on a variety of factors, individuals who speak a heritage language can naturally reach target-like production in both languages.

This research focuses on a particular phenomenon within the development of English Grammar by bilingual children with a heritage-L1: the syntactic operations involved in the development of Question-Formation. Concentrating on a particular

phenomenon within that process, this study aims to show how the heritage language may mediate but not prevent the full acquisition of English.

GOAL AND HYPOTHESIS

The Structure of Question-Formation in English

In English, as in any other language, Question-Formation can manifest in one of two ways. *Yes-no* questions garner the response of either “yes” or “no,” while *wh-* questions contain a *wh-* question word (fronted in English) and require a constituent response. These two varieties of questions can be seen in examples (1) and (2), respectively.

- (1) a. Did she leave?
b. Yes, she left.
- (2) a. When did she leave?
b. She left on Tuesday.

This study is specifically focused on the Question-Formation of *wh-* questions, looking in particular at one of the syntactic operations involved. Consider the example in (3): The *yes-no* question in (3b), formed out of the statement in (3a), is obtained through one major movement operation.

- (3) a. You are eating an apple.
b. Are you eating an apple?

This operation involves moving *are* from its base position, called T(ense), to a fronted position called C, hence the operation’s name T-to-C movement. As a result, *are* in (3b) precedes the subject *you* as opposed to following it (as it does in (3a)). The syntactic representation of T-to-C movement can be seen in (4), corresponding to (3b).

- (4) T-to-C movement in English.

Wh- questions require an additional operation called *wh-* movement. The *wh-* word (*what* in (5b) below) is moved from its base position occupied by *an apple* in (5a) to the position preceding C. The position occupied by *what* in (5b) is called the Specifier of C (Spec-C) and is represented in (6) below.

- (5) a. You are eating an apple.
b. What_{Spec-C} are_C you _T eating ?

- (6) T-to-C and *wh-*movement in English.

An additional phenomenon relevant to this study is exemplified in (7) and (8).

- (7) a. She can eat an apple.
b. Can_C she _T eat an apple?
- (8) a. She ate an apple.
b. Did_C she _T eat an apple?

Seen in (8), an operation that commonly occurs in English Question-Formation is DO-support. In productions with modals, like in (7), the modal *can* itself undergoes T-to-C movement. However, in utterances where there is no modal available to undergo T-to-C movement and fill C, the inflection in T is realized as the auxiliary DO and raised to C.

This study will address how T-to-C is realized in the language productions of Spanish-English and Mandarin-English bilingual children.

Goals

Based on the premises explained above, the goals for this study are:

- (9)
 - a. To examine the patterns of T-to-C movement in Question-Formation Acquisition in children with a native first language (L1) spoken at home: Mandarin-English and Spanish-English
 - b. To identify the role of the children's L1 in the patterns of T-to-C Acquisition for their second language (English)
 - c. To identify the patterns in which each different L1 (Mandarin, Spanish) interacts in the creation of the new Grammar (English)
 - d. To use non-target (NT) forms as a window into the Grammar formation process of a bilingual child

As established in goals (9c) and (9d), this study aims to identify the specific interactions of the L1 on the patterns of T-to-C Acquisition found in the second language (L2) of bilingual children. For this, we will use non-target (NT) productions as a window into the active mental Grammar that is being formed. This is relevant to the study because some of the non-target productions of the bilingual children in this study include examples like (10).

- (10)
 - a. #When does this picture taken?¹
[Mandarin-English bilingual child]
 - b. #What [Ø] the boy answers?
[Spanish-English bilingual child]

In (10a) DO is unexpectedly used in a non-target environment, while in (10b) there is a lack of DO in the target environment, where it would be expected. These non-target patterns seem to indicate that the L1 plays a role in interacting with the creation of the new L2 Grammar, possibly by drawing from elements of their existing L1 Grammar to form the L2 Grammar. Through the analysis of both target and non-target utterances found throughout the data, the non-target data can be used as a window into the ongoing Grammar Formation process of the bilingual children. The target data provide insight into which processes have already been acquired by the bilingual children.

More generally, the goal of this research is to show the *systematic* nature of the acquisition process in the speech of bilingual children, and how the children's home-L1 mediates but does not prevent or impede the development of the L2.

Hypothesis and Theoretical Assumptions

The theoretical background for this study comes from Park's (2011) Person Feature Auxiliary Movement (PFAM) Hypothesis, which found that in the Question-Formation Acquisition of Korean-English bilingual children, full T-to-C movement, in particular with DO-support, is acquired when the [PERSON] ([PRS]) feature is acquired in T. Additionally, this acquisition occurred in three distinct progressive stages: 2nd > 1st > 3rd [PRS].

- (11) 1st Stage
 - a. 1st PERSON no DO
 - b. 2nd PERSON √ DO
 - c. 3rd PERSON no DO
- (12) 2nd Stage
 - a. 1st PERSON √ DO
 - b. 2nd PERSON √ DO
 - c. 3rd PERSON no DO
- (13) 3rd Stage
 - a. 1st PERSON √ DO
 - b. 2nd PERSON √ DO
 - c. 3rd PERSON √ DO

Park posited in her discussion that this pattern was likely affected by the children's L1 in the sense that Korean doesn't have [PRS] in T, and the formation of the new English Grammar would require positing such a feature anew.

Following the predictions made in Park's (2011) PFAM Hypothesis, two groups of bilingual children were considered in this study. The first group comprised bilingual children possessing Mandarin as their home-L1. Mandarin is similar to Korean in terms of Question-Formation: both languages lack an overt PERSON ([PRS]) feature in T and have a sentence-final question particle,² MA for Mandarin, NI for Korean.

- (14) Ni3 chil le MA?³ [Mandarin]
You eat ASP Q
'Did you eat?'
- (15) Tangsin-un mwu-lul muk-ess-NI?⁴ [Korean]
You-NOM what-ACC eat-PAST-Q
'What did you eat?'

The second group comprised Spanish-English bilingual children. In addition to those syntactic processes exemplified in (3) and (5), Question-Formation in Spanish interacts with other processes, specifically V-to-T movement, as seen below in (16). The presence of V-to-T can be detected in (16a)

through the adverb *ayer*, “yesterday,” intervening between the verb and the direct object *el libro*, “the book.”²⁵ Since V is occupying the T position in (14a), when T-to-C takes place in Question-Formation, the verb is moved from T into the C position, as observed in (16).

- (16) a. Juan leyó_T ayer —_V el libro.
J. read.PST3S yesterday the book
‘John read the book yesterday’
- b. Qué leyó_C Juan —_T ayer —_V ?
What read.PST3S J yesterday —
‘What did John read yesterday?’

The present study hypothesizes that the Mandarin-English bilingual children will have patterns of T-to-C Acquisition mirroring those observed in the Korean-English bilingual children by Park (2011), due to the aforementioned lack of an overt [PRS] feature and direct merge of the question particle into C (MA and NI in (14) and (15)) that is present in both languages. The Spanish-English bilingual children are hypothesized to show a different pattern, because Spanish already possesses the [PRS] feature and exhibits V-to-T movement, likely having an effect on the realization of T-to-C in the English of Spanish-English bilingual children.

METHODOLOGY

Description of the Participants

Data from seven participants was selected for this study from a larger pool of data collected by the Indigenous and Endangered Languages Research Lab (IELLab) at Purdue University. These individuals were chosen based on age and linguistic background of their L1. Since previous research for this study has been completed with Korean-English bilingual children, Mandarin-English and Spanish-English bilingual children were chosen for this study. The participants from these language groups were from ages clustered around 6–9 and 11–14 years old, with approximately 10 months’ exposure to English. The differences between these age groups would ideally provide insight into the varying stages of acquisition.

All of the data for this study was collected from members of the greater Purdue University community. The data from the four Mandarin-English bilingual children were collected at a community center, while the data from the three Spanish-English bilingual children were collected at a private residence. The

personal data of all participants were securely encrypted and names were replaced with code names, as per Institutional Review Board (IRB) guidelines.

Data Collection Protocol

The bilingual children’s spontaneous speech was recorded during weekly meetings with the participants. During these sessions, the children participated in interactive games and socialization with the data collector, a native speaker of English. This environment allows for the collection of natural speech, which is crucial when working with children who often feel pressured during more experiment-based data collection methods. Data from the Spanish-English bilingual individuals was collected longitudinally over the course of three sessions, while the Mandarin-English data was selected from the larger data pool with similar collection environments (age and length of exposure to English).

The video recordings of each session were uploaded to the IELLab’s secure server, and transcribed using the specialized language annotation software ELAN 4.5.0. The transcription process involves manually converting the audio of each video into real-time text. The text then underwent preliminary coding. All *wh*- and *yes-no* question productions were coded for their syntactic function, *wh*- type, auxiliary movement, and PERSON feature. *Wh*- type refers to the range of variation of *wh*- question words (*who*, *what*, *when*, *where*, *why*) within the context of a single production. They can manifest at the beginning of a production (fronted) or in their original position before movement (in situ), in an embedded or in an independent clause. Once completed, this preliminary coding was exported from ELAN 4.5.0 into Microsoft Excel for further coding and analysis.

Data Analysis Techniques

After exporting to Microsoft Excel, a more extensive coding system was implemented for the analysis process. The *wh*-word syntactic function (= subject/object/adjunct/predicate) within each production was coded, as well as information on the content of the complementizer-C (= AUX/∅), tense-T (= AUX/copula/∅), and verb-V (= Tense/Aspect/Person) heads and their status as target or non-target.

By coding in Microsoft Excel, the data could be quickly sorted and rearranged, allowing patterns to appear out of the earlier coding of the C, T, and V-heads. During this step, productions that were incomplete or contained an overwhelming number of false starts were discarded to conserve the integrity of the data.

RESULTS AND DISCUSSION

What Really Happens With T-to-C Movement in Mandarin-English and Spanish-English Bilingual Children?

Every child in the study possesses near-native Grammar in the English-L2 after only a 10-month exposure, as seen by the high percentages across Age and L1 in Table 1. The total number of question productions used in this study are as follows: Spanish: 11–14 years: 55; 6–9 years: 78; Mandarin: 11–14 years: 65; 6–9 years: 50. Thus, no Age effect can be detected at this point of exposure to English.

(17) Table 1. Percentages of target and non-target question productions by age and language groups.

	Spanish		Mandarin	
Age	11–14 years	6–9 years	11–14 years	6–9 years
Target	80.00%	92.37%	78.46%	64.00%
Non-target	20.00%	8.33%	21.54%	36.00%

All of the children in the study have reached the third and final stage of the PFAM Hypothesis ([PRS]), evident in the data, which show the presence of T-to-C movement in first, second, and third person (cf. (11)–(13)), seen in (18) below. Additionally, *wh*-movement has been fully acquired by all of the bilingual children.

- (18) a. What are we doing ?⁶
 b. What are you doing ?⁷
 c. What are they doing ?⁸

However, not all productions are target, and thus the non-target utterances provide a window into some previously undetected complexities within this final stage ([3_PRS]). The observed non-target patterns are different in the data for the Mandarin-English and Spanish-English bilingual children, as expected.

Three patterns are observed within the data collected from Mandarin-English bilingual children, which can be seen in (19).

- (19) a. #Why are they do that?⁹
 b. #What does she eating?¹⁰
 c. #Why they put the piggy?¹¹

In the first pattern, seen in (19a), the featural content originally located in T ([α] in (20)) copies into C, as expected in T-to-C operations. This is represented in the tree in (20).

(20) Pattern 1: Mandarin-English.

In addition to the non-target production seen in (19a), this pattern is also responsible for target productions with modals and auxiliary-BE, as seen in (21a–c), where the content of T (the auxiliary *are* in (21a) and the modals *can* and *will* in (21b and c)) is copied onto C.

- (21) a. What are_C they _T doing ?¹²
 b. Can_C I _T move on?¹³
 c. Will_C they _T take the grade?¹⁴

In (19a), *are* successfully undergoes T-to-C movement; however, the verb does not have the expected inflection (showing null morphology: *do* instead of *do-ing*). Thus, the issue in this non-target example stems from a problem with the morphology of the main verb, not from the T-to-C movement, seen in (20).

In the second pattern exemplified by (19b), an inflected verb *eat-ing* with default DO-support is observed. We interpret this as a case where the content of T's featural matrix [α] includes, in addition to TENSE, only a [PRS] feature that, when undergoing T-to-C movement, spells out as DO, represented in the tree in (22).

(22) Pattern 2: Mandarin-English.

Like the pattern shown in (19a), this pattern results in both non-target and target (as seen in (23)) productions.

- (23) When does_C he —_T usually fix the car?¹⁵

The difference between the patterns in (19a) and (19b) is that the feature matrix of T ([α]) is full in (19a), containing TENSE, ASPECT, and PERSON, whereas in (19b) it only contains TENSE and PERSON. A feature matrix containing TENSE and PERSON is spelled-out as DO-support, both in the target cases of (23) and in the non-target cases of (19b). Interestingly, (19a) and (19b) contrast in a complementary way regarding where ASPECT is manifested: in T (*are* in 19a) and in V (*eat-ing* in 19b), whereas the target example of (21a) manifests it both in T (*are*) and in V (*do-ing*).

The final pattern seen in (19c) contains a fronted *why*. Interpreted as containing a T with an even less featural content than the pattern in (19b), nothing is available to undergo T-to-C movement, resulting in only non-target productions. A syntactic representation appears in (24).

(24) Pattern 3: Mandarin-English.

With respect to the Spanish-English set, three distinct patterns were also observed, exemplified in (25).

- (25) a. #What says one cow to another?¹⁶
 b. #What does a mummy says to a person?¹⁷
 c. #What [Ø] the boy answers?¹⁸

In order to properly understand what is happening in the English of Spanish-English bilingual children, it is useful to recall the phenomenon of V-to-T explained in (16): In Spanish the lexical verb *moves* from its initial position in V to the position of T (16a). When T-to-C happens, it takes all the content in T (which now includes the lexical verb) and moves it to C, thus yielding (16b) with the verb preceding the subject.

This can be observed in (25a): the full verb *says* appears in C, as the result of T-to-C, which found a full verb in T. The syntactic representation of (26) below shows V-to-T movement directly followed by T-to-C movement. T-to-C copies the entire T-matrix ([α]), which in this case includes not only [PRS] and [Present] features, but also a full lexical verb, onto C. As a result, the main verb *says* ends up located in C:

(26) Pattern 1: Spanish-English.

In the second pattern in (25b), it can be assumed that the lexical verb *says* has also moved to T, keeping the [PERSON] morphology *-s*. C copies only the two features for which it is specified (TENSE and PERSON), not the whole matrix; the TENSE and PERSON featural matrix spells out as DO-support as in the case of the Mandarin-English bilingual children's second non-target pattern, found in (22). Alternatively, it may be considered that the verb has successfully

remained in V, still preserving the morphological –s; C proceeds to copy the content of T (PERSON and TENSE), which is spelled out as DO-support, as expected (see (27)).

(27) Pattern 2: Spanish-English.

The third and final pattern presents a third alternative to the verb-in-T problem: an avoidance strategy, in which the bilingual child chooses to leave C empty ([$\emptyset$]) rather than attempting to fill it with an auxiliary. This is represented in (28).

(28) Pattern 3: Spanish-English.

In future research, it may be interesting to explore which conditions favor each strategy for T-to-C in Spanish-English bilingual children: full copy of featural matrix; copy only of the features specified in C (PERSON and TENSE, spelled out as DO-support); no copy and avoidance mechanism.

The presence of the second and third strategies in both Mandarin-English and Spanish-English bilingual children, despite the differences in heritage-L1, supports the theory of an independent language capacity for humans (what in Generative Grammar is identified as *Universal Grammar*).

CONCLUSION

The data collected in this study determined that Age is not a factor in the process of T-to-C Acquisition among Mandarin-English and Spanish-English bilingual children. However, the patterns observed in the data suggest that the bilingual children's length of exposure to the English L2 is a significant factor. The effect of the children's home-L1 manifests as the *parameterization* of certain independent operations concerning the relationships between V and T, namely V-to-T movement in Spanish-English and verbal morphology in Mandarin-English. The T-to-C processes are fully acquired and working properly, but influences from other operations in the Grammar of the home-L1 result in a variety of patterns, addressed in the results and discussion of this study. This evidence shows that bilingual children's Grammars are internally consistent. Bilingual children are not confused; their Grammars are simply distinct from that of a native speaker.

With regard to future research, more languages should be analyzed to evaluate the PFAM Hypothesis cross-linguistically (Park, 2011). These data should be collected from participants with less exposure to the English L2 in order to catch earlier (1st and 2nd) stages of Question-Formation Acquisition that were missed in this study. Additionally, the deeper patterns found within the final stage of acquisition (3rd PRS) should be explored more thoroughly, using data from a wider pool of participants.

The patterns discovered in this study have widespread applications, particularly in the field of education and in changing negative language ideologies. The results could help society to better understand the processes involved in natural language acquisition, preventing unnecessary discrimination against children who speak a heritage-L1 at home. Spreading the knowledge that bilingual children have no difficulty forming multiple fully developed mental Grammars is important to the formation of more positive beliefs about language and bilingualism in the future. Once this information becomes public knowledge, it could aid in the creation and support of better structured bilingual education programs implemented throughout mandatory education.

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NOTES

1. The symbol “#” precedes a sentence to indicate non-target (NT) forms. (10a) Retrieved from Mandarin-English data [Shelby 05:12:0]. (10b) Retrieved from Spanish-English data [Jill 24:57:7].

2. Presumably, this question particle occupies C, which appears in these languages’ sentences finally in questions.

3. Thank you to Xinyi (Katya) Zhao for her help with the Mandarin example.

4. Thank you to Young Eun Choo for her help with the Korean example.

5. The contrast in the V-to-T operation between English and French was first detected by Pollock (1989). Spanish works like French in this respect.

6. Retrieved from Spanish-English data [Clark 05:07.8].

7. Retrieved from Spanish-English data [Clark 25:13.3].

8. Retrieved from Mandarin-English data [Shelby 07:40.3].

9. Retrieved from Mandarin-English data [Katie 01:00.4].

10. Retrieved from Mandarin-English data [Katie 7:00.0].

11. Retrieved from Mandarin-English data [Katie 01:05.3].

12. Retrieved from Mandarin-English data [Katie 06:33.1].

13. Retrieved from Mandarin-English data [Katie 07:58.8].

14. Retrieved from Mandarin-English data [Seb. 01:35:4].

15. Retrieved from Mandarin-English data [Shelby 11:51:9].

16. Retrieved from Spanish-English data [Jill 34:05.7].

17. Retrieved from Spanish-English data [Jill 42:17:2].

18. Retrieved from Spanish-English data [Jill 24:57.7].

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