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Short title: Effects of Parental Input Quality in Child Heritage Language

Full title: Effects of Parental Input Quality in Child Heritage Language Acquisition\*

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## **Effects of Parental Input Quality in Child Heritage Language Acquisition**

This study investigates the role of parental input quality on the acquisition of Greek as a heritage language in Western Canada. Focusing on subject use, we tested four groups of Greek speakers: monolingual children, heritage children, and the parents of each one of those groups. Participants completed an elicited production task designed to elicit subject placement in wide focus and embedded interrogative contexts, where postverbal subjects are preferred/required in the monolingual variety. Results gave rise to two main conclusions: First, the parental input received by heritage children may be qualitatively different from the parental input received by monolingual children, in that it contains a higher rate of deviant preverbal subjects. Second, parental input quality in addition to quantity may affect the outcome of heritage language acquisition, in that children producing a higher rate of preverbal subjects had parents whose Greek input was not only quantitatively reduced, but also richer in preverbal subjects.

Key words: parental input quality, heritage language acquisition, word order, Greek

### **Introduction**

Heritage speakers are early bilinguals whose first language (heritage language) is different from the majority language of the society they live in. Existing research has demonstrated that they typically show patterns in their heritage language (HL) that differ from those shown by age-matched monolinguals (Benmamoun, Montrul, and Polinsky, 2013; Montrul, 2008, 2015; Polinsky and Kagan, 2007; Kupish and Rothman, 2016; Rothman, 2009b; Scontras, Fuchs, and Polinsky, 2015). Various, non-mutually exclusive factors have been argued to contribute to the observed differences between the two populations, including cross-linguistic influence from the majority language (e.g., Argyri and Sorace, 2007; Cuza, 2012; 2016), heritage input quantity (e.g., Daskalaki, Chondrogianni, Blom, Argyri, and Paradis, 2018; Flores, Santos, Jesus, and Marques, 2017; Gathercole and Thomas, 2009), and heritage input quality. Input quantity and quality have received various definitions in the literature (Paradis, 2011a; Unsworth, 2018). In the present study, input quantity will be taken to refer to the daily amount of heritage language input that children receive at home from their parents and siblings (Paradis, 2011b). Input quality, on the other hand, will be taken to refer to the variation that might be present in the heritage input, whereby a certain linguistic property (such as subject placement or subject realization) might not always be used in a monolingual-like manner (Paradis and Navarro, 2003; Pascual y Cabo, 2018; Pires and Rothman, 2009).

To illustrate the effect of these factors, we may consider subject placement among heritage speakers (HSs) of free word order languages residing in English-majority communities.

A recurring observation in the literature is that these speakers tend to overextend the use of preverbal subjects in contexts where postverbal subjects are preferred or required (for Greek, see Argyri and Sorace, 2007; and Daskalaki, Chondrogianni, Blom, Argyri, and Paradis, 2018; for Spanish, see Cuza, 2012, 2016). While it is possible that these patterns are the result of -cross-linguistic influence from English, which is a rigid subject-verb-object (SVO) language (Argyri and Sorace, 2007; Cuza, 2012, 2016), it is also possible that they are further modulated by the daily amount of heritage language use (Daskalaki, Chondrogianni, Blom, Argyri, and Paradis, 2018) and/or by the differential properties of subject placement attested in the heritage input.

To date, the evidence that the differences in the performance displayed by heritage speakers are related to the qualitative properties of the heritage input is mostly indirect. Most of the existing studies have attempted to reconstruct the input heritage speakers receive by testing a group of first generation immigrants, whose language is taken to be representative of the input received by second or later generations of heritage speakers (Montrul, Bhatt, and Girju, 2015; Montrul and Sánchez-Walker, 2013; Pascual y Cabo, 2018). Very few studies have explored the quality of the input heritage speakers received in childhood from their actual heritage input providers (i.e., from their parents) (Paradis and Navarro, 2003), and no study, to our knowledge, has examined the impact of heritage input quality on the language acquisition and development of heritage speakers. The present study aims to complement the existing literature by exploring whether the parental input in Greek immigrant families in Western Canada differs with respect to subject placement from the parental input in Greek monolingual families and whether there is an association between parental input and children's output in the placement of subjects.

### **The nature of the heritage input**

It is becoming increasingly acknowledged that the experience of HSs with their HL might not only be quantitatively, but also qualitatively different from the experience of age-matched monolinguals (Paradis, 2011b; Polinsky, 2016; Kupisch and Rothman, 2016; Rothman, 2009a; Pascual y Cabo & Rothman, 2012; Sorace, 2004, 2011). Qualitative differences could be due to two main reasons: First, heritage speakers are children of first and second generation immigrants, who might have undergone attrition themselves, or of L2 speakers who might have different levels of proficiency. As a result, they might be exposed to a contact variety of their language that diverges from the monolingual variety in the form and use of certain structures (Paradis and Navarro, 2003; Paradis, 2011b; Sorace, 2004, 2011). Alternatively, they could be children of immigrants who speak a regional and/or informal variety. Because the heritage language is typically used in informal settings, these heritage speakers would only be exposed to the regional/informal variety that possibly differs in its properties from the monolingual standard (Rothman 2007; Pires and Rothman, 2009). In either case, differences in the heritage input could affect the outcome of heritage language acquisition, especially in instances of limited access to HL schooling that would expose them to the properties of the monolingual standard (Bayram, Rothman, Iverson, Kupisch, Miller, Puig-Mayenco, and Westergaard, 2017; Kupisch and Rothman, 2016).

The very few studies that have explored the qualitative properties of the heritage input have provided preliminary support to the hypothesis that input quality might indeed be different in heritage contexts. In an early study, Paradis and Navarro (2003) compared spontaneous production data from two Spanish monolingual children (ages: 1;8–2;7 and 1;8–1;11), one Spanish–English bilingual child learning Spanish in a heritage context (age 1;9–2; 6), and their parental interlocutors. They focused on subject realization in Spanish, a domain that was predicted to be challenging for Spanish-English bilingual children due to the systematic differences between the two languages: Whereas in English, pronominal subjects are generally phonologically expressed (they are overt), in Spanish they can be omitted (they can be null). Their results indicated that the bilingual child produced a higher percentage of overt subjects (35%) than her monolingual peers (at or below 20%) a result that could be due, at least partially, to cross-linguistic influence from English. Crucially, though, a similar pattern was replicated in the parental input. Thus, the parents of the bilingual child (a native Cuban Spanish-speaking father and an L1 English/L2 Spanish speaking mother) produced more overt subjects in Spanish than the parents of the monolingual children. In view of these results, the researchers concluded that the type of Spanish input could contribute to the increased number of overt subjects found in the bilingual child’s output, in addition to and/or instead of cross-linguistic influence from English.

More recently, a number of studies (Montrul, Bhatt, and Girju, 2015; Montrul and Sánchez-Walker, 2013; Pascual y Cabo, 2018) explored the nature of HL input by employing a three-way comparison between monolingual, first, and second generation adult immigrants - the latter being heritage speakers. For example, Montrul and Sánchez-Walker (2013) focused on Differential Object Marking (DOM), that is the overt marker *a* that obligatorily precedes [+animate, +specific] direct objects in Spanish. Using a story retelling task and a picture description task, they collected data from five Spanish speaking groups: 39 child heritage speakers (ages 6;0 to 17;0), 20 child monolingual speakers (ages 6;0 to 17;0), 64 adult heritage speakers (ages 18–25), 23 first generation adult immigrants (ages 40–60), and 40 adult native speakers (ages 18–60). The bilingual groups resided in the US at the time of testing, whereas the monolingual groups resided in Mexico. Results from the adult groups showed that unlike the native speakers from Mexico, who performed at ceiling, both the heritage speakers and the first generation immigrants showed significant rates of omission of DOM in obligatory contexts. More precisely, heritage speakers were less accurate (accuracy-story retelling: around 80%; accuracy-picture description: around 77%) than both first generation (accuracy-story retelling: 87%; accuracy: picture description: 81%) and monolingual speakers (accuracy-story retelling: 96.7%; accuracy-picture description: 95.4%). Given that the heritage speakers were children of first generation immigrants, the authors concluded that they were likely exposed to a type of Spanish input that contained a higher DOM omission rate than those of their age-matched monolinguals.

Accordingly, Pascual y Cabo (2018) focused on the domain of Spanish dative experiencer verbs such as *gustar* ‘to like’, whose experiencer argument, when realized, needs to be preceded by the dative marker *a*. Using a scalar grammaticality judgment task and an elicited

production task, he collected data from 67 heritage speakers of Spanish residing in the US (49 adults, ages 18-24 and 18 children, ages 6;6-11;1), 29 monolingual speakers of Spanish (16 adults, ages 18-24 and 13 children, ages: 6;6-11;1) residing in Cuba, and, finally, 17 first generation adult immigrants who had come to the US between the ages of 15 and 41 and had resided in the US for at least 10 years. The findings from the elicited production task revealed that monolingual adults were more accurate with the dative marker *a* (86.69%) than both first generation immigrants (76.83%) and adult heritage speakers. Furthermore, heritage speakers' performance appeared to be modulated by their proficiency since advanced speakers performed better than intermediate speakers (advanced heritage speakers: 70.79%; intermediate heritage speakers: 51.63%). Based on these results, Pascual y Cabo concluded that, at least in the case of experienter verbs, the heritage speakers' linguistic outcomes could be traced back to the variability found in the language of first generation immigrants, who are the main source of their Spanish input.

The results of these studies are particularly significant, as they provide preliminary support for the hypothesis that there might be incipient structural changes in the heritage input that get quantitatively amplified in the language of the next generation of heritage speakers. However, the evidence for this hypothesis is still not fully established, because most of the existing studies (Montrul, Bhatt, and Girju, 2015; Montrul and Sánchez-Walker, 2013; Pascual y Cabo, 2018) provide us with an approximation of the type of input heritage speakers receive, as adults at the moment of testing. The type of input heritage speakers received from their parents in their school years and the impact it had on their heritage language development is still largely unexplored. In the present study, we addressed this gap by examining subject placement among heritage speakers of Greek in Western Canada (parents and school-aged children) and monolingual speakers of Greek in Greece (parents and school-aged children). In addition, to better understand the effect of input quality, we took into consideration the parental generation, as well as the children's general proficiency and input quantity in the heritage language. Before moving on to the specifics of our study, we briefly review subject placement in Greek and English, which is the phenomenon that will serve as the domain of comparison between the two languages.

## **Subject Placement in Greek**

### *The Syntactic Literature*

#### *Subject Placement in Declaratives*

Greek is a language with free word order, a fact that has been related to the availability of overt case marking and rich subject-verb agreement (Alexiadou and Anagnostopoulou, 2000). According to the predominant view, VSO is the basic word order in Greek declaratives, in that it is felicitous in neutral/all new contexts, as illustrated with the dialogue in (1) (Alexiadou and Anagnostopoulou, 1998; Philippaki-Warbuton 1987, 1989):

- (1) All New Contexts  
Q: Ti ejine?  
“What happened?”

A: Espase o Petros ti lamba

broke.3Sg the Peter.Nom the lamp.Acc

“Peter broke the lamp.”

Deviations from the canonical word order either follow from grammatical factors, such as the transitivity and the lexical semantics of the verbal predicate (Spyropoulos and Revithiadou, 2009; Roussou and Tsimpli, 2006), or depend on the information structure of the overall discourse (Alexopoulou, 1999; Skopeteas, 2016). Thus, preverbal subjects (of transitive/eventive predicates) can be associated with a topic (Philippaki-Warburton 1987, 1989; Tsimpli 1990, Alexiadou and Anagnostopoulou 1998; Spyropoulos and Philippaki-Warburton 2002; Kotzoglou 2006) or a narrow/contrastive focus reading (Tsimpli, 1995; Roussou and Tsimpli, 2006), unlike postverbal subjects that are non-felicitous in the same contexts. Illustrations are provided with the dialogues in (2) and (3), respectively:

(2) Topic Reading

Q: Ti ekane o Petros?

what did.3Sg the Peter.Nom

“What did Peter do?”

a. (O Petros) espase tin lamba.

(the Peter.Nom) broke.3Sg the lamp.Acc

“Peter fired Kostas.”

b. #Espase (o Petros) tin lamba

broke.3Sg the Peter.Nom the lamp.Acc

“Peter broke the lamp.”

(3) Narrow/Contrastive Focus

Q: Pjos espase tin lamba? O Petros i o Nikos?

who.Nom broke.3Sg the lamp.Acc? The Peter.Nom or the Nikos.Nom?

“Who broke the lamp? Peter or Nikos?”

a. O PETROS tin espase.

THE PETER.Nom cl.Acc broke.3Sg

“PETER broke it/It was Peter who broke it.”

b. #tin espase o PETROS

cl.Acc broke.3Sg the Peter.Nom

“Peter broke it.”

Conversely, postverbal subjects obtain higher felicity judgments than preverbal ones, in wide focus contexts, where the SV sequence is the perceived focus domain (Alexopoulou, 1999):

(4) Wide focus

Q: Ti ejine i lamba?

what became.3Sg the lamp.Nom

“What happened with the lamp?”

- a. #O Petros                    tin espase  
     the Peter.Nom cl.Acc broke.3Sg  
     “Peter broke it.”
- b. Tin                    espase                    o            Petros  
     cl.Acc            broke.3Sg            the    Petros.Nom  
     “Petros broke it.”

Greek, therefore, differs from English, where subjects are typically preverbal independently of whether they are attested in topic continuity (4), narrow/contrastive focus (5), or wide focus (6) contexts.

(5) Topic Reading

- a. What happened? Any news?  
 b. Peter broke the lamp.

(6) Narrow/Contrastive Focus

- a. Who broke the lamp? Peter or Nikos?  
 b. PETER broke the lamp.

(7) Wide Focus

- a. What happened with the lamp?  
 b. Peter broke the lamp.

*Subject Placement in Interrogatives*

Differently from declaratives, interrogative clauses in Greek, matrix and embedded alike, do not allow word order variation. In these contexts, postverbal subjects are obligatory, rather than merely preferred, and dissociated from information structure considerations (Kotzoglou, 2006; Panagiotidis and Tsiplakou, 2004; Tsimpli, 1990). Illustrations are provided in (8) with matrix and in (9) with embedded interrogatives.

(8) Matrix Interrogatives

- a. Ti espase o Petros?  
     what broke.3Sg the Peter  
     “What did Peter broke?”
- b. \*Ti o Petros espase?  
     what.Acc the Peter.Nom broke.3Sg  
     “What did Peter break?”



(9) Embedded Interrogatives

- a. Dhen ksero ti espase o Petros  
Neg know.1Sg what broke.3Sg the Peter.Nom

“I don’t know what Maria broke.”

- b. \*Dhen ksero ti I Maria espase.  
Neg know.1Sg what the Maria.Nom broke.3Sg

“I don’t know what Maria broke.”

Once again, Greek differs from English where postverbal subjects are required in matrix (10) but not in embedded interrogatives (11):

(10) Matrix Interrogatives

- a. What did Maria break?  
b. \*What Maria broke?

(11) Embedded Interrogatives

- a. \*I don’t know what broke Maria.  
b. I don’t know what Maria broke.

*Acquisition Studies*

The acquisition of word order alternations in Greek has received little attention in the L1 literature. The few studies that have been carried out suggest that monolingual children produce both preverbal and postverbal subjects at a very early age. Kapetangianni (2007) examined production data samples of three monolingual Greek-speaking children drawn from the Stephany Corpus of the CHILDES database (MacWhinney and Snow 1985, Stephany 1995) and reported that these three Greek children used preverbal and postverbal subjects at the earliest two-word production stages and before they reached the age of two. Tsimpli (2005) concluded the same based on the analysis of spontaneous data collected from two Greek speaking children at regular monthly intervals. Significantly, for our purposes, neither of the two researchers reported any non-felicitous uses of preverbal subjects in contexts where postverbal subjects are preferred/required.

A different picture emerges once we consider studies examining the developmental trajectories of Greek-English bilingual children. This population has been shown to systematically overextend the use of preverbal subjects (which is the overlapping option between Greek and English) into contexts, where postverbal subjects would be the preferred and, in some cases, the grammatical option (Argyri and Sorace, 2007; Daskalaki et al., 2018).

For instance, Argyri and Sorace (2007) examined subject placement in wide focus contexts, where subjects are preferably postverbal and in embedded interrogatives, where subjects are obligatorily postverbal. To this end, they analyzed comprehension and production data from two Greek-English bilingual populations: (i) Greek-English bilingual children born

and raised in the UK and (ii) Greek– English bilingual children born and raised in Greece. Their results pointed to an effect of input quantity, since the bilinguals living in the UK (who had more exposure to English) produced more erroneous preverbal subjects than the bilinguals living in Greece (who had more exposure to Greek). Furthermore, errors were observed in both the Wide Focus (WF) context (i.e, the context, in which subject placement depended on the integration of syntactic and discourse knowledge) and, to a lesser degree, in the Embedded Interrogative (EI) context (i.e., the context, in which subject placement was conditioned solely by syntactic constraints).

More recently, Daskalaki et al. (2018) replicated Argyri and Sorace’s (2007) production task with a different population: bilingual children learning Greek as a heritage language in North America (Western Canada and New York City). Whereas Argyri and Sorace (2007) examined the role of input through a between-groups comparison, Daskalaki et al. studied the role of language use (measured as the mean proportion of Greek received and produced by the children in the home environment) as a continuous variable. This allowed them to directly determine the impact of language use among children that belonged in the same group of bilinguals. In line with Argyri and Sorace (2007), they found that under limited Greek language use, subject placement is affected in both structures, in different degrees. Namely, Greek heritage children produced more preverbal subjects in the WF context than in the EI context.

To sum up, the evidence from the acquisition studies supports the conclusions that the production of preverbal subjects in WF and EI by Greek-English bilingual children is most likely a pattern due to cross-linguistic influence (since it appears in the language of Greek-English bilingual children but not in the language of young monolingual children) that is further modulated by the amount of Greek language use. Whether qualitative aspects (in addition to quantitative aspects) of the Greek input are associated with the type and rate of preverbal subjects produced by bilingual learners is a possibility that is not yet determined and is examined in the present study.

## **Present Study**

### *Research Questions*

The present study had two inter-related goals: to explore whether the parental input in Greek immigrant families differs with respect to subject placement from the parental input in Greek monolingual families and to examine whether there is an association between parental input and children’s output in the placement of subjects. To this end, we revisited Daskalaki et al.’s (2018) study on the acquisition of Greek as a heritage language in North America (New York and Western Canada). Using the same sentence completion task that was designed to trigger subject placement in WF and EI (two contexts where postverbal subjects are preferred (WF) or required (EI) in the monolingual variety), we analyzed data not only from heritage and monolingual children, but also from the parents of these two groups. The child data were drawn from the Canadian subsample tested in Daskalaki et al. (2018) and were re-analyzed against an age-

matched monolingual control group.<sup>1</sup> The parental data (for the Canadian subsample) were collected during the same period, but were only analyzed later on for the purposes of the present study. Three research questions were addressed:

1. Do Greek heritage children differ from Greek monolingual children in their choices of subject placement? Are these differences modulated by the generation of the heritage children?
2. Do the parents of Greek heritage children differ from the parents of Greek monolingual children in their choices of subject placement? Are these differences modulated by the generation of the immigrant parents?
3. Is there an association between the mothers' and the children's choices of subjects? Is this association independent of the children's general proficiency in Greek and the amount of heritage input they receive from their mothers?

For questions 1 and 2, differences in subject placement in the heritage and monolingual parental input was taken to signify differences in the parental input quality received by the heritage and the monolingual children, respectively. For question 3, maternal input quality was chosen over the paternal input quality, for practical reasons (fewer fathers participated in our study), but also because the existing literature suggests that mothers are more likely to behave in “child-centered” ways, such as to talk more and to use supportive rather than directive language with their children (for an overview, see Pierce and Genesee, 2014). Finally, the children's general proficiency and the mothers' heritage input quantity were treated as potentially contributing variables, in view of studies showing that they can both be associated with the outcome of heritage language acquisition (on the role of general proficiency in the HL, see Montrul and Rodríguez-Louro, 2006; Pascual y Cabo, 2018; and Rothman 2009b; on the role of parental input quantity in the HL, see Daskalaki et al., 2018; and Gathercole and Thomas, 2009. For an overview of the role of input in minority contexts, see Unsworth, 2018)

### *Predictions*

With respect to the first two questions, we predicted that the bilingual heritage groups would produce more preverbal subjects than the monolingual groups. This is in line with existing studies showing that bilingual populations speaking a free and a rigid SVO word order language combination tend to extend the use of preverbal subjects in ungrammatical or pragmatically non-felicitous contexts (for Greek-English bilinguals, see Argyri and Sorace, 2007 and Daskalaki et al., 2018; for Spanish-English bilinguals, see Cuza 2012, 2016). Furthermore, we predicted an effect of generation for both children and parents, in view of the studies suggesting that accuracy decreases with generation (Montrul, Bhatt, and Girju, 2015; Montrul and Sánchez-Walker, 2013; Pascual y Cabo, 2018; Silva-Corvalán, 1991).

With respect to the third question, we predicted that if there is an effect of maternal input quality, then there should be an association between mothers' and children's choices with respect

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<sup>1</sup> To be precise, in addition to the data drawn from the Canadian subsample of Daskalaki et al. (2018), we collected data from one more participant. Thus, whereas the group of heritage children in Daskalaki et al. (2018) consisted of 32 children from Western Canada and 30 children from New York, the group of heritage children in the present study consists of 33 children from Western Canada.

to subject placement in the two conditions. Furthermore, we predicted that this association would remain, even when the children's general proficiency and quantity of maternal HL input were partialled out.

## Methods

### *Participants*

To compare the quality of parental input and children's output in heritage and monolingual contexts (questions 1 and 2), we collected data from 29 Greek-English bilingual families residing in Western Canada and 20 Greek-speaking monolingual families, residing in Greece. Participants were then classified into four groups of Greek speakers: There were 34–33 heritage children from Western Canada (mean age: 11 years and 8 months; range: 6-18;10, SD: 37.72), 27 Greek-speaking monolingual children from Greece (mean age: 12; range: 9-14;9, SD: 17.07), 33 Greek-English bilingual parents residing in Western Canada (mean age: 43;3; range: 36;8-58; SD: 54.63), and 30 monolingual parents residing Greece (mean age: 46;7; range: 39-57; SD: 54.50). Heritage children matched monolingual children in socioeconomic background ( $t(44.1)=-0.76$ ,  $p=0.4$ ), as measured through years of maternal education. They also matched monolingual children in terms of age ( $t(48)=-.48$ ,  $p=.63$ ), even though the range was wider in the heritage group. Note that the youngest child in the monolingual group was 9 years old, whereas in the heritage child group there were also a few younger children. In order to exclude the possibility that lower performance in the heritage group is driven by these younger children, we performed between-group analyses with and without the heritage children below age 9 years. Bilingual parents were older than monolingual parents ( $t(60.5)=-2.86$ ,  $p=.006$ ,  $d=.06$ ), but given that the target structures are acquired by monolingual speakers in childhood and given that it's the bilingual parents who are older and not the reverse, the age difference between the parents' groups was not expected to be a factor of influence.

To obtain information about the language background of our bilingual families (parents and children), we used Daskalaki et al.'s (2018) adaptation of the *Alberta Language Environment Questionnaire* (Paradis, 2011a). Heritage children were either born in Canada ( $n=32$ ) or in Greece ( $n=2$ ), but had started consistent exposure to English in a daycare, or a preschool programme by the age of 5;0. Furthermore, children attended Greek (Saturday) schools and received Greek input by their parents (in varied degrees) since birth. In our sample, the mean proportion of Greek parental input (on a scale from 0 to 1, with 0 as only English being spoken and 1 as only Greek being spoken), was 0.84 in early childhood (range: 0.13-1; SD: 0.27), and 0.5 at the time of testing (range: 0.13-1; SD: 0.24), (Table 1).

The parents of the heritage children were all native speakers of Greek. More precisely, there were twenty-four 2<sup>nd</sup> generation Greek immigrant parents (nineteen mothers/five fathers) born and raised in Canada and exposed to Greek in early childhood and nine 1<sup>st</sup> generation Greek immigrant parents (five mothers/four fathers) who had immigrated to Canada in adulthood (mean age of arrival: 27;5; range: 21;9-41; SD: 75.412) and had resided in Canada for an average of

16;1 years (range: 4;3-33;6; SD: 109.179). Accordingly, there was one 2<sup>nd</sup> generation child (both parents 1<sup>st</sup> generation), 14 2.5 generation children (one parent 1<sup>st</sup>/other parent 2<sup>nd</sup>) and eighteen 3<sup>rd</sup> generation children (both parents 2<sup>nd</sup> generation).

If the parents did not use Greek with their children at home, if they used a third language in addition to English, or if the children were unable to complete the tasks in Greek, the family was excluded from the study. Descriptives for the background variables of relevance (age, age of onset to English, Greek parental input in early childhood, Greek parental input at the time of testing) are provided in Table 1, for both parents and children. Because there was only one 2<sup>nd</sup> generation child, we merged 2<sup>nd</sup> and 2.5<sup>th</sup> generation children into a single group.

Table 1

*Participant Characteristics. Full Sample*

Background Variables		HC Gen.2/2.5 (n=15)	HC Gen.3 (n=18)	HC (n= 33)	MC (n=27)	BP Gen.1 (n=9)	BP Gen.2 (n=24)	BP (n=33)	MP (n=30)
Age	Mean	11;10	11;9	11;10	12	43;5	43;3	43;3	46;7
	Range	6;3-18;4	6-18;10	6-18;10	9-14;9	38-58	36;8-50	36;8-58	39-57
	SD	34.26	39.27	36.5	17.07	79.35	44.29	54.63	54.50
SES	Mean	15.06	18.11	16.72	17.67	18	17.083	17.33	17.47
	Range	12-14	14-24	12-24	12-24	12-24	14-24	12-24	9-24
	SD	2.25	2.11	2.62	4.22	4.242	2.569	3.06	4.22
AoO	Mean	3;10	3;0	3;5	NA	27;5	4;9	13;3	NA
	Range	1-5	1-4	1-5		21;9-41	4-5	4-41	
	SD	10.74	10.28	11.4		75.412	5	141.64	
LoE	Mean	7;9	8;4	8	NA	16;1	38;1	30.5	NA
	Range	3-11;8	4;6-13	3-13		4;3-33;6	31;8-44	4;3-44	

	SD	27.97	30.42	29.2		109.179	47.85	147.5	
GR Parental Input Early Childhood	Mean	0.96	0.74	0.84	NA	NA	NA	NA	NA
	Range	0.5-1	0.13-1	0.13-1					
	SD	0.12	0.32	0.27					
GR Parental Input Current	Mean	0.65	0.36	0.49	NA	NA	NA	NA	NA
	Range	0.25-0.87	0-1	0.13-1					
	SD	0.15	0.2	0.23					
GR Expr. Vocab. (RS)	Mean	23.33	14.72	18.63	44.63	47.67	34.29	37.94	47.23
	Range	6-32	4-31	4-36	39-49	40-50	11-48	11-50	41-50
	SD	8.12	7.84	8.97	2.54	3.08	8.74	9.69	2.40
ENGL Recept. Vocab. (SS)	Mean	107.2	107.66	107.45	NA	87.33	97.26	94.47	NA
	Range	85-127	86-136	85-136		72-110	85-118	72-118	
	SD	13.87	13.08	13.23		12.94	9.89	11.54	

Notes: HC=Heritage Children; MC=Monolingual Children; BP=Bilingual Parents; MP=Monolingual Parents; Gen=Generation; Age = chronological age; SES= socioeconomic status as measured by years of maternal education; AoO=age of systematic exposure to English; LoE= length of exposure to English, months of consistent exposure to English; GR Parental Input Early Childhood= the proportion of Greek spoken to the child by his/her parents in early childhood (0 to 36 months). It is calculated between 0 and 1, with 0 as only English being spoken and 1 as only Greek being spoken; GR Parental Input Current= the proportion of Greek spoken to the child by his/her parents at the time of testing(same scale as above); GR Expr. Vocab. = Greek expressive vocabulary (Vogindroukas et al, 2009); RS = Raw scores; ENGL Recept. Vocab. = English receptive vocabulary measured with PPVT-4 (Dunn & Dunn, 2007); SS = Standard scores (mean=100; range=85-115).

To determine if there is an association between the accuracy of heritage children and the accuracy of their parents (question 3), we focused on the bilingual group and extracted a subsample consisting of mother-child dyads. From this subsample, one dyad was excluded because the mother did not speak Greek to the child. This resulted in twenty-seven mother-child dyads: one with a 2<sup>nd</sup> generation child, 12 with a mixed/2.5 generation child (one parent 1<sup>st</sup>/other parent 2<sup>nd</sup>), and fourteen with a 3<sup>rd</sup> generation child. Of the twenty-seven dyads, there were five cases (including one twin) that involved two children from the same family. Descriptives for the subsample are provided in Table 2. As can be seen, the mean proportion of maternal input in

Greek was 0.9 in early childhood (range: 0.25-1; SD: 0.23), and 0.55 at the time of testing (range: 0.25-1; SD: 0.26).

Table 2

*Participant Characteristics. Subsample*

Background Variables		HC Gen. 2/2.5 (n=13)	HC Gen. 3 (n=14)	HC (n=27)	BM Gen.1 (n=4)	BM Gen.2 (n=18)	BM (n=22)
Age	Mean	11;6	12;5	12;1	42;4	42;7	42;6
	Range	7;3-18;4	6-18;10	6-18;10	38;1-49;9	36;8-50	36;8-50
	SD	34.21	40.87	37.52	61.6	44.54	46.36
SES	Mean	14.76	18.46	16.67	15.5	17.222	16.91
	Range	12-18	14-24	12-24	12-18	14-24	12-24
	SD	1.92	2.18	2.72	3	2.76	2.81
AoO	Mean	3;10	3	3;5	27	4;9	12;2
	Range	2-5	1-4	1-5	21;9-32;8	4-5	4-32;8
	SD	11.18	11.19	12.39	56.331	5.09	133.209
LoE	Mean	7;1	8;10	8	15	37;6	30;2
	Range	3-10;6	4;9-13	3-13	5;3-19;1	31;8-44	5;3-44
	SD	25.12	3.57	29.65	68.002	53.516	144.144
GR Maternal Input Early Childhood	Mean	1	0.8	0.9	NA	NA	NA
	Range	1	0.25-1	0.25-1			
	SD	1	0.29	0.23			

GR Maternal Input Current	Mean	0.69	0.41	0.55	NA	NA	NA
	Range	0.5-1	0.25-1	0.25-1			
	SD	0.2	0.23	0.26			
GR Expr. Vocab. (RS)	Mean	24.92	16.42	20.51	46.5	27	37.64
	Range	6-36	7-31	6-36	40-50	25-48	25-50
	SD	7.51	7.93	8.73	4.5	6.92	7.74
ENGL Recept. Vocab. (SS)	Mean	106.76	109.57	108.22	83.25	95.411	93.09
	Range	85-129	86-136	85-136	72-98	85-115	72-115
	SD	14.36	13.95	13.95	11.18	9.2	10.50

Notes: HC=Heritage Children; BM= Bilingual Mothers; Gen.= Generation; Age = chronological age; SES= socioeconomic status as measured by years of maternal education; AoO=age of systematic exposure to English; LoE= length of exposure to English, months of consistent exposure to English; GR Maternal Input Early Childhood= the proportion of Greek spoken to the child by his/her mother in early childhood (0 to 36 months). It is calculated between 0 and 1, with 0 as only English being spoken and 1 as only Greek being spoken; GR Maternal Input Current= the proportion of Greek spoken to the child by his/her mother at the time of testing (same scale as above); GR Expr. Vocab. = Greek expressive vocabulary (Vogindroukas et al, 2009); RS = Raw scores; ENGL Recept. Vocab. = English receptive vocabulary measured with PPVT-4 (Dunn & Dunn, 2007); SS = standard scores (mean=100; range=85-115).

## **Materials**

### *Parental Questionnaire*

Daskalaki et al.'s (2018) adaptation of the *Alberta Language Environment Questionnaire* (Paradis, 2011a) was administered to the parents, through face-to-face interviews. The questionnaire included questions on various variables that might have affected the child's language experience, including parental input at home, both at the time of testing and in early childhood (before the age of three), socio-economic status (SES), Age of Onset to English (AoO), and Length of Exposure to English (LoE).

The parental input at the time of testing was measured using questions about how often the parents spoke Greek to the child on a scale from 0 (Greek almost never/English almost always) to 4 (Greek almost always/English almost never). The overall amount of Greek parental input was then calculated as the mean proportion of input that the child received from the mother and the father. Additionally, we calculated the amount of Greek parental input in early childhood, by using the same questions and scale as above. Information about the socioeconomic status (SES) of the family was calculated based on years of maternal education. The child's Age of Onset (AoO) and Length of Exposure (LoE) to English coincided with the child's age of exposure and length of exposure to English in school.



Other information gathered from the ALEQ targeted the parents themselves. Parents provided information about their date and place of birth and their year of immigration to Canada (if applicable). In the case of 2nd generation immigrants, AoO and LoE coincided with their age of exposure and length of exposure to English in school. In the case of 1st generation immigrants AofO and LofE coincided with the year of immigration and years of residence to Canada.

### *English Vocabulary*

To assess participants' proficiency in English, we used the Peabody Picture Vocabulary Task (4<sup>th</sup> edition) (PPVT-IV) (Dunn & Dunn, 2007), which is a receptive vocabulary task standardized with monolingual speakers of English in North America. In this task, participants were shown a four-picture panel and asked to point to the picture that best matched the word spoken by the experimenter. Raw scores were converted to standard scores and descriptives are given in Table 1 for the full sample and in Table 2 for the subsample of our participants. All bilingual heritage children met monolingual age-appropriate norms. Bilingual adults also met age-appropriate norms, except for four first generation immigrants who received a score below the normal range.

### *Greek Vocabulary*

To assess participants' proficiency in Greek, we used an expressive vocabulary task, which was standardized for Greek school-aged children (Vogindroukas, Protopapas, & Sideridis, 2009). In this task, which at the time of testing was the only available vocabulary task standardized for monolingual speakers of Greek, participants were presented with a total of 50 black-and-white flashcards and were asked to name the object depicted on the flashcard. Bilingual groups had a statistically significant lower accuracy than their monolingual controls. This was true for both the child ( $t(39.7)=-16.29, p<.001, d=3.99$ ) and the adult groups ( $t(36.3)=-5.33, p<.001, d=1.32$ ).

### *Experimental task*

To test subject placement in the two target structures (i.e., in the Wide Focus and Embedded Interrogative structure), we used Daskalaki et al.'s (2018) elicited production task, which is an adaptation of Argyri and Sorace (2007). In this task, participants were shown a number of pictures on a computer screen and were subsequently asked a question that prompted the structures under consideration.

In the Wide Focus (WF) condition, participants were presented with pictures that depicted an activity between two animated characters (e.g., a little girl playing with a toy-boat and a little boy, Janis, who was looking at the girl, clearly upset). They were then asked a wide focus question that was meant to prompt the production of a postverbal subject, as in (12):

- (12) Experimenter: Ti ejine to karavi tu Jani?  
what happened.3SING the toy-boat.NOM the Jani.GEN  
“What happened to Janis' toy-boat?”  
Expected response: To pire to koritsaki.

It CL.ACC took.3SING the girl.NOM

“The girl took it.”

In the Embedded Interrogative (EI) condition, participants were presented with a picture depicting a grandparent, who complained about not remembering his/her grandchild’s activities. After each picture, participants were prompted to complete a sentence of the sort *i jaja/o papus den thimate* ‘Grandmother/grandpa doesn’t remember...’, which in Greek requires a postverbal subject:

(13) Experimenter: I egoni mu i Maria mu ipe ti aghorase,  
the granddaughter.NOM my the Maria.NOM me told.3SING whatbought.3SING  
ala dhen thimame tora.  
but NEG remember.1SING now

“My granddaughter Maria, told me what she bought but I don’t remember.”

Experimenter: Ti den thimate o papus?  
what NEG remember.3SING the grandfather.NOM

“What doesn’t the grandfather remember?”

Expected Response: Den thimate ti aghorase i egoni tu.  
NEG remember.3SING what bought.3SING the granddaughter his.GEN

“He doesn’t remember what his granddaughter bought.”

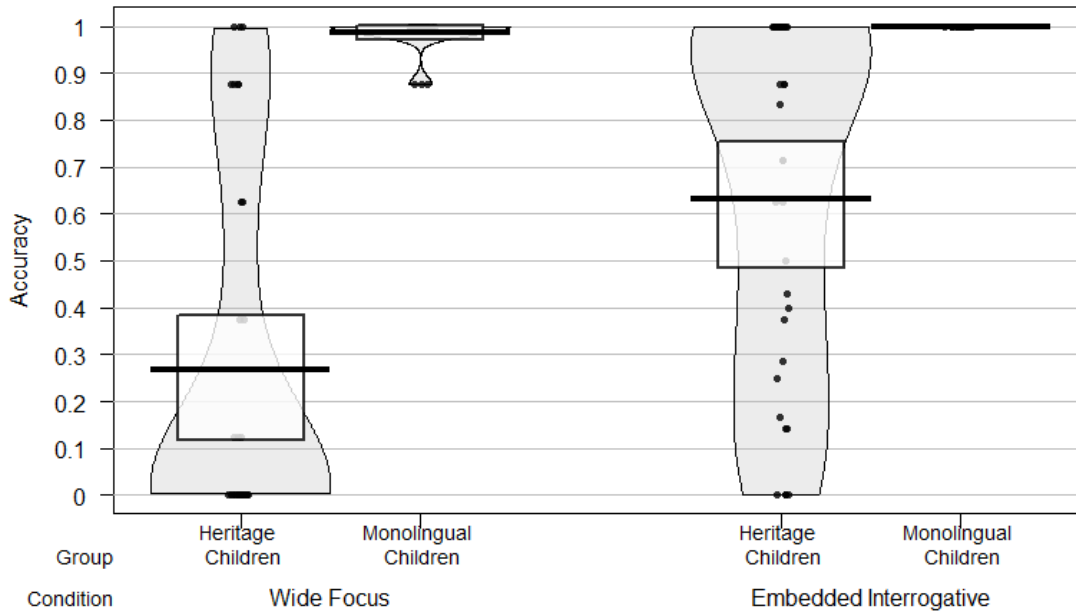
There were eight items per condition, which resulted in sixteen items. For a detailed description of the task, see Daskalaki et al. (2018). All responses with postverbal subjects were coded as correct and were given a value of “1” and responses with preverbal subjects as incorrect and were given a value of “0”. Responses containing intersentential code-switching, responses with missing verbs or null responses were excluded from the calculation.

### *Procedures*

Parents and children were tested in their homes or at the Greek school of the community by a Greek-English bilingual researcher. Each family member participated in an hourly session that consisted of a battery of tasks including: a video-recorded elicited production task (used to test subject placement in Greek), and two vocabulary tasks (used to assess participants’ proficiency in English and Greek). Children were tested first, followed by their mother, and/or father. At the end of the session, parents were administered a questionnaire that was used to gather information for the inclusion criteria.

## Results

In order to answer the first research question, we analyzed the data from the Greek heritage children in Western Canada and compared these to the data from the monolingual children living in Greece. Results indicated that heritage children showed an overall lower accuracy (.45) than monolingual children (.99). Accurate responses (i.e., VS responses) per experimental condition are visualized in Figure 1, where the heritage children are merged into a single group independently of their generation, and in Figure 2, where the heritage children are divided into two subgroups: (i) the heritage children generation 3 group (HC 3), which includes 18 3<sup>rd</sup> generation children (both parents 2<sup>nd</sup> generation) and (ii) the heritage children generation 2/2.5 group (HC 2/2.5), which includes one 2<sup>nd</sup> generation child (both parents 3<sup>rd</sup> generation) and 14 2.5<sup>nd</sup> generation children (one parent 1<sup>st</sup>/other parent 2<sup>nd</sup> generation). The pirate plots were created using the *yarr* package in R and provide information on the raw data (points), the full data distribution (density curve), the mean (line), and the Confidence Interval (band) (Philips, 2017).



*Figure 1.* Children's accuracy with subject placement in the heritage and the monolingual children on the Wide Focus and the Embedded Interrogative conditions.

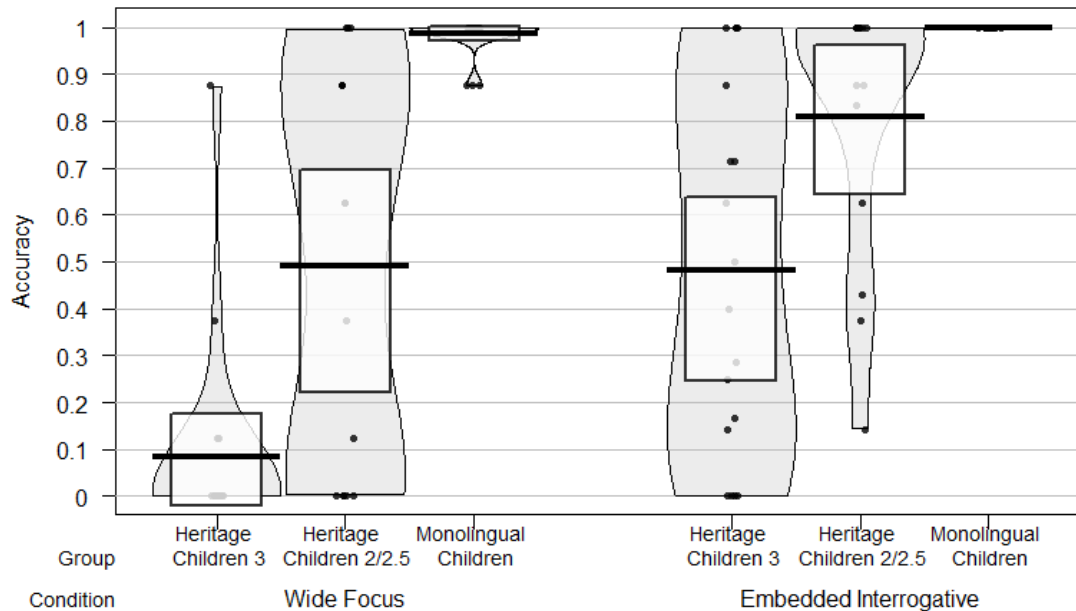


Figure 2. Children’s accuracy with subject placement in the heritage generation 3 group, heritage generation 2/2.5 group, and the monolingual group on the Wide Focus and the Embedded Interrogative conditions.

To investigate statistical differences between groups and conditions, we analyzed the data using mixed-effects modelling with a logistic link function (R version 3.3.3). To the extent that this was possible, we included maximal random effects structure with by-subject and by-item random intercepts as well as slopes (Barr, Levy, Scheepers, and Tily, 2013). In case, the models did not converge, random-intercepts-only models were run. The first model included by-subject and by-item random intercepts and slopes. Orthogonal sum-to-zero contrast coding was applied to the fixed-effects factors Group and Condition (Baguley, 2012). Children’s accuracy was the binary outcome variable (correct, incorrect).

To investigate the modulating effect of group, we ran two models. The first model included a two-level factor Group (monolingual children, heritage children), in addition to Condition (Wide Focus, Embedded Interrogative). The second model included a three-level factor Group (monolingual children, heritage children generation 2/2.5, heritage children generation 3), in addition to Condition (Wide Focus, Embedded Interrogative). Subsequently, the two models were compared using a likelihood-ratio test to determine whether the second model was

preferred over the first model and distinguishing between heritage children generation 2/2.5 versus generation 3 improved the model fit. Both models showed main effects of Group and Condition; the model comparison showed that the second model, which distinguished between two heritage groups based on generation, was preferred ( $\chi^2(1)=6.92, p<.01^{**}$ ). The estimates from the optimal model are presented in Table 3. Both generations of heritage children were outperformed by the monolinguals on subject placement. Changing the reference level demonstrated that the heritage children generation 2/2.5 were more accurate than the heritage children generation 3 (Estimate = -2.95,  $SE= 1.11, z \text{ value}= -2.65, p< .01^{**}$ ). The main effect of Condition showed that children were more accurate in the Embedded Interrogative than in the Wide Focus condition. Excluding the children in the heritage group who were younger than 9 years old (four children in total) did not change the significance of the effects of Group and Condition.

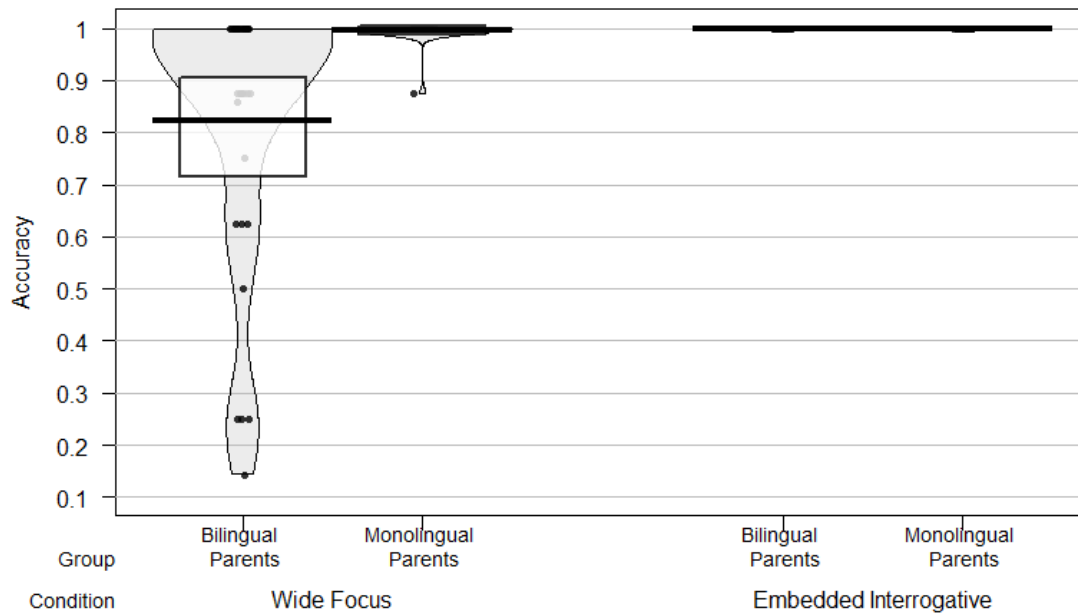
Table 3

*Mixed-effects regression model predicting children's accuracy with subject placement as a function of Group (reference level = monolinguals) and Condition (reference level = Wide Focus)*

	Estimate	Standard error	z value	p
Intercept	6.5318	1.0302	6.340	.001***
Heritage children's accuracy: Generation 2/2.5	-7.4886	1.3048	-5.739	<.001***
Heritage children's accuracy: Generation 3	-10.4374	1.4108	-7.398	<.001***
Condition	3.6875	0.5075	7.266	<.001***

In order to answer the second research question, we compared the data from the Greek bilingual parents in Western Canada with data from the monolingual parents living in Greece. The results indicated that the bilingual parents had a lower overall accuracy (Mean Accuracy: .91) than monolingual parents (Mean Accuracy: 1.00). Accuracy per experimental condition is visualized in Figure 3, with bilingual parents merged into a single group, independently of their generation, and Figure 4, with bilingual parents divided into two subgroups: (i) the bilingual parents

generation 1 group, which includes nine 1<sup>st</sup> generation parents and (ii) the bilingual parents generation 2 group, which includes 24 2<sup>nd</sup> generation parents.



*Figure 3:* Parents' accuracy with subject placement in the bilingual and the monolingual parents on the Wide Focus and the Embedded Interrogative conditions.

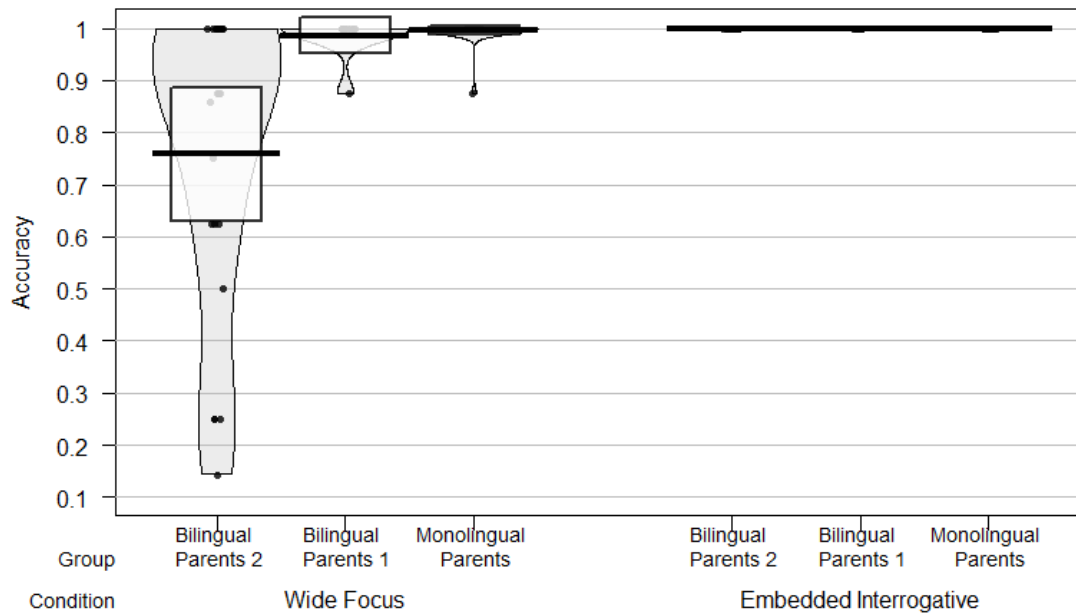


Figure 4. Parent's accuracy with subject placement in the bilingual generation 2 group, bilingual generation 1 group, and the monolingual group on the Wide Focus and the Embedded Interrogative conditions.

For the statistical analysis of the parents' data, the same procedure was followed as for the heritage children. The first model included a two-level factor Group (monolingual parents, bilingual parents), in addition to Condition (Wide Focus, Embedded Interrogative). The second model included a three-level factor Group (monolingual parents, bilingual parents generation 1, bilingual parents generation 2), in addition to Condition (Wide Focus, Embedded Interrogative). Subsequently, the two models were compared using a likelihood-ratio test. Both models showed a main effect of Group but not of Condition; the model comparison showed that the second model, which distinguished between two bilingual groups based on generation, was preferred ( $\chi^2(1)=9.38, p<.01^{**}$ ). The estimates from the optimal model are presented in Table 4.<sup>2</sup> There was no difference between the monolingual and bilingual generation 1 parents; the bilingual parents generation 1 were more accurate than the bilingual parents generation 2. Changing the reference level to bilingual parents generation 2 demonstrated that the monolingual parents were more accurate than the bilingual parents generation 2 (Estimate = 5.36,  $SE= 1.38, z \text{ value}= 3.89, p< .001^{***}$ ).

<sup>2</sup> Bilingual parents generation 1 (BP 1) were the reference level, as the model with the monolingual parents (MP) as the reference level failed to converge, probably due to ceiling effects.

Table 4

*Mixed-effects regression model predicting parents' accuracy with subject placement as a function of Group (reference level = bilingual parents generation 1) and Condition (reference level = Wide Focus)*

	Estimate	Standard error	z value	p
Intercept	6.42	1.62	3.96	<.001***
Bilingual parents' accuracy: Generation 2	-4.15	1.56	-2.67	<.01 **
Monolingual parents' accuracy	1.21	1.86	0.65	.52
Condition	21.87	193.52	0.11	.91

Having established that not only heritage children (generation 2/2.5 and 3), but also the second generation bilingual parents residing in Western Canada produce a higher rate of preverbal subjects in the Wide Focus condition than monolinguals, we moved on to explore whether there is an association between children and parents' choices (with respect to subject placement), and, if yes, whether the observed association is independent of the child's general proficiency and the parents' amount of Greek input (question 3).

Accuracy on the two conditions in the subsample resembled that of the entire group. Maternal accuracy ( $n=22$ ) on the Embedded Interrogative condition was 1 and .81 ( $SD = .25$ ,  $Range=.15-1$ ) on the Wide Focus condition and the heritage children ( $n=27$ ) had an accuracy of .68% ( $SD = .38$ ,  $Range 0-1$ ) and .32 ( $SD = .41$ ,  $Range=0-1$ ) respectively. Two mixed-effects models were run. The first model included by-subject and by-item random intercepts, and mother's accuracy and children's Greek proficiency as fixed-effects predictors (both mean-centered). Children's accuracy was the binary outcome variable (correct, incorrect). The predictive effect of mother's accuracy could only be explored for the Wide Focus condition, as maternal performance in the Embedded Interrogative condition was at ceiling. The model returned significant effects for both mothers' accuracy in the Wide Focus condition and children's Greek proficiency, showing that children who produced fewer preverbal subjects in the Wide Focus condition had mothers with higher accuracies in this condition, thereby controlling for children's proficiency in Greek. Children who had a higher level of Greek, were



more accurate in the Wide Focus condition. In order to account for the heterogeneity in the sample of parents, we added parental generation to the model. However, likelihood ratio tests indicated that the model without parental generation was preferred ( $\chi^2(1)=0.53, p=.46$ ). Table 5 summarizes the outcomes of this model.

Table 5

*Mixed-effects regression model predicting heritage children's accuracy in the Wide Focus condition with bilingual mother's accuracy and heritage children's Greek proficiency as predictors*

	Estimate	Standard error	z value	P
Intercept	-24.79	8.07	-3.07	.002
Bilingual mothers' accuracy WF condition	15.22	7.27	2.09	.036*
Heritage children's Greek proficiency	0.41	0.12	3.33	<.001***

To test if mothers' accuracy in the Wide Focus *uniquely* predicted children's accuracy in the same condition, we also ran a follow-up model in which it was tested whether or not mothers' accuracy in the Wide Focus condition and children's Greek proficiency predicted children's accuracy in the Embedded Interrogative condition. The results, summarized in Table 6, show that while children's Greek proficiency emerged as a significant predictor, mothers' accuracy in the Wide Focus condition did not predict children's accuracy in the Embedded Interrogative condition.

Table 6

*Mixed-effects regression model predicting heritage children's accuracy in the Embedded Interrogative condition with bilingual mother's accuracy and heritage children's Greek proficiency as predictors*

	Estimate	Standard error	z value	p
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Intercept	-4.09	2.73	-1.50	.013
Bilingual mothers' accuracy WF condition	-0.54	2.82	-0.19	.849
Heritage children's Greek proficiency	0.34	0.10	3.30	<.001***

The differential effect of maternal accuracy on child accuracy is visualised in Figure 5.

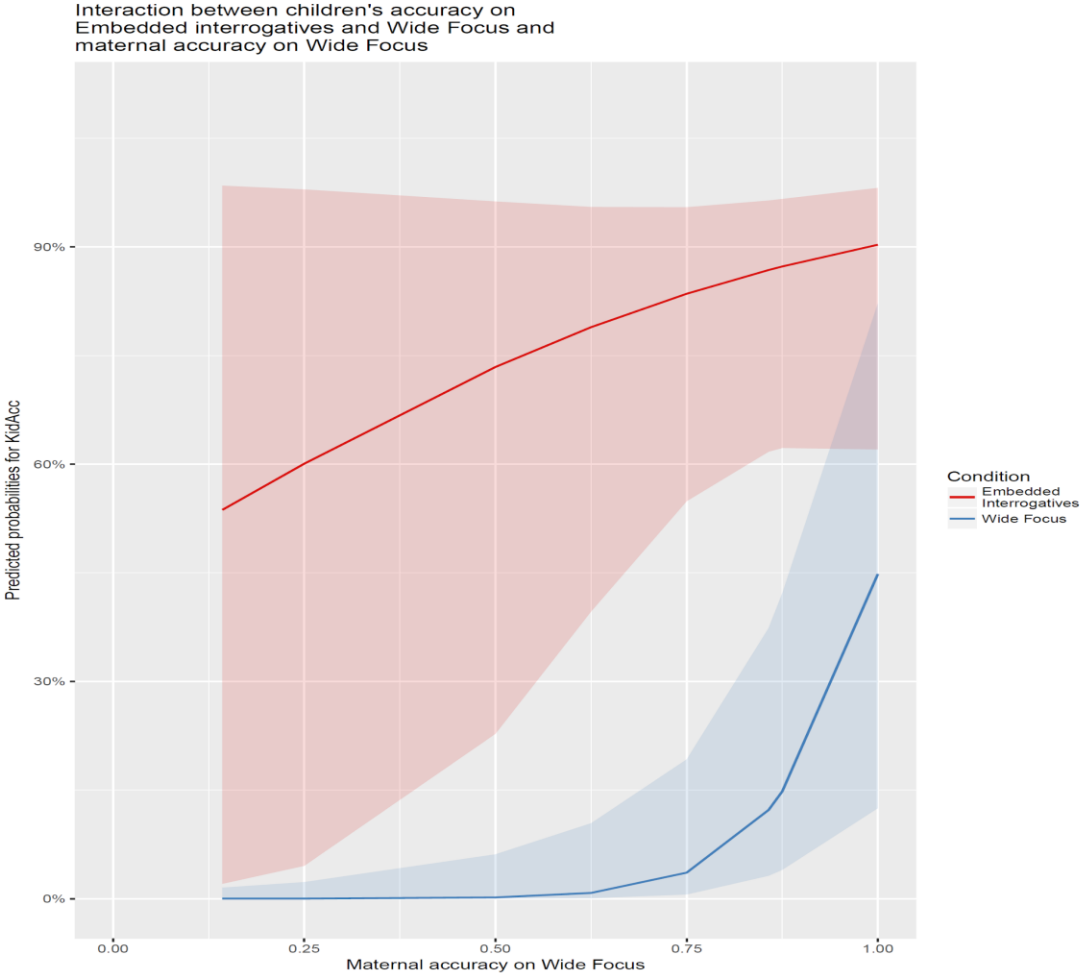
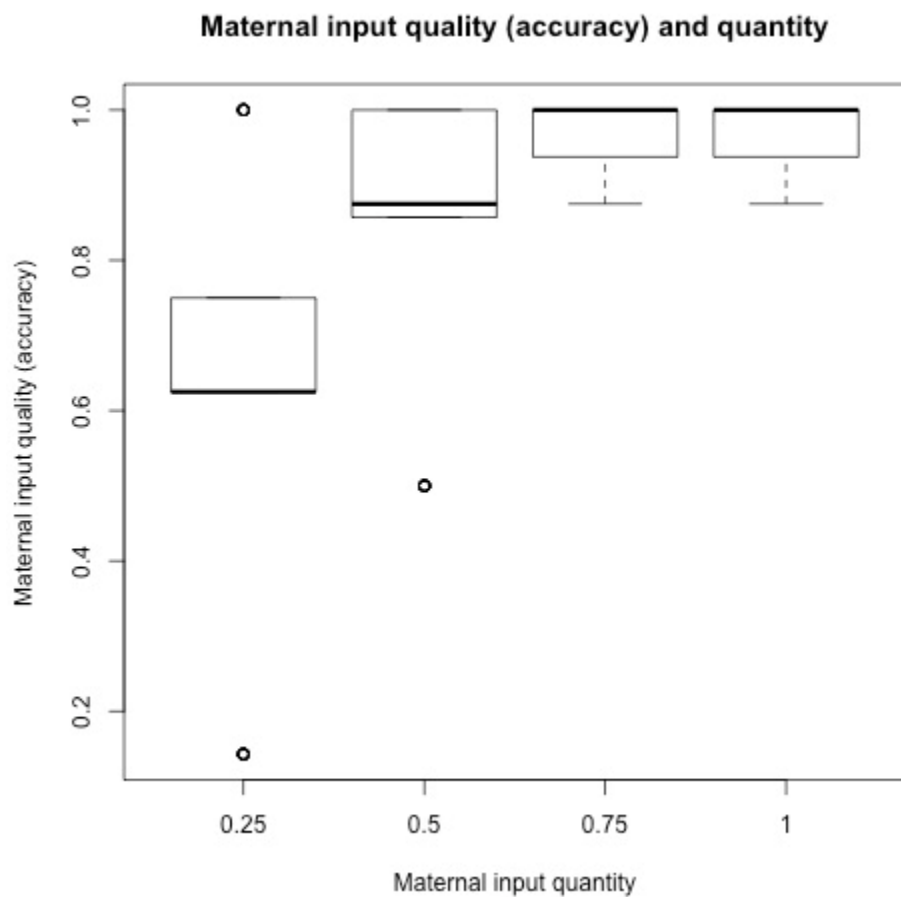


Figure 5. Interaction effect of Condition and Maternal Accuracy on Child Accuracy

The second model, which had mother's accuracy and maternal input quantity as fixed-effect predictors failed to converge. Figure 4 6 demonstrates that maternal accuracy (which is an ordinal variable with four levels) is related to maternal input quality and that (with one exception) the mothers who use Greek relatively infrequently, that is 25% of the time, are the ones who use SV structures in the Wide Focus condition.



*Figure 6. Maternal Input Quality (Accuracy) and Maternal Input Quantity*

## **Discussion**

The goal of the present study was twofold: (1) to test the hypothesis that the parental input received by heritage children is qualitatively different from the parental input received by monolingual children and (2) to explore whether these differences affect the outcome of heritage language acquisition. To this end, we revisited Daskalaki et al. (2018) study on subject placement in two different contexts: the Wide Focus context, where postverbal subjects are preferred due to discourse related conditions, and the Embedded Interrogative context, where postverbal subjects are required due to syntactic constraints. In addition to analyzing the heritage children's language in relation to age-matched monolinguals, we analyzed it in relation to the parental input they received. More precisely, our research questions were sought to determine: (1) differences between monolingual and bilingual/heritage children (2/2.5<sup>th</sup> and 3<sup>rd</sup> generation), (2) differences between monolingual and bilingual parents (1<sup>st</sup> and 2<sup>nd</sup> generation immigrants), and (3) the association, if any, between mothers' and children's choices in this domain.

### *Bilingual Speakers vs. Monolingual Speakers*

Regarding the bilingual-monolingual differences (questions 1 and 2), the bilingual groups produced a higher rate of preverbal subjects in contexts where postverbal subjects would be the preferred or required option in the monolingual variety. More precisely, bilingual/heritage children produced fewer postverbal subjects (.45, overall accuracy) than monolingual children (.99, overall accuracy). Accordingly, bilingual parents produced fewer postverbal subjects (.91, overall accuracy) than monolingual parents (1.00, overall accuracy), though the overall performance of the bilingual group was almost at ceiling.

Further analyses revealed an effect of generation and condition. An effect of generation was found in the case of both bilingual groups (heritage children, bilingual parents), a finding that is consistent with existing literature reporting that the heritage language of immigrants becomes less monolingual-like across generations (Silva-Corvalán, 1991). More precisely, even though both 3<sup>rd</sup> and 2/2.5<sup>nd</sup> generation heritage children were significantly different from monolingual children in subject placement, 3<sup>rd</sup> generation children produced significantly fewer postverbal subjects than 2/2.5<sup>nd</sup> generation children. A similar pattern was observed in the parents' group, with 2<sup>nd</sup> generation parents producing significantly fewer postverbal subjects than 1<sup>st</sup> generation parents. The latter ones performed at ceiling on a par with monolingual parents (1.00, overall accuracy). The discrepancy between the ceiling performance of 1<sup>st</sup> generation immigrants tested in the present study and the variable performance of 1<sup>st</sup> generation

immigrants tested in the US studies discussed in previous sections (Montrul and Sánchez-Walker, 2013, and Pascual y Cabo, 2018) could be due to the biographical characteristics of the respective groups. Specifically, the US based immigrants had an earlier and longer exposure to English, which could explain their variable performance.

In addition, the type of sentence (Wide Focus *vs.* Embedded Interrogative) was found to modulate the performance of both bilingual groups. More precisely, bilingual/heritage children produced more preverbal subjects in Wide Focus than in Embedded Interrogatives. As to the bilingual parents, they produced preverbal subjects solely in the Wide Focus condition. The differential vulnerability of the two contexts is in line with findings reported in Argyri and Sorace (2007) and in Daskalaki et al. (2018), and could either be due to the syntax-discourse interface status of Wide Focus subjects or to the fact that, even in the monolingual variety, preverbal subjects have a more variable distribution in declaratives than in interrogatives. Thus, whereas interrogatives only accept postverbal subjects, declaratives accept both preverbal and postverbal subjects depending on the discourse context. Both the interface status and the less consistent distribution of subjects in declaratives could facilitate the effect of cross-linguistic influence from English, which is a rigid SVO language (for detailed discussion, see Argyri and Sorace, 2007, and Daskalaki et al., 2018).

To sum up, our study confirmed the hypothesis that the parental input in heritage contexts can be qualitatively different than the parental input in monolingual contexts. Furthermore, it showed that the observed differences can be modulated by individual-level variables (such as the generation of the parents) and language-level variables (such as the structure under consideration). In this regard, it complemented previous studies, which based on smaller participant samples (Paradis and Navarro, 2003) or on a reconstructed heritage input (Montrul, Bhatt, and Girju, 2015; Montrul and Sánchez-Walker, 2013 and Pascual y Cabo, 2018) had reached similar conclusions.

### *Parent-child accuracy*

Having provided evidence that the parental input received by the heritage children might be qualitatively different from the parental input received by the monolingual children, we moved on to determine whether the maternal choices with respect to subject placement had an impact on their children's choices (question 3). To this end, we focused on mother-child dyads and ran two models: one with maternal accuracy/input quality and child general proficiency as predictors, and a second one with maternal accuracy/input quality and maternal input quantity as predictors.

The first model revealed that children's general proficiency was positively associated with children's accuracy in both the Wide Focus and Embedded Interrogative conditions. This is consistent with existing studies showing that proficiency is a predictor of speakers' performance in their heritage language (Montrul and Rodríguez-Louro, 2006; Pascual y Cabo, 2018; Rothman 2009b). As to the role of maternal accuracy/input quality, the model gave rise to mixed

results: In the Wide Focus context, a significant association was established between maternal and child accuracy, confirming the impact of input quality on the outcome of heritage language acquisition. More precisely, a maternal accuracy of 75% was associated with a child accuracy of 5%, whereas a higher maternal accuracy of 90% was associated with a higher child accuracy of 15%. In the Embedded Interrogative context, on the other hand, children's accuracy was predicted neither by their mother's ceiling accuracy in Embedded Interrogative, nor by their mother's accuracy in Wide Focus. It may be that in the case of Embedded Interrogative, which is a structure of higher complexity, more distal qualitative factors explored in the literature, such as level of literacy (Bayram et al., 2017; Kupisch and Rothman, 2016) and access to HL books and TV programs (Jia and Paradis, 2015), may account for the observed variance. It may also be that a composite quality measure, comprising the accuracy of both parents and siblings would be a better predictor, since, based on our results, speakers belonging in the children's generation are more likely to use preverbal subjects in both conditions.

The second model, with maternal accuracy/input quality and maternal input quantity as predictors, did not converge, most likely due to the low variance in the amount of HL input provided by the mothers of our sample. Further analyses revealed that mothers using a higher rate of preverbal subjects were mothers using Greek less often with their children. The observed relationship is interesting in its own right as it shows that the different patterns observed in the children's heritage language, most commonly taken to be the result of reduced input quantity, could also be the result of divergent input quality. This explanation is consistent with studies in the L2 literature that found that not only quantitative but also qualitative aspects of the (parental) input might be relevant for the children's L2 development (Chondrogianni and Marinis, 2011; Paradis 2011a; Paradis and Jia, 2017; Sorenson Duncan and Paradis, 2018). Future research with a greater sample of participants showing more variation in the amount of heritage input will enable us to determine with certainty whether the effects of input quality remain even when the effects of input quantity are partialled out.

### *Conclusions*

The results of this study taken together give rise to two main conclusions: First, the parental input received by heritage children can be qualitatively different from the parental input received by monolingual children, in that it may contain preverbal subjects in contexts where monolinguals would prefer postverbal subjects. These differences are modulated by the generation of the input providers (with first generation immigrants being more monolingual-like than second generation immigrants), as well as by the structure under consideration (with structures having a more variable distribution in the monolingual variety being more vulnerable to change than structures with a more consistent distribution). Second, parental input quality in addition to parental input quantity may affect the outcome of heritage language acquisition, in that children producing a higher rate of preverbal subjects have parents whose Greek input is not only quantitatively reduced, but also richer in preverbal subjects. These two findings, in turn,

highlight the methodological advantage of cross-generational comparisons in heritage contexts and suggest that the different patterns often observed in the language of heritage speakers could be due in part to the heterogeneity of the input they are exposed to.

### *Limitations and future directions*

At the same time, it has to be acknowledged that our conclusions are based primarily on how 2<sup>nd</sup> generation mothers and their children performed concurrently on a sentence completion task (recall that of the twenty-seven mother-child dyads, only four included a 1<sup>st</sup> generation mother). Further research is needed to determine whether the observed association between the qualitative properties of the parental input and the children's output is also true for first generation mothers and their children, whether it is maintained over time and/or once we examine naturalistic rather than elicited data. These are questions that we intend to address in a follow up study.

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