

Path and rate of development in child heritage speakers: Evidence from Greek subject/object form and placement

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Abstract

Aims: We investigated: (1) whether differences in accuracy between heritage speakers (HS) and monolingual speakers (MS) signal differences in the path or merely in the rate of language development, and (2) whether, independently of these differences, HS become more accurate as they grow older.

Methods: Using an elicitation task, we collected data from three groups of speakers of Greek: HS in the United States and Canada (78–226 months), MS of the same age (77–177 months), and younger MS (42–69 months). In terms of structures, we focused on two phenomena that are encoded differently in Greek and English: subject/object form in reference maintenance contexts and subject placement in embedded *wh*-dependencies.

Data and Analysis: Data were analyzed with mixed-effects logistic regression models.

Findings: We found that the heritage group had a lower accuracy and produced different error patterns than both monolingual groups. Specifically, only the heritage group produced non-felicitous lexical subjects/objects in reference maintenance contexts and ungrammatical preverbal subjects in embedded *wh*-structures. Accuracy, though, increased with age. Furthermore, current amount of heritage language (HL) input and generation, which were included as covariates, emerged as significant predictors in some or all of the conditions.

Originality: The inclusion of a younger monolingual group helped us determine whether the different patterns observed in the language of HS are also attested in the language of MS at earlier developmental stages. The inclusion of a wide age range helped us determine whether, independently of differences in the path/rate of development, HS become more accurate as they grow older and accumulate the necessary amount of HL input.

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Implications: HS may go through developmental stages not attested in L1 acquisition. However, differences in developmental stages do not necessarily entail differences in the outcome of language acquisition. HS' accuracy may continue to increase, provided that they continue using their HL.

Keywords

Heritage language acquisition, monolingual acquisition, rate of development, path of development, subject/object use, Greek

Introduction

It is well-established that children who learn their first language as a heritage language (HL) often have a lower accuracy rate compared with monolingual children of the same age (see Albirini, 2018; Chondrogianni & Schwartz, 2020; Cuza, 2016, among others). What is not always examined is whether differences in accuracy signal differences in the *rate* or the *path* of development. Under the former scenario, which refers to the rate of development, heritage language acquisition is merely protracted: That is, child heritage speakers go through the same developmental stages as monolingual children, albeit at a slower rate (e.g., Flores & Barbosa, 2014; Flores et al., 2017). Under the second scenario, which refers to the path of development, heritage language acquisition is different: That is, child heritage speakers may go through developmental stages not attested in child L1 acquisition (e.g., Cuza, 2016; Rodina & Westergaard, 2017; Strik & Pérez-Leroux, 2011). Disentangling these two possibilities is of theoretical significance, because it bears on the more fundamental question whether exposure to a language from birth guarantees a monolingual-like path of development, or whether conditions inherent to bilingualism (such as cross-linguistic influence from the majority language, exposure to a quantitatively reduced and possibly qualitatively different HL input, and/or processing difficulties) may lead to a qualitatively different developmental path (for discussion, see Kupisch, 2019).

In the present study, we will contribute to this line of research by comparing heritage speakers of Greek (61 children and adolescents; 78–226 months) not only with age-matched monolingual speakers (30 children and adolescents; 77–177 months), but also with younger monolingual speakers (YMS) (28 preschool children; 42–69 months), who are in the process of learning their L1. This study design will enable us to determine whether the different patterns observed in the language of heritage speakers are also attested in the language of monolingual speakers, at earlier developmental stages. Furthermore, we will investigate whether, independently of the observed differences in the path/rate of development, heritage speakers become more accurate as they grow older, and as they accumulate the necessary amount of HL input (in line with results reported in Flores & Barbosa, 2014; Flores et al., 2017; Jia & Paradis, 2020).

To this end, we will focus on two phenomena that have been shown to be challenging for heritage speakers of Greek, for reasons that could be related to the typological differences between Greek and English: the form and placement of subjects and objects (Andreou et al., 2015; Daskalaki et al., 2019, 2020; Kaltsa et al., 2015). In what follows, we will review the relevant studies with an emphasis on the language development of *child* heritage and *child* monolingual speakers of Greek.

Subject/object form and placement in acquisition studies

Subject/object form in bilingual acquisition

In terms of subject/object pronominal forms, Greek is a null subject and object clitic language, respectively. Null subjects (1a) and object clitics (2a) are preferred in reference maintenance

contexts, whereas overt subjects (1b) and objects (2b) (pronominal or lexical) are preferred in switch reference contexts (Mavrogiorgos, 2010; Papadopoulou et al., 2015).¹

- (1) a. O Petros_i efije epidhi *pro*_i nevriase
 the peter.Nom left.3Sg because *pro* got.upset.3Sg
 “Peter_i left, because he_i got upset.”
- b. O Petros_i efije epidhi aftos_j/o Pavlos nevriase
 the peter.Nom left.3Sg because he/the Paul.Nom got.upset.3Sg
 “Peter_i left because he_j/Paul got upset.”
- (2) a. O Petros_i thimose, epidhi ton_i prosvale o kathijitis
 the Peter.Nom got.upset.3Sg, because him.Acc offended.3Sg the professor.Nom
 “Peter_i got upset, because the professor offended him_i.”
- b. O Petros_i thimose, epidhi o kathijitis prosvale afton_j/ton Pavlo.
 the Peter.Nom got.upset.3Sg because the prof.Nom offended.3Sg him/the Paul.Acc
 “Peter_i got upset, because the professor offended him_j/Michael.”

A recurring observation in acquisition studies is that school-aged children who learn a null subject/object clitic languages such as Greek under the influence of a non-null subject/non-object clitic language such as English often use a rate of non-felicitous overt pronominal and/or lexical Determiner Phrases (DPs) in their HL (for an overview, see Serratrice & Hervé, 2015; for Greek–German, see Andreou et al., 2015; for Italian–English, see Serratrice, 2007; Serratrice et al., 2012; Sorace et al., 2009; for Italian–German, see Torregrossa & Bongartz, 2018; for Spanish–English, see Montrul, 2018; Montrul & Sánchez-Walker, 2015).

Consider, for example, the results coming from two elicited production studies with Greek–English bilingual children carried out in the United Kingdom (Argyri & Sorace, 2007) and in the United States and Canada (Daskalaki et al., 2019). Argyri and Sorace (2007) found that monolingual and Greek–English bilingual children alike performed at ceiling in producing exclusively null subjects and preverbal object clitics in reference maintenance contexts. Daskalaki et al. (2019), however, using an adaptation of the same task targeting solely subjects, found that Greek–English early sequential bilinguals produced a small, though significant, percentage of non-felicitous lexical subjects. The different results between the two studies could be due to a combination of geographical, environmental, and biographical considerations. It is possible that Greek–English bilingual children in the United States and Canada have fewer opportunities to practice their heritage language, due to the geographical distance from the home country, which could result in fewer trips to the home country (Kupisch, 2019), and/or due to belonging to older generations of immigration, which could result in reduced exposure to the heritage language (Flores et al., 2017).

Bilingual children’s tendency to use overspecified forms such as overt subjects and objects is also reported in narrative elicitation studies. For instance, Torregrossa et al. (2021) analyzed subject/object form in Greek as produced by three groups of bilingual children: Greek–Albanian, Greek–English, and Greek–German. They found that all three groups produced non-felicitous lexical DPs in reference maintenance contexts. However, children whose other language was Albanian (a null subject-object clitic language) produced a higher rate of felicitous responses, suggesting that transfer from the children’s other language is a contributing though not a necessary factor for the emergence of differential “overspecified forms” in bilingual grammars (see Sorace et al., 2009, for a similar conclusion).

Subject placement in bilingual acquisition

Turning to subject placement, Greek allows both preverbal subjects (SV) and postverbal subjects (VS). Whereas in simple declarative sentences subject placement is variable and determined by discourse/pragmatic constraints (Alexopoulou, 1999; Skopeteas, 2016), in *wh*-movement dependencies, matrix and embedded alike, subjects are obligatorily postverbal (Kotzoglou, 2006; Terzi, 2016; Tsimpli, 1990). The phenomenon is known as obligatory subject–verb inversion and is illustrated below with object interrogatives, matrix (3) and embedded (4), as well as with object relatives (5).

- (3) Ti dhiavase o Nikolas?
 what read.3Sg the.Nom Nikolas.Nom
 “What did Nicholas read?”
- (4) Dhen ksero ti dhiavase o Nikolas
 Neg know.1Sg what read.3Sg the Nikolas.Nom
 “I don’t know what Nicholas read.”
- (5) to arthro pu dhiavase o Nikolas
 The article.Nom that read.3Sg the Nikolas.Nom
 “The article that Nicholas read.”

What is of relevance for our purposes is that children who learn a language with a flexible word order such as Greek under the influence of a language with a relatively rigid subject–verb–object word order such as English tend to overextend the use of SV in contexts, where a VS would be the preferred or grammatical option in the monolingual variety (for Greek–English, see Argyri & Sorace, 2007b; Daskalaki et al., 2019, 2020; for Spanish–English, see Austin et al., 2013; Cuza, 2016).

For instance, Argyri and Sorace’s (2007) elicited production study showed that Greek–English bilingual children in the United Kingdom differed from monolingual children in Greece in producing a rate of ungrammatical SV in embedded interrogatives. The same monolingual–bilingual contrast is reported in Daskalaki et al.’s follow-up studies in the United States and Canada (Daskalaki et al., 2019, 2020): The authors reported that whereas monolingual children uniformly produced VS, early sequential children who were heritage speakers of Greek, occasionally opted for ungrammatical SV.

Similar results are reported in Cuza’s (2016) study of obligatory subject–verb inversion in Spanish matrix and embedded interrogatives. The results showed that heritage children in the United States produced significantly lower rates of target VS than monolingual children in Mexico. Furthermore, whereas in the case of heritage children, non-target responses consisted primarily of SV, in the case of monolingual children, non-target responses consisted primarily of null/omitted subjects. The heritage–monolingual contrast was even more pronounced in embedded interrogatives, the structure in which Spanish and English differ the most, a result that confirms the contribution of cross-linguistic influence in the emergence of ungrammatical SV.

Interim summary

In sum, the results from the above studies support the conclusion that, in contexts targeting subject/object form and subject placement, bilingual children who are heritage speakers of languages such

as Greek, typically show significantly lower accuracy rates than their monolingual peers. As mentioned in our introduction, the observed monolingual-heritage differences in accuracy may signal differences in *the rate* or differences in *the path* of language development.

Under the first scenario, both monolingual and heritage speakers of Greek go through a phase of overproducing lexical and SV, though heritage speakers may retain this phase for a longer period. This could be due to the fact that they have limited opportunities to use their HL, and, consequently, they may need more time to accumulate the necessary amount of positive evidence to acquire the target structures. This explanation is in line with other studies, which attribute acquisition delays to reduced HL exposure (Flores et al., 2017, among others).

Under the second scenario, it is only heritage speakers who go through a phase of overproducing lexical and/or SV. This could be due to a variety of factors that characterize heritage bilingualism including but not limited to cross-linguistic influence from English.

To disentangle these two scenarios, we would need to examine the language of younger monolingual children, who are in the process of learning Greek. This is because at least in the Greek studies reviewed above, school-aged monolingual children had a ceiling performance. While studies with younger children do exist, they are based primarily on naturalistic data drawn from longitudinal corpora, a methodological difference, which undermines the comparability of the results. Let us consider them, in turn.

Form and placement of referential expressions in LI acquisition

Subject/object form in LI acquisition of Greek

Spontaneous language samples show that subject/object forms emerge early in child Greek (for subject forms, see Kapetangianni, 2011 and Tsimpli, 2005; for object forms, see Marinis, 2000; Sinopoulou-Pavlatou, 2005; Tsimpli, 2005).

Kapetangianni (2011), for instance, based on longitudinal data from three children (1;9–2;9) drawn from the Stephany Corpus of the CHILDES database (MacWhinney & Snow, 1985; Stephany, 1997), reports that the alternation between null and overt subjects emerges by the age of 1;9 and that, while in the earliest stages, null subjects outnumber overt subjects, they gradually decrease after age 2;0. Based on the same corpus, Sinopoulou-Pavlatou (2005) reports that children go through a brief phase of object omission, before they start using object clitics productively. More precisely, the use of third person accusative object clitics in obligatory contexts increases from 54%, in the first developmental stage (1;9–1;11), to 85% and 95%, in the second (2;3–2;5) and third (2;9–2;11) developmental stage, respectively.

To our knowledge, elicited production studies targeting the use of subject forms are not available. However, elicited production studies targeting object forms do exist and confirm the high production of clitics in child Greek (Chondrogianni, 2008; Varlokosta et al., 2016). They report very few errors, which consist primarily of object clitic replacements (with pronouns and/or lexical DPs) rather than of object clitic omissions. For instance, Chondrogianni (2008), based on data elicited from 18 younger children (2;8–5;6) and 50 older children (7;00–12;00) reports that, even though both groups performed at ceiling, they produced a small rate of lexical DPs (younger group: 3.94% vs older group: 1.04%) and an even smaller rate of omissions (younger group: 1.04% vs older group: 0%). Accordingly, Varlokosta et al. (2016), based on data elicited from 20 children (5;00–5;11), report a small rate of errors, consisting of object pronouns (4.2%), lexical DPs (2.5%), and omissions (0.4%).

Subject placement in L1 acquisition of Greek

Turning to subject placement in L1, existing studies based on longitudinal corpora show that the word order variability attested in the adult grammar is also attested in the early child grammar (Kapetangianni, 2011; Tsimpli, 2005). For instance, Tsimpli (2005), analyzing spontaneous data from two Greek-speaking children (recorded from 1;9 to 2;2), reports that from a very young age (1;9 and 1;11, respectively) children alternated between SV and VS, with VS being the majority in all developmental stages. In line with Tsimpli (2005), Kapetangianni (2011) reports that the alternation between SV and VS emerges early (by 1;9) and complies with the pragmatic constraints regulating adults' placement of subjects. Even though neither of the two studies directly addresses subject placement in interrogatives/relative clauses, child interrogative sentences cited in Tsimpli (2005) provide some preliminary, though limited, evidence that subject–verb inversion is acquired early. As illustrated with (6), children as young as 1:10 correctly place the subject after the verb in main interrogative sentences (see also Pérez-Leroux & Dalious, 1998, for a similar conclusion about interrogative inversion in L1 Spanish).

- (6) a. Pu pai Elli (Elli, 1;10)
 where go.3Sg Elli
 “What is Elli going?” (Tsimpli, 2005: ex. 10a)
- b. Ti foa i Elli (Elli, 2;00)
 what wear.3Sg the Elli
 “What is Elli wearing?” (Tsimpli, 2005: ex. 10g)

Open issues

The results from the above mentioned studies provide preliminary support that, at least with respect to the phenomena under consideration, heritage children who are speakers of Greek might be going through a developmental trajectory that is different from that of monolingual children. This is because existing production studies provide no evidence that young monolingual children go through a phase of using a significant rate of non-felicitous lexical subjects/objects or deviant SV, before converging with the adult grammar.

At the same time though, we need to keep in mind that existing production studies with younger monolingual children are based primarily on the analysis of simple sentences that are produced by very few children, in a naturalistic setting (with the exception of Chondrogianni, 2008 and Varlokosta et al., 2016). Studies with older heritage children, however, are based on the analysis of complex sentences, produced by a bigger sample of children, through elicitation. Differences in methods and syntactic complexity may compromise the comparability of the results from studies that looked at (younger) monolingual children, on one hand, and (older) heritage children, on the other. In addition, the low number of children participating in the monolingual studies may undermine the generalizability of the results. To address this gap, we compared three groups of speakers of Greek: (1) heritage speakers (children and adolescents; 78–226 months) born and raised in New York City (NYC), United States, and Western Canada (WC), (2) monolingual speakers (children and adolescents; 77–177 months) born and raised in Greece, and (3) YMS (younger children; 42–69, months), also born and raised in Greece.

Age in heritage language development

Related to the question of path/rate of development is the role of age and whether, independently of the observed heritage-monolingual differences, heritage children's accuracy increases over

time. The evidence on the role of age on HL development is actually conflicting. Some studies have reported a positive age effect pointing toward a protracted developmental trajectory (Flores & Barbosa, 2014; Flores et al., 2017; Jia & Paradis, 2020; Sorace et al., 2009). These studies support the conclusion that HS need more time than their monolingual peers to accumulate the amount of HL that is necessary for the acquisition of the various target structures. Other studies, though, have reported a negative age effect or no effect at all (Chondrogianni & Schwartz, 2020; Cuza, 2016; Montrul, 2018; Polinsky, 2011).

For instance, Sorace et al. (2009) using an acceptability judgment task in Italian found that older bilingual children (8;0–10;10) (who were simultaneous bilinguals of Spanish-Italian and English-Italian) accepted a higher rate of appropriate forms (i.e., null subjects) than younger bilingual children (6;2–7;11). The reverse trend was reported in Cuza's (2016) elicited production study on obligatory inversion in Spanish. Specifically, the author found that older bilingual children (8;8–13;3) (who were heritage speakers of Spanish in the United States) used fewer target-like VS in interrogatives than younger bilingual children (5;0–8;5).

Studies focusing on ultimate attainment in heritage speakers have also yielded conflicting results. Polinsky (2011) found that adult heritage speakers of Russian in the United States were less accurate in the comprehension of object relatives than both child heritage speakers and adult monolingual speakers of Russian. Montrul (2018), however, using a similar study design, found that adult heritage speakers of Spanish in the United States were more accurate with the use of subject/object forms in reference maintenance contexts than child heritage speakers (though still less accurate than adult monolinguals).

The conflicting results could be related to the differential experience of HS with their heritage language. It is well-reported that HS differ considerably from each other on the amount and quality of HL input they receive on a daily basis (Unsworth, 2019). It is, therefore, reasonable to hypothesize that HS who use their HL more often are more likely to become more accurate over time compared with HS who use their language less. Consistent with this hypothesis are the results reported in Flores et al. (2017) and Jia and Paradis (2020). Flores et al. (2017) examined mood selection in Portuguese among children who were heritage speakers of Portuguese in Germany. They found that children's accuracy was affected not only by age (older children did better than younger ones) but also by two indirect measures of HL input: generation and order of siblings. More precisely, children whose both parents were second-generation immigrants did better than children from mixed households (in which one parent was a speaker of Portuguese and the other one a speaker of German). Furthermore, older siblings did better than younger siblings. Accordingly, Jia and Paradis (2020) examined comprehension and production of Mandarin relative clauses among children who were heritage speakers of Mandarin in WC. They found that both older age and current amount of HL use were positive predictors of children's productive abilities. Following the study design of Flores et al. (2017) and Jia and Paradis (2020), in the present study we will revisit the age effect, while taking into consideration HS' experience with their HL.

Present study

Research questions

The goal of the present study was twofold. First, to revisit the question whether heritage and monolingual speakers of Greek go through similar stages with respect to subject/object expression and subject placement, while keeping the method and the target structures constant. Second, to determine whether independently of differences/similarities in the path of development, heritage speakers become more accurate as they grow older and as they gradually accumulate HL input. We asked three main questions:

1. Are there differences in accuracy between heritage speakers (HS), monolingual speakers (MS), and YMS in the form and placement of subjects/objects?
2. Are there differences in error types between HS, MS, and YMS in the form and placement of subjects/objects?
3. Does heritage speakers' accuracy with respect to the form and placement of subjects/objects increase as a function of age?

To answer these questions, we selected two structures targeting subject/object form in reference maintenance contexts (where null subjects/object clitics are preferred in the monolingual variety), and two structures targeting subject placement in embedded interrogatives and relatives clauses (where VS are required in the monolingual variety).

With respect to accuracy (question 1), we predicted that HS will have a significantly lower accuracy rate than MS, who are expected to perform at ceiling. The question is, therefore, whether YMS will also have lower accuracy than MS (question 1), and, if so, whether they will pattern similarly to the heritage group in terms of error types (question 2). We anticipated three possible outcomes:

- (1) Both HS and YMS will have a lower accuracy rate than MS *and* they will produce the same error types (i.e., non-felicitous lexical DPs in reference maintenance contexts and ungrammatical SV in *wh*-movement dependencies).
- (2) Both HS and YMS will have a lower accuracy rate than MS, *but* they will produce different error types. For instance, it may be that, in reference maintenance contexts YMS will produce non-felicitous overt pronouns (rather than/or in addition to non-felicitous lexical DPs), as in Varlokosta et al. (2016). As for the placement contexts, it may be that YMS will produce non-felicitous null subjects (rather than SV), as in Cuza (2016).
- (3) Only HS will have a lower accuracy rate than MS. YMS will pattern with MS in having a ceiling performance.

Outcome (1) would be consistent with the hypothesis that both monolingual and heritage speakers go through a stage of producing a rate of non-felicitous lexical DPs and SV. However, heritage speakers retain this stage for a longer period, because they learn their language under reduced input conditions and they may therefore need more time to accumulate the critical mass of positive evidence to acquire the target structures. Outcomes (2) and (3), however, would be consistent with the hypothesis that use of non-felicitous lexical DPs/SV is not attested in L1 acquisition.

With respect to the effect of age on HS performance (question 3), we anticipated two possible outcomes:

- (1) Age will positively modulate HS' accuracy (as in Sorace et al., 2009, among others).
- (2) Age will not modulate or will negatively modulate HS' accuracy (as in Cuza, 2016, among others).

Outcome (1) would be compatible with the hypothesis that HS may ultimately overcome the "differential stages" in their language development, as they grow older and accumulate more HL input. Outcome (2) would be compatible with the hypothesis that HS will permanently retain the "differential stage of lexical subjects/objects and preverbal subjects" in their language. To examine these possibilities, we followed the study design of Flores et al., (2017) and Jia and Paradis (2020), who tested the effect of age while taking into consideration variables that target the experience of HS with their HL: generation of immigration (Flores et al., 2017) and current amount of HL use in

the home setting (Jia & Paradis, 2020). In addition to the experiential variables of generation and current amount of HL, we also added age of acquisition (AoA) of English, as a covariate, based on studies showing that HS with a later AoA perform better in their HL than HS with a younger AoA (see Albirini, 2018, among others).

Methods

Participants

To test our predictions, we analyzed data from three groups of Greek speakers: There were 61 heritage speakers from New York and WC (children and adolescents; mean age: 129.26; range: 78–226, SD : 31.30), 30 monolingual speakers from Greece (children and adolescents; mean age: 130.03; range: 77–177; SD : 25.64), and 28 YMS from Greece (preschool children; mean age: 58.93; range: 42–69; SD : 6.66).²

Of the 61 heritage speakers, 32 were tested in WC (23 in Alberta, 4 in Saskatchewan, and 5 in British Columbia) and 29 were tested in NYC. In terms of generation of immigration, there were 18 Generation 2 heritage speakers (both parents first-generation immigrants), 19 Generation 3 heritage speakers (both parents second-generation immigrants), and 24 Generation 2.5 heritage speakers (one parent was first generation/other parent was second generation).

Independently of their country/city of residence, all heritage speakers (children and adolescents) were early sequential bilinguals. They were either born in New York/WC ($N=56$) or in Greece ($N=5$), but had started consistent exposure to English in daycares, or English preschool programs by the age of 5;0. Furthermore, they all used Greek (to some extent) at home, and they all attended heritage Greek programs for 4 hours per week.

Monolingual speakers (children and adolescents) were born and raised in Greece by parents who were native speakers of Greek and matched the heritage speakers in age, $t(89)=0.012$, $p=.99$, and socio-economic status, $t(78)=-0.538$, $p=.592$. YMS (preschool children) were also born and raised in Greece and matched the heritage speakers in socio-economic status (SES), $t(77)=-0.432$, $p=.666$, but not in age, $t(87)=11.957$, $p<.001$.

Finally, speakers (from any of the three groups) who failed to complete at least 50% of the task or whose parents reported a delay in their language development were excluded from the study.

Materials

Parental questionnaire. To obtain background information about our participants, we used Daskalaki et al.'s (2019) adaptation of the *Alberta Language Environment Questionnaire* (Paradis, 2011). The questionnaire included questions concerning participants' place and date of birth, participants' type of schooling (attendance of mainstream monolingual, bilingual, and/or heritage language programs), and participants' SES measured by years of maternal education. In addition, it included questions targeting solely the heritage group. These concerned the amount of Greek/English language use at home and the Age of Onset of English (AoO).

The amount of language use at home corresponded to the mean proportion of the amount of Greek that participants received from and directed to other family members (parents, grandparents, siblings), at the time of testing. It was calculated on a scale between 0 and 4, with 0 as only English being used and 4 as only Greek being used. As to the participants' Age of Onset (AoO) of English, it coincided with the participants' age of exposure to English in an English school/pre-school/daycare.

Table 1. Participants' characteristics by group.

Group	Age	AoO	SES	GR use at home	GR Vocab. (RS/50)	ENG Vocab. (SS)
MS (n = 30)	130.03	NA	17.92	NA	45.07	NA
	77–177		12–24		39–49	
	25.64		4.25		2.38	
YMS (n = 28)	58.93	NA	17.65	NA	36.7	NA
	42–69		12–24		27–47	
	6.66		3.13		5.3	
HS (n = 61)	129.26	40.08	17.32	0.45	21.16	110.48
	78–226	12–60	12–24	0.09–1	4–45	85–211
	31.30	10.40	2.68	0.20	9.97	17.87

Note. HS=heritage speakers; MS=monolingual speakers; YMS=younger monolingual speakers; Age=chronological age in months; SES=socio-economic status measured by years of maternal education; AoO=age of systematic exposure to English; GR use at home=the mean proportion of Greek input and output that the child received from and directed to other family members (parents, grandparents, siblings) at home, at the time of testing; It is calculated between 0 and 1, with 0 as only English being used and 1 as only Greek being used; GR Vocab.=Greek expressive vocabulary (Vogindroukas et al., 2009); RS=raw scores; ENGL Vocab.=English receptive vocabulary measured with PPVT-4 (Dunn & Dunn, 2007); SS=standard scores ($M=100$; range = 85–115).

English vocabulary. As a background measure of English proficiency, we used the Peabody Picture Vocabulary Task (4th 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 presented with a panel depicting four pictures and were asked to point to the picture that best matched the word spoken by the experimenter. Standard scores are provided in Table 1.

Greek vocabulary. As a background measure of Greek proficiency, we used an expressive vocabulary task, standardized for Greek school-aged (4–8 years old) children (Vogindroukas et al., 2009). In this task, which was the only available task targeting Greek vocabulary when the study was conducted, participants were presented with a total of 50 black-and-white flashcards and were asked to name the object depicted on the flashcard. The raw scores (out of 50) are given in Table 1.

Sentence completion task. To test subject/object form in reference maintenance contexts and subject placement in *wh*-dependencies, we used a sentence completion task, adapted from previous studies on Greek–English bilingual children (Argyri & Sorace, 2007; Daskalaki et al., 2019, 2020). The task consisted of four conditions with eight items per condition. There was one condition targeting subject form (the Topic Continuity (TC) condition), one condition targeting object form (the WF condition), and two conditions targeting subject placement (the Embedded Interrogative (EI) and the Object Relative (OR) conditions).³ For each condition, participants were shown a picture of animated characters on a laptop screen, and were, subsequently, asked a question that was meant to prompt the production of the target structure. Let us consider them in turn:

TC condition. In the TC condition (7), participants were shown a picture of a character involved in a certain activity (e.g., a man going to a kiosk, as in Figure 1). Subsequently, they were asked to give a reason for the character's activity, and were instructed to begin their response with the word *epidhi* "because." The felicitous response involved the use of a null subject pronoun to maintain reference with a salient subject antecedent:



Figure 1. Sample picture for the TC condition.

(7) EXPERIMENTER: Aftos ine o kirios Jianis. Giati piye sto periptero i kirios Jianis?
 “This is Mr. Jianis. Why did Mr Jianis go to the kiosk?”

EXPERIMENTER: Ksekina tin apadisi su me to *epidhi*
 “Start your reply with *because*”

EXPECTED RESPONSE: *epidhi* ithele na aghorasi efimeridha
 because wanted.3Sg to buy newspaper
 “Because he wanted to buy a newspaper.”

Wide Focus condition. In the Wide Focus (WF) condition (8), participants were presented with a picture depicting one animate character acting on an object (e.g., a little boy tearing a newspaper) and a second animate character (e.g., a grandfather) watching the activity, while being clearly upset (Figure 2). They were, then, asked a WF question of the type *What happened to the [object]*? The felicitous answer in Greek involved an object clitic to refer to the previously mentioned salient antecedent.



Figure 2. Sample picture for the WF condition.

- (8) EXPERIMENTER: O papus iche mia efimeridha.
 “Grandpa had a newspaper.”
 EXPERIMENTER: Ti ejine i efimeridha tu papu?
 “What happened to grandpa’s newspaper?”
 EXPECTED RESPONSE: Tin eskise to aghori
 It.Obj.Cl teared.3Sg the boy.Nom
 “The boy teared it.”

EI condition. In the EI condition (9), participants were presented with a picture of a grandparent who complained about not remembering his or her grandchild’s activities (Figure 3). They were then prompted to complete a lead-in sentence of the sort *i jiajia/o papus den thimate* “Grandpa/grandmother doesn’t remember . . .” The target structure involved an embedded interrogative, which in Greek requires a post-verbal subject.



Figure 3. Sample picture for the EI condition.

- (9) EXPERIMENTER: I egoni mu i Maria mu pe ti majirepse, ala dhen thimame tora.
 “My granddaughter Maria, told me what she cooked. But I can’t remember now.”
 EXPERIMENTER: Ti dhen thimate i jiajia?
 “What doesn’t the grandmother remember?”
 EXPERIMENTER: Ksekina tin apadisi su me to *den thimate*
 “Start your reply with *She doesn’t remember*”
 EXPECTED ANSWER: Dhen thimate ti majirepse i Maria
 Neg remember.3Sg what cooked.3Sg the Maria.Nom
 “She doesn’t remember what Mary cooked.”

OR condition. In the OR condition (10), participants were presented with a picture depicting one animate character acting on an object (e.g., a girl watering a flower) and a second animate character (little Nicholas) pointing to the object (Figure 4). Subsequently, participants were asked to explain what the little boy was pointing to and were instructed to start their reply with the phrase *Little Nicholas is pointing to the [object] that . . .* The target structure was an object relative with a VS.



Figure 4. Sample picture for the OR condition.

- (10) EXPERIMENTER: Aftos ine o mikros Nikolas ki afti ine i Evi. Opos vle pume i Evi troi ena paghoto ke o Nikolas mas dhichni kati. Ti mas dhichni o mikros Nikolas? “This is little Nicholas and this is Evi. As we can see, Evi is eating an ice-cream, while Nicholas is pointing to something. What is little Nicholas pointing to?”
 EXPERIMENTER: ksekina tin apadisi su me ti phrasi *mas dhichni to paghoto pu . . .*
 “Start your reply with *he is showing to us the ice-cream that . . .*”
 EXPECTED RESPONSE: Mas dhichni to paghoto pu troi i Evi.
 to.us show.3Sg the ice-cream that eat.3Sg the Evi.Nom
 “He is showing to us the ice-cream that Evi is eating.”

Coding and scoring

In the TC condition, subjects were coded based on their form as null/omitted, pronominal, or lexical (Table 2). All responses with a null subject were coded as correct and given a value of “1,” and all responses with an overt subject, either pronominal or lexical, were coded as incorrect and were given a value of “0.”

Table 2. Range of responses in topic continuity (TC).

Null subject	epidhi	∅ ithele	na aghorasi	efimeridha
	because	wanted.3Sg	to buy	newspaper
	“Because he wanted to buy a newspaper.”			
Pronominal subject	epidhi	aftos ithele	na aghorasi	efimeridha
	because	he wanted.3Sg	to buy	newspaper
	“Because he wanted to buy a newspaper.”			
Lexical subject	epidhi	o kirios Jianis	ithele	na aghorasi efimeridha
	because	the Mr. Jianis. Nom	wanted.3Sg	to buy newspaper
	“Because Mr. Jianis wanted to buy a newspaper.”			

In the WF condition, objects were coded based on their form as (single) clitics, Clitic Left Dislocations (CLLD), pronominal, lexical, or null/omitted (Table 3). All responses with object clitics were coded as correct and given a value of “1,” and all remaining responses were coded as incorrect and were given a value of “0.”

Table 3. Range of responses in wide focus (WF).

Object clitic	Tin eskise to aghori It. Obj.Cl tore.3Sg the boy.Nom “The boy tore it.”
CLLD	Tin efimeridha tin eskise to aghori the newspaper. Acc it. Obj.Cl tore.3Sg the boy.Nom “Literally: The newspaper, the boy tore it.”
Null/omitted objects	To aghori eskise The boy. Nom tore.3Sg “The boy tore.”
Pronominal object	To aghori eskise aftin The boy. Nom tore.3Sg it. Acc “The boy tore it.”
Lexical object	To aghori eskise tin efimeridha the boy. Nom tore.3Sg the newspaper. Acc “The boy tore the newspaper.”

Note. CLLD: clitic left dislocations.

Finally, in the EI and the OR conditions subjects were coded based on their placement as post-verbal, preverbal, and null/omitted (Tables 4 and 5). All responses with VS were coded as correct and were given a value of “1,” whereas responses with preverbal or null/omitted subjects were coded as incorrect and were given a value of “0.”

Table 4. Range of responses in embedded interrogatives (EI).

Postverbal subject (VS)	Dhen thimate ti majirepse i Maria Neg remember.3Sg what cooked.3Sg the Maria. Nom “She doesn’t remember what Mary cooked.”
Preverbal subject (SV)	Dhen thimate ti i Maria majirepse Neg remember.3Sg what the Maria. Nom cooked.3S “She doesn’t remember what Mary cooked.”
Null subject (V)	Dhen thimate ti majirepse Neg remember.3Sg what cooked.3Sg “She doesn’t remember what she/he cooked.”

Table 5. Range of responses in object relatives (OR).

Postverbal subject (VS)	Mas dhichni to paghoto pu troi i Evi. to.us show.3Sg the ice-cream that eat.3Sg the Evi.Nom “He is showing to us the ice-cream that Evi is eating.”
Preverbal subject (SV)	Mas dhichni to paghoto pu i Evi troi. to.us show.3Sg the ice-cream that the Evi. Nom eat.3 “He is showing to us the ice-cream that Evi is eating.”
Null subject (V)	Mas dhichni to paghoto pu troi. to.us show.3Sg the ice-cream that eat.3Sg “He is showing to us the ice-cream that she/he is eating.”

Incomprehensible responses, responses that did not represent the target structure, and responses with missing verbs or English verbs were coded as “NA” and were excluded from calculation. This amounted to 4% of the data for the monolingual group (2.4% in EI; 1.3% in OR; 0.2% in WF; and 0.1% in TC), 9% of the data for the younger monolingual group (4.71 % in TC, 3.62% in OR; 0.43% in EI, and 0.21% in WF), and 18.4% of the data for the heritage group (8.38% in OR, 5.1% in TC, 2.44% in EI, and 2.44% in WF). As is made evident by the percentages, the higher rate of NAs in the case of HS was triggered primarily by the OR and the TC conditions. In the OR condition, HS occasionally resorted to less complex structures such as subject relatives (e.g., *O Nikolas mas dhichni to paghoto pu lioni* “Nicholas is showing to us the ice-cream that is melting”) or object relatives with co-referential null subjects (e.g., *O Nikolas_i mas dhichni to paghoto pu Ø_i theli* “Nicholas_i is showing to us the ice-cream that *pro_i* wants”). In the TC condition they occasionally resorted to the more colloquial *jia na* “to” structure (e.g., *O kirios Jianis pije sto periptero jia na aghorasi efimeridha* “Mr. Jianis went to the kiosk to buy a newspaper”). The same alternative structures were attested in the language of our YMS (though to a lesser degree).

Procedures

Participants were tested in their homes or at their Greek schools by a Greek–English bilingual researcher. They participated in an hourly session that included a battery of tasks consisting of a video/audio-recorded sentence completion task (used to test subject/object form and subject placement in Greek), and two vocabulary tasks (used to assess their proficiency in English and Greek). Parents were administered the questionnaire over the phone, through face-to-face interviews, or were asked to complete it on their own.

Data analysis

Statistical analyses for this study were carried out using R (version 4.0.2; R Core Team, 2020). More specifically:

To compare the three groups in accuracy (research question 1), we first explored our results descriptively and subsequently we ran two mixed-effects logistic regression models with a binomial distribution using the *lme4* package (version 1.1-23; Bates et al., 2015). The first model focused on the conditions targeting subject/object form (TC and WF), whereas the second one focused on the conditions targeting subject placement (EI and OR). In both models, participants’ accuracy was the binary outcome variable with values 1 for correct or 0 for incorrect. Fixed effects included: group (a three level factor), condition (a two level factor), and the interaction between

group and condition. To the extent that this was possible, the random effect structure included by-subject and by-item random intercepts. When the models did not converge, models with by-subject random intercepts only were run. After the random-effects structure was established, we followed backwards selection of the fixed effects. At each step, the reduced model was compared with the previous model using a log likelihood ratio test with the *anova* function, and the reduced model was retained when it did not entail a significant loss of model fit.

To investigate error patterns (research question 2), we started again with a descriptive exploration of our data. However, due to the categorical nature of the participant responses, we did not proceed to any further statistical analysis.

Finally, to investigate the effect of age on heritage children's accuracy (question 3), we employed a mixed-effects logistic regression and ran two models: one for the conditions targeting form (TC and WF) and another one for the conditions targeting placement (EI and OR). Heritage children's accuracy was again the binary outcome variable (correct, incorrect). Fixed effects included condition (a two-level factor), age (continuous factor), and their interaction. In addition, taking into consideration that in heritage contexts age may be conflated with a number of individual differences, we included generation, AoA, and current amount of Greek language use as covariates. Both age and amount of Greek language use were centered around 0 and standardized using the *scale* function from the base package. To establish the random effect structure and the optimal model, we followed the same procedures as the ones described above.

Visualizations of the groups' accuracy (question 1) and the interactions between age and condition (question 3) were obtained using the *ggplot* (Wickham, 2016) and the *interactions* packages (Long, 2019), respectively.

Results

Accuracy

Figure 5 shows that all three groups chose primarily felicitous null subjects and object clitics (in TC and WF) and grammatical VS (in EI and OR). However, HS had a variable performance, differing in this regard from both YMS, who were at ceiling in TC and WF, and from MS who were at ceiling across all four conditions.

To investigate whether the observed differences are statistically significant, we ran two mixed-effects logistic regression models: one for the conditions targeting subject/object form (TC and WF) and another one for the conditions targeting subject placement (EI and OR) (for details, see the "Data analysis" section).

In the model targeting the form of referential expressions, there was a main effect of group and condition.⁴ More precisely, HS (but not YMS) had a significantly lower accuracy than MS, whereas changing the reference level revealed that HS were also significantly less accurate than YMS (estimate = -5.970, *SE* = 1.456, *z* value = -4.099, *p* < .001). Furthermore, accuracy in the WF condition was significantly lower than accuracy in the TC condition. The estimates of the model are presented in Table 6.

In the model targeting placement, there was a significant effect of Group with both HS and YMS having a lower accuracy than MS. Changing the reference level revealed that HS were also less accurate than YMS (estimate = -3.877, *SE* = 1.192, *z* = -3.251, *p* = .001). In addition, there was a significant interaction between the HS group and condition. The latter was because HS's performance was modulated by condition (it was lower with object relatives than with embedded interrogatives), which was not found in the monolingual groups. The estimates of the model are presented in Table 7.

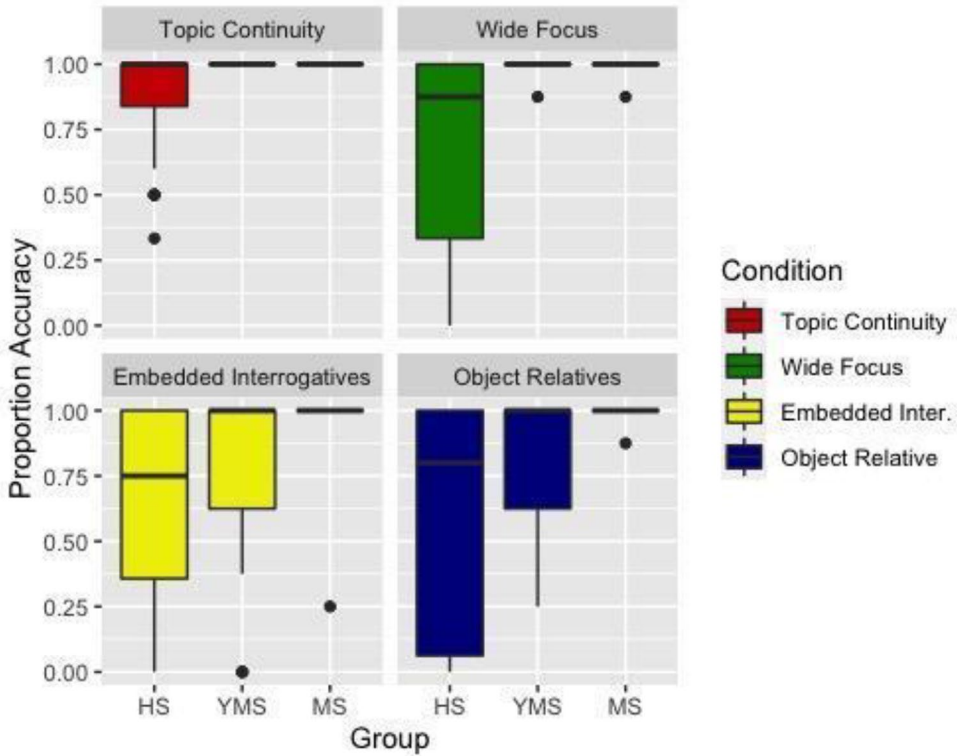


Figure 5. Accuracy with subject/object form and placement in heritage (HS), monolingual (MS), and young monolingual speakers (YMS).

Table 6. Mixed-effects regression model predicting participants' accuracy with argument expression (subject/object expression) as a function of group (reference level = monolingual speakers) and condition (reference level = subject expression in topic continuity).

	Estimate	Standard error	Z value	p
(Intercept)	10.899	1.518	7.17	<.001***
Heritage speakers	-6.083	1.442	-4.21	<.001***
Young monolingual speakers	-0.113	1.935	-0.05	.953
Wide focus	-2.753	0.532	-5.170	<.001***

Note: *** = $p < .001$.

Types of errors

Having established the group differences with respect to accuracy, we moved on to determine group differences in error patterns. Descriptive results revealed a nearly categorical divide between the heritage and the two monolingual groups, which rendered further statistical exploration unnecessary.

Specifically, in the conditions targeting subject/object form (Tables 8 and 9), non-felicitous lexical DPs were produced almost exclusively by the heritage group (9.7% in TC; 26.6% in WF). There were only two instances of non-felicitous lexical DPs in the monolingual groups (one in the

Table 7. Mixed-effects regression model predicting speakers accuracy with argument placement as a function of group (reference level= monolingual speakers) and condition (reference level= subject placement in topic embedded interrogatives).

	Estimate	Standard error	Z value	p
(Intercept)	6.803	1.015	6.704	<.001***
Heritage speakers	-4.962	1.088	-4.562	<.001***
Young monolingual speakers	-3.877	1.193	-3.251	.001**
Object relatives	2.703	1.569	1.722	.085
Heritage speakers × object relatives	-3.636	1.594	-2.282	.022*
Younger monolingual speakers × object relatives	-2.769	1.602	-1.728	.084

Note: *** = $p < .001$; ** = $p < .01$; * = $p < .05$.

Table 8. Subject form in topic continuity contexts (by Group).

Group	Descriptives	Null Pro	*Overt Pro	*Lexical
Monolingual speakers	M	100%	0%	0%
	SD	0	0	0
Younger monolingual speakers	M	100%	0%	0%
	SD	0	0	0
Heritage speakers	M	90.2%	0%	9.7%
	SD	0.164	0	0.164

Note. *Dispreferred or ungrammatical option; SD: standard deviation.

Table 9. Object form in wide focus contexts (by group).

Group	Descriptives	CLITIC ⁵	*Overt Pro	*Lexical	*Null
Monolingual speakers	M	99.5%	0%	0.4%	0%
	SD	0.022	0	0.022	0
Younger monolingual speakers	M	99.5%	0%	0.4%	0%
	SD	0.023	0	0.023	0
Heritage speakers	M	69.5%	0%	26.6%	3.8%
	SD	0.401	0	0.366	0.099

Note. *Dispreferred or ungrammatical option; SD: standard deviation.

younger and another one in the older group), and no instance of non-felicitous overt pronominals in any of the three groups.

Accordingly, in the conditions targeting subject placement (Tables 10 and 11), ungrammatical SV were only produced by heritage speakers (34.5% in EI; 40.3% in OR). YMS produced a rate of non-felicitous null subjects (21.8% in EI; 23.5% in OR), and so did monolingual speakers, though to a much lesser degree (2.6% in EI; 0.4% in OR).

Age effects in the heritage group

Finally, to examine the effect of age on accuracy, we focused on the heritage group. We ran two mixed-effects logistic regression models (one for Form and another one for Placement), with the same three covariates: AoA, generation, and amount of Greek language use.

Table 10. Subject placement in embedded interrogatives (by group).

Group	Descriptives	VS	*SV	*Null
Monolingual speakers	M	97.3%	0%	2.6%
	SD	0.141	0	0.141
Younger monolingual speakers	M	78.1%	0%	21.8%
	SD	0.326	0	0.326
Heritage speakers	M	65.4%	34.5%	0%
	SD	0.378	0.378	0

Note. *Dispreferred or ungrammatical option; SD: standard deviation.

Table 11. Subject placement in object relatives (by group).

Group	Descriptives	VS	*SV	*Null
Monolingual speakers	M	99.5%	0%	0.4%
	SD	0.228	0	0.228
Younger monolingual speakers	M	76.4%	0%	23.5%
	SD	0.288	0	0.288
Heritage speakers	M	58.5%	40.3%	1%
	SD	0.444	0.439	0.06

Note. *Dispreferred or ungrammatical option; SD: standard deviation.

Table 12. Mixed-effects regression model predicting heritage speakers' accuracy with subject/object form as a function of condition (reference level = topic continuity), age, and generation.

	Estimate	Standard error	Z value	p
(Intercept)	5.918	0.980	6.037	<.001***
Wide focus	-3.158	0.575	-5.491	<.001***
Age	-0.808	0.498	-1.624	.104
Generation 2.5	0.262	1.068	0.246	.805
Generation 3	-2.697	1.120	-2.408	.016*
Scale age × wide focus	0.996	0.309	3.217	.001**

In the first model, there was an interaction between age and condition, in that performance increased with age in the case of WF but not in the case of TC. Furthermore, there was a main effect of condition (TC more accurate than WF), and generation (Generation 2 more accurate than Generation 3), but no effect of Amount of Greek Language Use or AoA. The optimal model is given in Table 12, whereas the visualization of the interaction between age and condition is given in Figure 6.

In the model targeting placement, there was a positive effect of age, of condition (EI more accurate than OR), of generation (Generation 2 more accurate than Generation 3) and Amount of Greek language use, but no effect of AoA. Furthermore, there was interaction between age and condition (Figure 7).

Because the model with the interaction was not a better fit than the model without the interaction ($\chi^2=0.342, p=.558$), the simplest model was retained (Table 13).

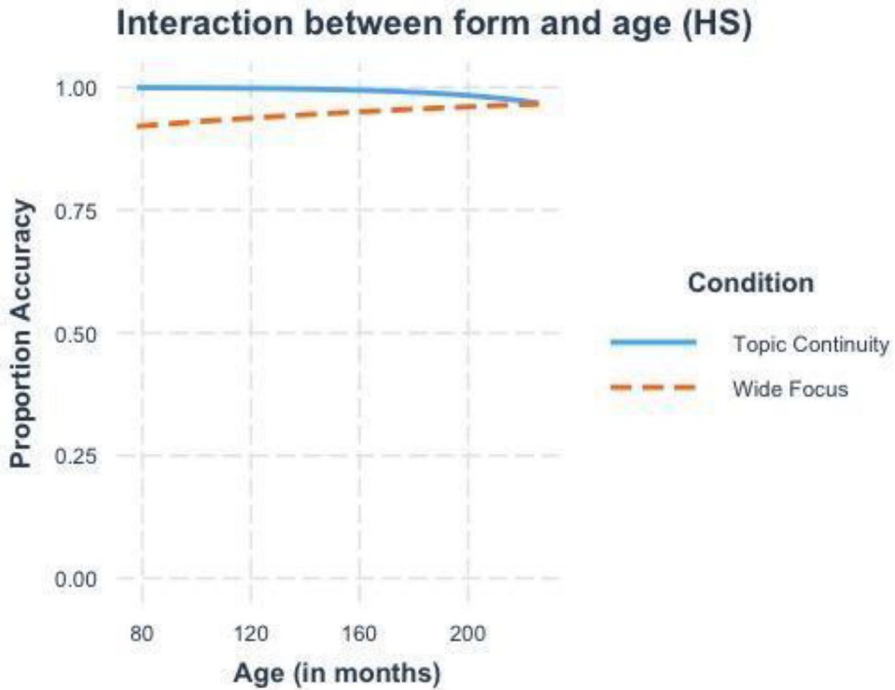


Figure 6. Interaction between age and conditions targeting form (TC and WF).

Discussion

This study had two main objectives: First, to determine whether differences in accuracy between heritage speakers (HS) and monolingual speakers (YMS and MS) signal differences in the rate or in the path (i.e., the stages) of development. Second, to determine whether, independently of differences/similarities in developmental paths, HS become more accurate as they grow older and accumulate more heritage language (HL) input. To this end, we focused on two domains that are encoded differently in Greek and English: (1) subject/form in reference maintenance contexts (where null subject and object clitics are the appropriate option in the monolingual variety); (2) subject placement in embedded *wh*-dependencies (where VS are the appropriate option in the monolingual variety). Differently from previous studies on HL acquisition, though, we analyzed data not only from aged-matched heritage and monolingual speakers, but also from younger monolingual children. Furthermore, we tested the effect of age, while taking into consideration potentially interfering variables such as AoA, generation, and amount of current HL use at home. The inclusion of the younger monolingual group enabled us to determine if monolingual children were also challenged by these domains (only earlier in their language development), and if so, whether they made the same types of errors. The inclusion of age as a predictor of heritage speakers' accuracy enabled us to determine whether the different patterns produced by heritage speakers persisted over time. In what follows, we will first summarize our results per research question and we will then consider their implications.

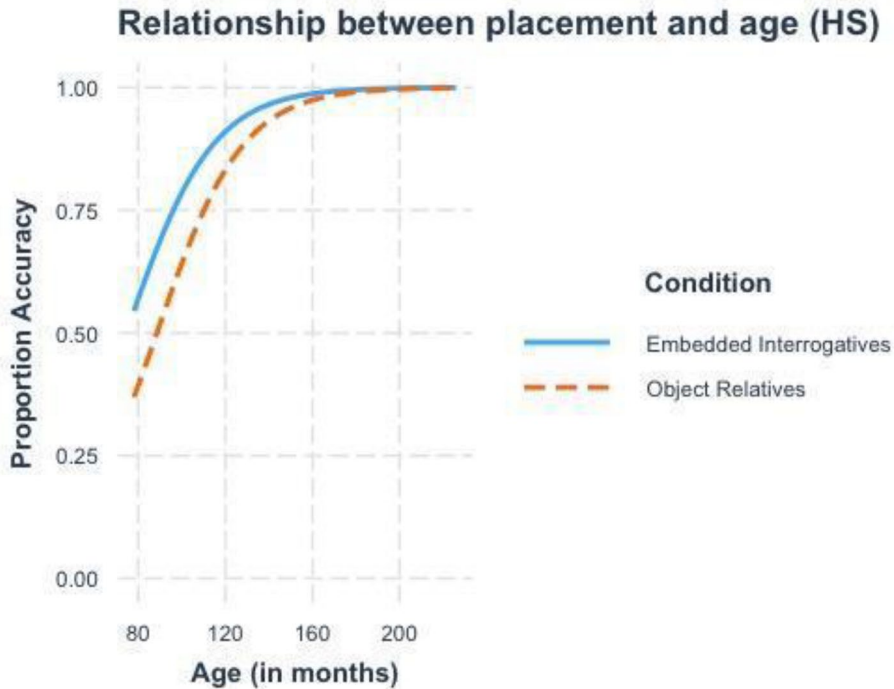


Figure 7. Relationship between age and conditions targeting placement (EI and OR).

Rate of accurate responses

In terms of accuracy rates, results revealed quantitative differences between the heritage and the two monolingual groups, across conditions. Specifically, in the conditions targeting subject/object form in reference maintenance contexts (TC and WF), HS had a lower accuracy than both YMS and MS, whereas no statistical difference emerged between YMS and MS. Rather, both monolingual groups were at ceiling in producing almost exclusively pragmatically felicitous null subjects and object clitics. In this regard, the evidence from our sentence completion task is in line with the evidence from previous naturalistic studies showing that young monolingual children (speakers of Greek) produce a high rate of felicitous null subjects and object clitics from very early on (for subject forms, see Kapetangianni, 2011 and Tsimpli, 2005; for object forms, see Marinis, 2000, Sinopoulou-Pavlatou, 2005 and Tsimpli, 2005).

In the conditions targeting subject placement (EI and OR), a different pattern emerged as both HS and YMS had a lower accuracy than MS (though HS were still less accurate than YMS). At first, this might be taken to suggest that “subject–verb” inversion might be challenging for both the YMS and the HS Group (contrary to the preliminary evidence discussed in our introduction). However, inspection of the error patterns produced by YMS (subjects omissions rather than misplacements) suggests that, at least in their case, the lower accuracy is more likely due to the cognitive demands associated with the task. This is an explanation we will discuss in more detail in our next section.

In addition to the effect of group, which was the variable of main interest in the present study, there was also an effect of condition that needs to be discussed. To begin with the conditions

Table 13. Mixed-effects regression model predicting heritage speakers' accuracy with subject placement as a function of condition (reference level = embedded interrogatives), age, and amount of Greek language use.

	Estimate	Standard error	Z value	p
(Intercept)	2.783	0.936	2.971	.02**
Object relatives	-0.714	0.258	-2.768	.005**
Scale (age)	1.578	0.458	3.442	.0005***
Scale (amount of Greek language) use	1.220	0.463	2.632	.008**
Generation 2.5	-0.191	1.085	-0.176	.860
Generation 3	-2.868	1.245	-2.303	.021*

targeting subject/object form, accuracy in WF was lower than accuracy in TC, which means that, in reference maintenance contexts, HS were more likely to produce illicit lexical objects rather than illicit lexical subjects. A higher rate of illicit lexical objects (compared with illicit lexical subjects) has also been reported in a number of studies using narratives (Andreou et al., 2015; Serratrice, 2007b) and could be related to the inherent complexity of object clitics in Romance languages and Greek. Clitics are complex in the sense that they require the coordination of pragmatic knowledge (related to their discourse distribution), morphological knowledge (related to their inflection), and syntactic knowledge (related to their placement). These difficulties could be further accentuated in language contact contexts, especially when the majority language lacks an equivalent structure (for an explanation along these lines, see Serratrice, 2007b).

Conditions targeting subject placement also showed a difference, with accuracy being lower in OR than in EI. What this means is that HS were more likely to use ungrammatical SV in ORs rather than in EIs. The observed discrepancy could be due to the fact that, unlike EIs, ORs allow SV in certain marked contexts, including ORs with adjuncts at the end of the sentence (Guasti et al., 2012) and ORs where the subject bears contrastive focus. The presence of OR contexts, where SV are acceptable may have reinforced heritage children's tendency to use SV in ORs, in which a VS would actually be the grammatical option.

Error patterns

The heritage-monolingual differences were not only quantitative. In terms of error patterns, results also revealed a nearly categorical divide between HS, on one hand, and YMS and MS, on the other hand, across all four conditions.

In the conditions targeting subject/object forms, only HS produced a rate of errors and these consisted of lexical DPs rather than overt pronouns. Note that the replacement of null subjects/object clitics with lexical DPs instead of (or in addition to) overt pronouns has been reported for other bilingual populations (both heritage and L2), though the relative proportion of lexical DPs as opposed to overt pronouns varies, depending on the language and/or the task (for Italian-English, see Serratrice, 2007a, 2007b; for Italian-German, see Torregrossa & Bongartz, 2018; for Greek-German, see Andreou et al., 2015; for Greek-English, Greek-German, and Greek-Albanian, see Torregrossa et al., 2021; for Spanish-English, see Montrul, 2018 and Montrul & Sánchez-Walker, 2015; for L2 English, see Arche & Domínguez, 2011; Cuza et al., 2013; Sánchez & Al-Kasey, 1999). In Greek, in particular, the avoidance of third person overt pronouns could be related to their morphological and semantic properties: being morphologically demonstratives with a salient

deictic reading, they may resist a reference maintenance interpretation (Giannakou & Sitaridou, 2020).

Turning to the conditions targeting subject placement, errors were produced by both the HS and YMS, but they were of a different type: Whereas in the case of HS they consisted primarily of SV, in the case of YMS, they consisted exclusively of null/omitted subjects (see Tables 10 and 11). Recall from our literature review that similar results were reported in Cuza's (2016) study of obligatory "subject-verb inversion" in Spanish interrogatives. Using an elicited production task, the author found that school-aged bilingual children (who were heritage speakers of Spanish in the United States) were more likely to produce ungrammatical SV, as opposed to same-aged monolingual children, who were more likely to omit the subject altogether.

What could underlie the different error patterns produced by YMS and heritage speakers? YMS' tendency to omit subjects (and more generally to use underspecified pronominal forms) in contexts where a full lexical DP would be the preferred option has been independently reported in the literature (e.g., Leclercq & Lenart, 2013) and has been associated with considerations of cognitive maturity, such as difficulties with perspective taking and limited working memory (on the role of cognitive abilities in the acquisition of reference, see, for example, De Cat, 2015). In our study, for instance, children were expected to take the experimenter's perspective into consideration, who pretended not to know the action taking place or the agent of the action.

Heritage speakers' error patterns, on the other hand, could be attributed to conditions that are unique to the bilingual experience, since they were not attested in the Greek monolingual speakers tested in the present study or reported in previous research. At least three possibilities can be entertained. First, they could be the result of cross-linguistic influence from English, a language that prefers overt pronouns in reference maintenance contexts and SV in embedded *wh*-movement dependencies (Argyri & Sorace, 2007; Cuza, 2016). A second possibility is that heritage speakers, due to the cognitive load of dealing with two languages, resort to structures that facilitate processing (Sorace, 2011). These could be structures favoring overspecified referential forms (such as lexical DPs or strong pronouns) (for variants of this explanation, see Sorace & Serratrice, 2009; Sorace et al., 2009; Torregrossa et al., 2021; Torregrossa & Bongartz, 2018) and non-variable word orders (Scontras et al., 2015). Third, it is also possible that heritage speakers are exposed to a contact variety that is richer in lexical arguments and SV than the variety spoken in the country of origin. For instance, Paradis and Navarro (2003) reports an overuse of non-felicitous overt subjects in Spanish not only in the language of Spanish-English bilingual children, but also in the language of their parents. Accordingly, Daskalaki et al. (2020) report that both children (who are heritage speakers of Greek) and parents overuse SV in Greek declaratives (though not in the structures targeted in the present study).

These three possibilities are not mutually exclusive, since a grammatical option that is "efficient from a processing perspective" could be further reinforced by the properties of the majority language, as well as by the properties of HL input HS are exposed to. To determine the relative effect of these factors, one would either have to target Greek structures that differ in the degree of dissimilarity with English (see, for instance, the study design of Cuza, 2016 for Spanish) or to study Greek under the influence of both typologically dissimilar languages (such as English) and typologically similar languages (such as Spanish or Italian, which are also null-subject/object clitic languages with VS in *wh*-dependencies) (see, for instance, the study design of Torregrossa et al., 2021). For instance, Torregrossa et al. (2021) found that Greek-German and Greek-English bilingual children (whose other language was a non-null subject, non-object clitic language) produced a higher rate of non-felicitous lexical subjects than Greek-Albanian bilingual children (whose second language was a null subject, object clitic language), suggesting that cross-linguistic influence might not be the sole or primary reason for the use of non-felicitous lexical DPs by HS.

Age and heritage language development

Having determined the heritage—monolingual differences in accuracy rates and error patterns, we examined the effect of age (at time of testing) on HS's accuracy, while including three potentially interfering factors as covariates: AoA, Generation, and current amount of HL use.

Age emerged as a positive predictor in three out of the four conditions that we tested. At the age of seven, HS, as a group, were on average 90% accurate with object clitics in WF, 35% accurate with VS in EI, and 55% accurate with VS in OR. By the age of 17, they had a ceiling performance in all three conditions (95%, 100%, and 100%, respectively) (Figures 6 and 7). By contrast, there was no significant age effect with null subjects (in TC). Whereas this result might seem puzzling, we need to keep in mind that in this specific condition, accuracy was very high from very early on. As depicted in Figure 6, children as young as 7 years were already 100% accurate with null subjects.

Turning to the effect of the covariates, AoA emerged as non-significant, possibly due to the fact that most of our participants (50/ 61) were exposed to the majority language, between the ages of 3 and 4 years old. Generation was a significant predictor across conditions: Speakers that belonged in more recent generations of immigration (i.e., 2/2.5 generation), and who were, therefore, more likely to use their HL on a daily basis, were more accurate than third-generation speakers (in line with results reported in Daskalaki et al., 2020 and Flores et al., 2017). Amount of current HL use at home emerged as a positive predictor in the conditions targeting placement, but not in the conditions targeting form. It may be that subject/object form in reference maintenance contexts, being a relatively simple and early acquired structure is less affected by HL input at the time of testing than embedded *wh*-dependencies that are syntactically more complex and later acquired (on early and late acquired phenomena and their expected reliance on input, see Tsimpli, 2014). It may also be that the effect of input quantity is conflated with the effect of input quality. As mentioned in our previous section, at least in the case of referential form, there is evidence that HS may be exposed to a type of input that includes an increased rate of lexical subjects/objects, which, in turn, may interfere with the effects of input quantity.

Overall, our results suggest that, independently of monolingual-heritage differences in the path and rate of development, heritage speakers' accuracy may continue to increase as they grow older and accumulate more HL input (in line with results reported in Flores et al., 2017, Jia & Paradis, 2020 and Sorace et al., 2009). At the same time, they suggest that “the positive age effect” does not come for free, but it appears to interact with both quantitative and qualitative aspects of the input.

Limitations and further research

Last but not least, it is important to acknowledge a number of limitations with our study design. First, in our study we focused on two phenomena that are encoded differently in Greek and English. Further research is required to show if bilingualism may lead to differences in the path of development, independently of the typological properties of the involved languages. Second, we need to keep in mind that our conclusions are based on the performance of a group of young monolingual children, whose age ranges from 3;6 to 5;9. Whether the phase of non-felicitous DPs or ungrammatical SV is attested at an even earlier developmental stage is a question that deserves further investigation. A further issue concerns the conditions targeting subject placement. In our study we targeted ORs and EIs with animate subjects and inanimate objects (e.g., *dhen thimate ti efaje o Nikolas*: “she doesn't remember what Nicholas ate”). Future studies could also explore whether the heritage-monolingual difference with respect to subject placement will be replicated with even more demanding ORs and EIs involving reversible actions (e.g., *dhen thimate pjon kalese o*

Nikolas: “She doesn’t remember who Nicholas invited”). It is, in principle, possible that even monolingual children will resort to ungrammatical SV word orders, when animacy does not disambiguate who is doing what to whom (see, for example, Chondrogianni & Schwartz’s (2020) comprehension study).

Conclusion

To conclude, our results are consistent with the hypothesis that child heritage speakers may go through developmental stages not attested in L1 acquisition. More precisely, we did not find any evidence that monolingual children go through a phase of overextending the use of lexical DPs in reference maintenance contexts. Rather, young monolingual children consistently used felicitous null-subjects and object clitics. Accordingly, we did not find any evidence that monolingual children go through a phase of producing SV in contexts of obligatory subject–verb inversion. Even though younger monolingual children had a lower accuracy rate than older monolingual children, this was due to subject omission errors. It follows that exposure to a language since birth does not guarantee a monolingual-like path of development, and that input factors, cross-linguistic influence, and/or the cognitive demands related to bilingualism may actually lead to a qualitatively different developmental trajectory. At the same time, though, differences in developmental trajectories do not necessarily entail differences in the outcome of acquisition. The positive effect of age in our study suggests that, at least in some domains, child heritage speakers may ultimately acquire the target structures, provided that they continue using their HL.

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Notes

1. The following abbreviations are used: 3 (third person), Acc (Accusative), Cl (clitic), Neg (Negation), Nom (Nominative), Obj (Obj), Poss (Possessive), Sg (Singular).
2. Our group of heritage speakers coincides with Daskalaki et al. (2019) except for one child who was replaced due to young age and another two children who were replaced due to more than 50% of missing responses.

3. Of these four conditions, the TC and the EI were borrowed from previous versions of the task; the WF was modified so that it targets object form rather than subject placement; and the EI was added for the purposes of the present study.
4. The model with the interaction between the two conditions did not converge, possibly due to the ceiling effects of the monolingual groups.
5. The category CLITIC includes both clitic and clitic left dislocation (CLLD) constructions. The breakdown per group is as follows: MS used 91.19% clitics and 8.39% CLLD; YMS used 99.53% clitics and 0% CLLD; HS used 60.38% clitics and 9.18% CLLD.

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