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Sources of variability in the acquisition of Differential Object Marking by Turkish heritage language children in the United States

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Research Article

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Abstract

Differential object marking (DOM) is an area of vulnerability in adult heritage speakers. This study traces such vulnerability to childhood by examining Turkish DOM in child Turkish heritage speakers in the U.S and the parental generation, who are the main input providers. Twenty first-generation immigrants, 20 adult and 20 child (aged 7–14) Turkish heritage speakers, and the monolingual group including 20 Turkish-speaking adults, 20 7–14-year-old and 20 3–6-year-old Turkish-speaking children in Turkey completed a story retelling task and a picture selection task. Results showed that the first-generation immigrants patterned with the monolingual adults. However, the heritage speakers (children and adults) omitted DOM in both tasks, showing more variable performance than the monolingual groups. These findings suggest that instability of DOM in heritage grammars is more likely due to insufficient input in the early years of heritage language development than to changes in parental input or attrition in later years.

Introduction

Heritage speakers are early bilinguals who acquire a minority language in a bilingual setting where the socio-politically majority language is spoken by the community (Montrul, 2015; Valdés, 1995). Since extensive exposure to the majority language takes place in childhood, heritage speakers are exposed to less input in their native language (the heritage language) than a typical monolingual child. They can also be exposed to qualitatively different input because they are growing up in a language contact situation. Research has shown that the language development of heritage speakers is significantly affected by changes in input, leading to partial or incomplete acquisition of specific aspects of the heritage grammar (Montrul, 2002, 2004; Polinsky, 1997, 2011; Polinsky & Scontras, 2020; Silva-Corvalán, 2018).

Inflectional morphology has been consistently shown to be the most vulnerable area in adult heritage grammars (Montrul, 2016a; Polinsky, 2018). Adult heritage speakers show patterns of simplification, such as omission of required morphology in obligatory contexts, levelling of morphological paradigms, and overregularization of regular and default forms to irregular forms. Previous research has indicated that the quantity and quality of heritage language input received from adult caregivers in the early years is critical for their language development (Daskalaki, Blom, Chondrogianni & Paradis, 2020; Jia & Paradis, 2015; Montrul, 2008; Montrul & Sánchez-Walker, 2013; Sorace, 2005). However, even if full acquisition of certain properties takes place in childhood, heritage speakers might still undergo first language (L1) attrition in later childhood (Polinsky, 2011). Additionally, cross-linguistic influence from the majority language is yet another contributing force on the variability attested in adult heritage speakers (Argyri & Sorace, 2007; Kim, Montrul & Yoon, 2010; Montrul, 2008). Investigating the role of parental input quality on the acquisition of pre-verbal and post-verbal subject positions in Greek as a heritage language in Western Canada, Daskalaki et al. (2020) compared 27 mother-child dyads, consisting of 23 second-generation immigrant parents (adult heritage speakers born and raised in Canada) and 4 first-generation immigrant parents (born and raised in Greece). The results of an elicited production task indicated that the child heritage speakers (ages 6–18) showed variability in subject placement, and so did some of the second-generation immigrant parents, while the first-generation immigrant parents were target-like. Daskalaki et al. concluded that both quantity and quality of input may have an effect on the heritage language development of child heritage speakers (for a discussion on parental attrition, see Sorace, 2020), at least for children whose parents are heritage speakers as well. To investigate whether the same explanation applies to children (and eventually adults) of first-generation immigrant parents, research that directly examines these groups is needed. This is the focus of our study.

If longitudinal studies are not possible, one way to understand the root of morphological variability in adult heritage speakers amply reported in the literature is to examine children

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(Montrul, 2018). The present study contributes to this goal by investigating the acquisition of differential object marking (DOM) by second-generation child heritage speakers of Turkish and their first-generation Turkish immigrant parents, and by second-generation adult heritage speakers using a story retelling task and a picture selection task. Monolingual adults and children in Turkey are the comparison groups. DOM is the overt marking of direct objects that are semantically and pragmatically prominent (Bossong, 1991), and this phenomenon has been shown to exhibit significant variability in language contact-situations (Mardale & Montrul, 2020), including in heritage speakers of Spanish (Montrul, 2004; Montrul & Bowles, 2009; Montrul & Sánchez-Walker, 2013), Hindi (Montrul, Bhatt & Bhatia, 2012) and Romanian (Montrul, Bhatt & Girju, 2015). Adult heritage speakers whose majority language does not exhibit DOM (such as English or French) show high rates of omission of DOM in required contexts in the heritage language (Montrul, 2004; Montrul & Bowles, 2009; Montrul & Sánchez-Walker, 2013) and use DOM in a non-target-like manner in both comprehension and production (Chung, 2020). Therefore, if child heritage speakers also display significant variability in their production and comprehension of DOM as compared to their parents (first-generation immigrants), then it is likely that insufficient input may underlie such variability. However, if child heritage speakers show less variability than adult heritage speakers, then potential attrition of DOM in later years of language development may be at play (as in Polinsky, 2011). Finally, if first-generation immigrants show more variability compared to monolingual speakers in Turkey (a sign of attrition), then we can assume that parental input quality may contribute significantly to morphological variability in heritage speakers. The innovations of this study lie in the comparison of child heritage speakers of Turkish to their input providers (their first-generation immigrant parents) and to adult heritage speakers, as well as the use of both comprehension and production measures.

Heritage language acquisition of DOM

The marking of direct objects (DOs) is realized differently in languages with overt case-marking of DOs (Bossong, 1991; Comrie, 1975). In these languages, only a subset of DOs receives overt morphological marking. This phenomenon is called differential object marking (DOM), and it is regulated by syntactic, semantic or pragmatic prominence of DOs that must be distinguished from subjects (Aissen, 2003).

Despite its inherent complexity and variability in contexts of use, DOM is usually mastered around age 3 by monolingual children of diverse languages (Mardale & Montrul, 2020), but it remains difficult to master in bilingualism. In one of the earliest studies investigating knowledge of DOM in adult heritage speakers of Spanish, Montrul (2004) reported on the oral production of 24 intermediate and advanced heritage speakers as well as 20 Spanish-speaking adults. Findings revealed that heritage speakers omitted obligatory DOM (*a* marking) with animate, specific objects between 20% and 40% of the time. In a follow-up study, adult heritage speakers of Spanish with different proficiency levels completed an elicited production task and a written acceptability judgement task (Montrul & Bowles, 2009). High variability was observed in both production and judgments of DOM even in the heritage speakers with advanced proficiency in Spanish. Montrul and Sánchez-Walker (2013) compared child and adult Spanish heritage speakers and first-generation Spanish immigrants in the U.S. as well as monolinguals from Mexico using two oral production tasks. Results indicated that all bilingual groups showed high rates of DOM omission in required contexts compared to the speakers in Mexico. Based on these findings, Montrul and Sánchez-Walker (2013) concluded that transfer from English, potential attrition in first-generation immigrants and incomplete acquisition in childhood due to reduced input all play a role in the acquisition of DOM in Spanish heritage speakers.

Omission of DOM in obligatory contexts has also been observed in adult heritage speakers of other DOM languages, such as Hindi and Romanian, in contact with English. In Montrul et al. (2015), Spanish, Romanian and Hindi heritage speakers and first-generation immigrants residing in the U.S. as well as age-matched homeland native speakers in Mexico, Romania and India, respectively, completed a bimodal acceptability judgement task. Results revealed that heritage speakers of Romanian and Hindi showed variability in their acceptance of DOM omission whereas first-generation Hindi- and Romanian-speaking immigrants were monolingual-like. Spanish first- and second-generation immigrants (heritage speakers), on the other hand, showed higher variability in their judgements, displaying similar performance to those in Montrul and Sánchez-Walker (2013)'s study. Given the different levels of DOM erosion observed in the three bilingual groups, Montrul et al. (2015) suggested that the potential combined effects of transfer from English, quality of parental input as well as reduced input in the heritage language contributed to the degree of DOM erosion attested in the heritage languages.

In sum, DOM is a vulnerable grammatical domain in adult heritage speakers. Among the potential sources of this vulnerability, input quantity and quality in the early years of heritage language acquisition have been extensively discussed in the literature. However, previous studies have mostly reported on production data and have not been able to tease apart the potential effects of the quantity and the quality of parental input in the early years of language development. This was due to two main reasons: i) heritage speakers were predominantly adults at the time of testing, and ii) studies have included both first generation and second-generation immigrant parents, who might be considered heritage speakers themselves (Daskalaki et al., 2020), as representative of the parental input that child heritage speakers received, when in fact they are two very different populations based on their heritage language abilities. To identify the factors that play an important role in the early years of adult heritage speakers' acquisition of DOM, it is critical to examine their production and comprehension of this morphology in child heritage speakers and their parents (first-generation immigrants). Before presenting the details of our study, the next section describes DOM in Turkish.

Differential Object Marking in Turkish

Turkish is an SOV language with agglutinative morphology. DOs can be ± definite and ± specific. Indefiniteness is marked with the indefinite marker *bir* "a(n)", and the accusative marker *–(y)I* can co-occur with it. The presence/absence of the accusative marker *–(y)I* on the DO is optional and is determined by the specificity of the DO (Enç, 1991; von Heusinger & Kornfilt, 2005; Laszakovits, 2013): DOs are accusative-marked when they are specific and unmarked otherwise, and this variation is characterized as the DOM phenomenon (Aydemir, 2004; Dede, 1986; Erguvanlı-Taylan, 1984; von Heusinger & Kornfilt, 2005; Kornfilt, 1997;

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Lewis, 1967). Animacy is also considered to play a role in Turkish DOM, albeit a minor one (Erguvanlı-Taylan & Zimmer, 1994; von Heusinger & Kornfilt, 2005) because animate DOs are more likely to receive case-marking as compared to inanimate DOs (see also Krause & von Heusinger, 2019; Krause & Roberts, 2020 for a discussion on the role of animacy in Turkish DOM; cf. Bossong, 1985 for whom animacy plays no role in Turkish DOM).

The four types of DOs in Turkish are non-referential (incorporated), definite/specific, indefinite/non-specific and indefinite/specific, as shown in (1) below (Coskun Kunduz, 2018).

(1) a. Ebru elma yedi. (non-referential/incorporated)
Ebru apple eat.D.PAST.3SG[1]
'Ebru was eating an apple/apples.'
(Incorporated reading: 'Ebru was apple-eating.')
b. Ebru elma-yı yedi. (definite/specific)
Ebru apple-ACC eat.D.PAST.3SG
'Ebru ate the apple.'
c. Ebru bir elma yedi. (indefinite/non-specific)
Ebru a apple eat.D.PAST.3SG
'Ebru ate an apple.'
d. Ebru bir elma-yı yedi. (indefinite/specific)
Ebru a apple-ACC eat.D.PAST.3SG
'Ebru ate a (certain) apple.'

In (1a), the DO receives non-referential/incorporated reading given the absence of the accusative marker on it and refers to the category of apples in general. On the other hand, the case-marked DO in (1b) is interpreted as definite/specific, suggesting that the DO is identifiable to both the speaker and the hearer (Krause & Roberts, 2020). The use of the indefinite marker *bir* without case marking in (1c) indicates that the DO is indefinite and non-specific, referring to any member of the category of apples that is not identifiable to the hearer. Lastly, the indefinite article *bir* is combined with the accusative marker in (1d), which in turn implies that the DO receives a specific indefinite interpretation. That is, the DO is identifiable by the speaker, but not by the hearer. The case-marked DOs in (1b) and (1d) also receive a singular meaning since accusative-marking expresses a singular meaning in addition to specificity (Laszakovits, 2013).

Although accusative-marking denotes specificity when it appears on DOs in the pre-verbal (focus) position, it is not a reliable indicator of specificity when DOs are moved from that position (Erguvanlı-Taylan, 1984; von Heusinger & Kornfilt, 2005). This is because unmarked objects have to receive case-marking to scramble out of the pre-verbal (focus) position regardless of whether they are specific or not, as in (2) (Erguvanlı-Taylan, 1984, p. 26)

(2) a. *Murat bir kitap aceleyle okuyor.
Murat a book hurriedly read.PROG.3SG
'Murat is reading a book hurriedly.'
b. Murat bir kitab-ı aceleyle okuyor.
Murat a book-ACC hurriedly read.PROG.3SG
'Murat is reading a (certain) book hurriedly.'

Erguvanlı-Taylan (1984) argues that unmarked DOs must be adjacent to the verb; the occurrence of the adverb *aceleyle* 'hurriedly' between the DO and the verb results in ungrammaticality in (2a). However, when the DO is case-marked, it can scramble to the left of the adverb, as in (2b), even though it is not necessarily interpreted specifically.

In sum, specificity is the most important parameter for Turkish DOM: Specific DOs must be marked with the accusative marker in the immediately pre-verbal position. Animacy, on the other hand, is usually considered to play a minor or no role.

Although research on the L1 acquisition of Turkish DOM has revealed that the accusative marker is among the first nominal inflections to appear in the speech of Turkish-speaking children (Aksu-Koç & Slobin, 1985; Ekmekçi, 1979; Ketrez, 1999; Ketrez & Aksu-Koç, 2009), its use is mostly restricted to marking syntactic relations. In fact, full acquisition of its morpho-pragmatic properties does not occur until the age of 6, as revealed in comprehension studies (Ketrez, 2004, 2006, 2015; Ketrez & Aksu-Koç, 2009). Ketrez (2015) investigated the scope-taking properties of accusative-marked indefinite objects in Turkish in 4-, 5- and 6-year-old children using an act-out truth value judgement task with sentences uttered by a puppet. The children's task was to decide whether the puppet was right or wrong. The stimuli consisted of accusative-marked objects taking wide scope with respect to negation, as in (3), and non-case marked objects taking narrow scope, as in (4):

(3) Keçi bir çiçeğ-i yemedi.
goat a flower-ACC eat.NEG.D.PAST.3SG
'The goat did not eat a flower.' (=there is a flower such that the goat did not eat it)
(4) Keçi bir çiçek yemedi.
goat a flower eat.NEG.D.PAST.3SG
'The goat did not eat a(ny) flower(s).' (= no flower is eaten)

Results revealed that even 6-year-olds were unable to differentiate accusative-marked objects from bare objects with respect to their scope-taking properties. Ketrez attributed the observed difficulty to the complexity of DOM in Turkish and infrequent use of accusative-marked indefinites in child-directed speech.

The few studies that investigated DOM in first- and second-generation Turkish immigrants have examined the knowledge of the indefinite marker *bir* rather than DOM per se (Backus, Doğruöz & Heine, 2011; Felser & Arslan, 2019; Kupisch, Belikova, Özçelik, Stangen & White, 2017; Krause & Roberts, 2020). Şahin (2015), however, analyzed the Backus corpus of spoken Turkish (Doğruöz & Backus, 2009) and compared the use of the accusative marker *–(y)I* by monolingual Turkish speakers, first-generation Turkish immigrants (Turkish-dominant) and adult Turkish heritage speakers (Dutch-dominant) in the Netherlands. Results showed that of all the groups, the Dutch-dominant bilinguals performed the most variably overall with inflectional morphology, and particularly with the accusative marker *–(y)I*, while the Turkish-dominant bilinguals were target-like.

More recently, Krause and Roberts (2020) examined the effect of animacy on Turkish DOM in adult heritage speakers residing in Germany using an acceptability judgement task. According to the results, heritage speakers with higher proficiency in Turkish were monolingual-like whereas those with lower proficiency showed high variability in their judgments with respect to animacy. Krause and Roberts argued that variability in adult heritage speakers cannot be necessarily attributed to the simplification of heritage grammars under the influence of a dominant

[1]3SG: Third person singular, ACC: Accusative marker, DAT: Dative marker, D.PAST: Past tense *-DI*, NEG: Negation, LOC: Locative marker, PROG: Progressive marker

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language but may instead stem from finer semantic distinctions that these speakers make in the heritage language.

In sum, due to its inherent complexity and apparent variability in the input (as to when to mark or not mark objects), DOM in Turkish is not fully acquired until after the age of 6 by monolingual children. The few existing studies of adult Turkish heritage speakers in the European context also indicate that DOM remains a vulnerable area in adulthood.

Research questions

The purpose of the present study is to investigate the extent to which child and adult heritage speakers of Turkish (second-generation immigrants) who were born in the U.S. show variability and omission of DOM in Turkish as compared to first-generation immigrants (in most cases the parents of the children in the heritage group) as well as monolingual controls in Turkey. The target inflectional marker investigated is the accusative marker *–(y)I*; and the tasks employed are a story retelling task and a picture selection task. The following research questions guide our study:

1. Do first- and second-generation Turkish immigrants (child and adult heritage speakers) show variability in their comprehension and production of Turkish DOM as compared to monolingual controls?
2. Do child and adult heritage speakers perform differently from first-generation immigrants in their comprehension and production of Turkish DOM?
3. Does the performance of each group differ across the tasks?
4. Does age and experience with the language play a role in the monolingual and heritage children's morphological variability?

Based on previous research on the heritage language acquisition of DOM, we predict that Turkish DOM (i.e., the interaction between accusative marking and specificity) will pose challenges for child and adult heritage speakers. Additionally, animacy might play a minor role in Turkish DOM in these groups (Krause & Roberts, 2020). Turkish-speaking children master all the inflectional suffixes by the age of 6 (Aksu-Koç & Ketrez, 2003; Aksu-Koç & Slobin, 1985). However, it is possible that child (and eventually adult). Turkish heritage speakers (aged 7–14) may show significant variability supplying or omitting DOM in different contexts due to being exposed to insufficient (Montrul & Bowles, 2009) or different ("attrited") input (Daskalaki et al., 2020; Sorace, 2005) in the early years of their heritage language development or attrition in later years. As for first-generation immigrants, Montrul et al. (2015) found evidence of attrition of DOM in first-generation Spanish-speaking immigrants from Mexico, but no attrition effects in first-generation Romanian- and Hindi-speaking immigrants. Thus, it is an open question whether Turkish-speaking adult immigrants in this study will exhibit attrition of DOM as well.

Regarding the second research question, if first-generation immigrants are target-like as compared to child heritage speakers (in most cases their own children) and adult heritage speakers, then it is likely that the main cause of vulnerability in children (and eventually adults) is insufficient input during childhood. However, if first-generation immigrants differ from monolingual adults and show signs of attrition, then parental input quality may be assumed to contribute significantly to morphological variability (Daskalaki et al., 2020). Finally, if variability is observed in adult heritage speakers, but not in child heritage speakers, then potential attrition of DOM in later years of language development can be inferred.

As for the third research question, in principle we expect heritage speakers to perform similarly in production and comprehension, just like the adults. However, because the child heritage speakers were exposed to spoken Turkish, and because younger children tend to perform better on tasks of oral production as opposed to comprehension of morphology (Aksu-Koç & Slobin, 1985; Ketrez, 2015; Ketrez & Aksu-Koç, 2009), they may show higher accuracy in oral production than in comprehension. Finally, if morphological acquisition is affected by length of exposure to input in children, then younger children will show higher error rates than older children in both monolingual and heritage groups.

Methods

Participants

A total of 60 bilinguals were tested in this study: Twenty first-generation adult immigrants (M_{age} = 41.8, SD = 4.5, range = 33–50), 20 second-generation child Turkish immigrants (Mage = 10.4, SD = 2.8, range = 7–14) and 20 second-generation adult Turkish immigrants (Mage = 22, SD = 3.4, range = 18–30), as shown in Table 1. First-generation immigrants and child heritage speakers were recruited at a Turkish Community Sunday School in Chicago, while data from adult heritage speakers were collected through Zoom following Covid-19 social distancing guidelines. Therefore, the adult heritage group included participants from Chicago as well as the other parts of the U.S. Five out of 20 child heritage speakers had one non-Turkish-speaking parent, whose native language was English, Spanish or German. In addition, two children were living in single-parent families, and one child lived with her Turkish-speaking grandmother. Twelve first-generation immigrants were the parents of the 12 children in the child heritage group, whereas the remaining 8 of the children and adults in each group were unrelated. Out of 12 child-parent dyads, in which only one parent was tested, only two children had one non-Turkish speaking parent. Lastly, all the child heritage speakers in this group lived with their parents, who provided the majority of Turkish input for them.

All participants were asked to complete a background questionnaire. The immigrant parents were asked to complete two different language background questionnaires: one for themselves and one for their children. The questionnaires elicited information about the language used at home and in other contexts, age of first exposure to English, self-perceived proficiency and so forth (Montrul et al., 2012, p. 154).

The first-generation immigrants emigrated to the U.S. after puberty and have been living there for at least 8 years (M = 15, range = 8–26). All the heritage speakers were born in the U.S. except for two children who were born in Turkey but immigrated to the U.S. with their family before the age of 5. All the heritage speakers were exposed to Turkish at birth whereas their first exposure to English ranged between the ages 1 and 6 (M = 3.2; SD = 1.3) for child heritage speakers and between the ages 1 and 5 (M = 1.5; SD = 2) for adult heritage speakers. Regarding the amount of input and language use, the parents of 9 out of 20 child heritage speakers reported that they predominantly speak Turkish with their children at home, while 4 only speak English and 7 speak both English and Turkish. In addition, 9 child heritage speakers preferred speaking English at home,

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Table 1. Basic information about the participants

		United States (immigrants)			Turkey		
		First-generation immigrants	Adult heritage speakers	School-age child heritage speakers	Adults	School-age children	Younger children
N		20	20	20	20	20	20
Age (Years)	*M*	41.8	22	10.4	39.6	10.7	4.6
	Range	33–50	18–30	7–14	33–50	7–14	3–6
	SD	4.5	3.4	2.8	4.3	2	.89
AoA English	*M*	13.3	1.5	3.2	–	–	–
	Range	13–30	1–5	1–6			
	SD	3.8	2	1.3			
AoA Turkish		birth	birth	birth	birth	birth	birth
LoR US (years)	*M*	15	22	9.9	–	–	–
	Range	8–26	18–30	7–14			
	SD	4.4	3.4	2.7			
LoR Turkey (years)	*M*	26.8	–	.5	–	–	–
	Range	22–38	–	0–5			
	SD	3.9	–	1.5			

while 8 used both English and Turkish, and 3 preferred Turkish only. Furthermore, it was noted that 11 children do not watch TV in Turkish, and 7 do not do any readings (books, stories etc.) in Turkish. For all child heritage speakers, the medium of instruction at school was English; and therefore, even the predominantly Turkish-speaking parents indicated that they usually switched to English when they helped their children with the schoolwork. The sub-sample of the 12 child-parent dyads was also representative of the sample in age, age of acquisition of Turkish and English as well as L1 Turkish exposure and use.

As for adult heritage speakers, all of them indicated that they were more dominant in English than in Turkish. Regarding their current exposure to both languages, 16 out of 20 of them reported based on a 10-point Likert scale that their current mean exposure to Turkish ($M = 2$; $SD = 2.2$) was lower than English ($M = 7$; $SD = 2.3$), while 2 of them reported higher mean exposure rates for Turkish ($M = 7.8$; $SD = 1.6$) as compared to English ($M = 2.3$; $SD = 1.6$). The rest indicated that they were equally exposed to both languages. Four adult heritage speakers reported that they did not know how to read and write in Turkish, while 9 indicated that they do not currently watch TV, listen to radio/music or do any readings in Turkish.

The monolingual adults were comparable to the first-generation immigrants in terms of educational (mostly college graduates) and professional profiles (engineers, teachers, businessmen etc.), and they were tested to confirm whether the language of the first-generation immigrants in the U.S. already exhibited signs of attrition. We also included two ages of monolingual children, school-age children (age-matched with child heritage speakers) and younger children (Mage = 4.6, $SD = .89$, range = 3–6), because we wanted to establish when in childhood Turkish children reach adult-like competence of DOM, as measured by the tasks used in this study. To our knowledge, DOM does not vary by dialect. Therefore, we did not control for dialectal differences in the monolingual groups.

As displayed in Table S1 (Supplementary Material), the child and adult immigrants' proficiency in English and in Turkish was assessed by self- or parental ratings on a five-point Likert scale (1 = poor; 2 = needs work; 3 = good; 4 = very good; 5 = native speaker command). The ratings of the child and adult heritage speakers' listening, speaking, reading and writing skills in English were overall higher than in Turkish, while the opposite pattern of higher ability in Turkish than in English was obtained for the first-generation immigrant group. In addition, as a measure of fluency, words per minute (Montrul, 2016a; Polinsky, 2011) were calculated based on the data from the story retelling task. A one-way ANOVA on the mean fluency scores yielded a significant difference between groups ($F(5, 115) = 17.54$, $p < .001$). Post-hoc comparisons using the Tukey HSD test (Wiedmaier, 2017) indicated that the first-generation immigrants, monolingual adults and monolingual school-age children were overall more fluent than the school-age child heritage speakers and the younger monolinguals ($p < .02$), who produced significantly more words than the adult heritage speakers ($p < .002$).

Materials and procedures

Two main tasks that were used in this study were a story retelling task and a picture selection task. Following Montrul (2004), production data was elicited by using a series of pictures from the story, *Little Red Riding Hood,* which were presented in a PowerPoint presentation. This task was chosen because it has proven to be successful in previous studies to elicit DOM (Montrul, 2004; Montrul & Bowles, 2009; Montrul & Sánchez-Walker, 2013).

The second task was a picture selection task, whose goal was to test the comprehension of DOM in Turkish. All the stimuli were presented audio-visually since not all participants were literate in Turkish (Benmamoun, Montrul & Polinsky, 2013; Montrul, 2011, 2012). Participants were first presented with a series of pictures, each depicting a short story, as demonstrated in Figure 1a.

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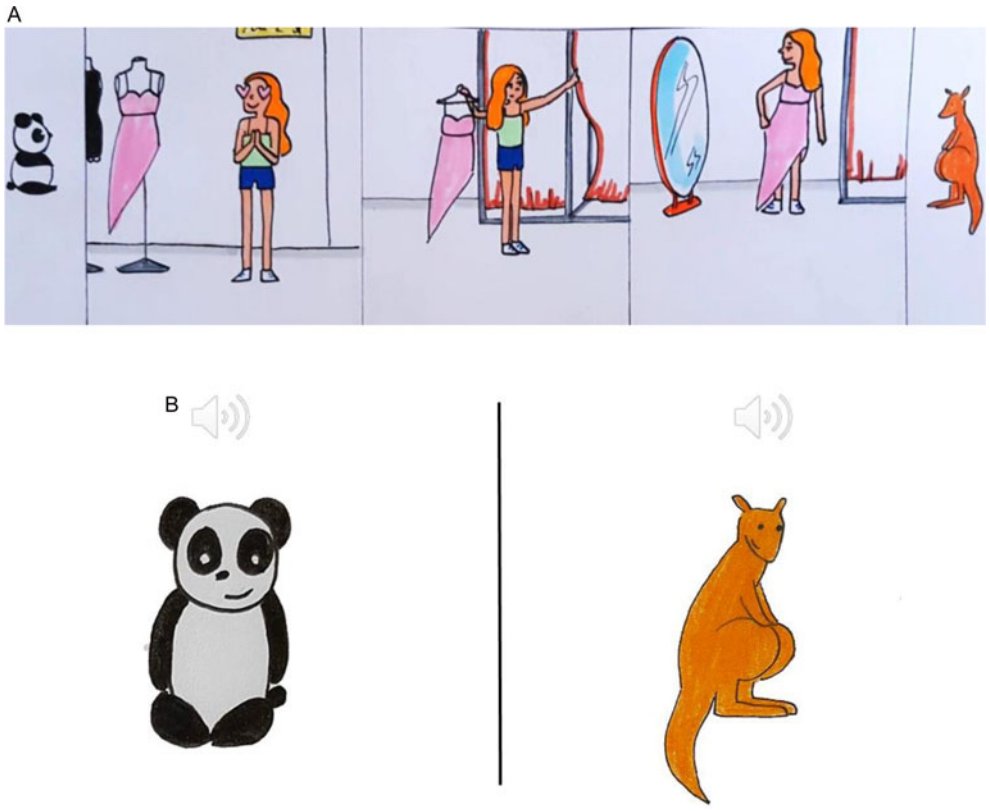

Fig. 1. A) A sample picture and B) a sample slide showing the puppets in the picture selection task

Then two puppets which saw the events appeared on the screen (see Figure 1b) and described the same event in two different sentences (i.e., +DOM and -DOM). For instance, for the target picture in Figure 1a, participants first heard the panda saying *Kız elbise denemiş* (The girl tried on a dress/dresses), while the kangaroo said *Kız elbiseyi denemiş* (The girl tried on the dress). After listening to both puppets, participants were then asked to click on the puppet (kangaroo vs. panda) who they think described the event better.

The design of this task was adapted from Ünal and Papafragou (2016), who argued that this type of design is cognitively less demanding compared to other similar designs, where pictures depicting the two types of target sentences (accusative-marked vs. unmarked) were simultaneously presented to children who were then asked to match the given description with one of the pictures. However, in this design, children were presented with one picture at a time. Additionally, they were given the two contrastive descriptions of the event (accusative-marked vs. unmarked), such that they did not have to generate the other description on their own.

There were a total of 35 stimuli consisting of 16 target items testing DOM, 16 distractor items (quantifiers and numerals) and three practice items that were presented in a PowerPoint presentation, (see Appendix S1, Supplementary Material). All sentences consisted of only three words, and the verb was always marked with the past tense marker *-DI* in Turkish. No nominal markers other than the accusative marker *–(y)I* appeared on the DO. The target items consisted of two conditions – definite/specific and non-referential (incorporated) – which differed only in the absence/presence of the accusative marker *–(y)I* on the DO. In the definite/specific condition, two puppets were referring to a specific object in the pictures, as shown in (5) and Figure 2a; and therefore, the DO was accusative-marked. Since the accusative marker also expresses a singular meaning, the pictures did not include any plural objects in this condition. In contrast, in the non-referential (incorporated) condition, only plural objects appeared in the pictures to ensure that the non-referential reading was preferred over the specific/definite reading, as demonstrated in (6) and Figure 2b below[2]. Indefinite non-specific and specific conditions with the indefinite marker *bir* 'one' were excluded since we were interested in the accusative marker *–(y)I* per se. Although animacy is argued to play a minor role in Turkish DOM, Krause and Roberts (2020) reported that adult Turkish heritage speakers in Germany made finer semantic distinctions based on the animacy of the DO in an acceptability judgement task. In order to investigate whether this observation extends to adult and child Turkish heritage speakers in the U.S, we manipulated animacy in this task. In addition, as Erguvanlı-Taylan (1984) stated, accusative-marking is a reliable indicator of specificity only when it appears on DOs in the pre-verbal (focus) position. In Turkish, there are two possible word orders, where the DO appears in pre-verbal position – namely, SOV and OVS. Therefore, we further subdivided the sentences in each condition into four based on their word orders (SOV vs. OVS) and the animacy of the DO (animate vs. inanimate). Accordingly, there were

[2]One of the reviewers correctly noted that this may conflate singularity/plurality, referentiality and specificity. However, obtaining non-specificity in this type of test is not an easy methodological task, and this is one way to obtain non-specificity in a test such as the one we used. Future research should consider this limitation.

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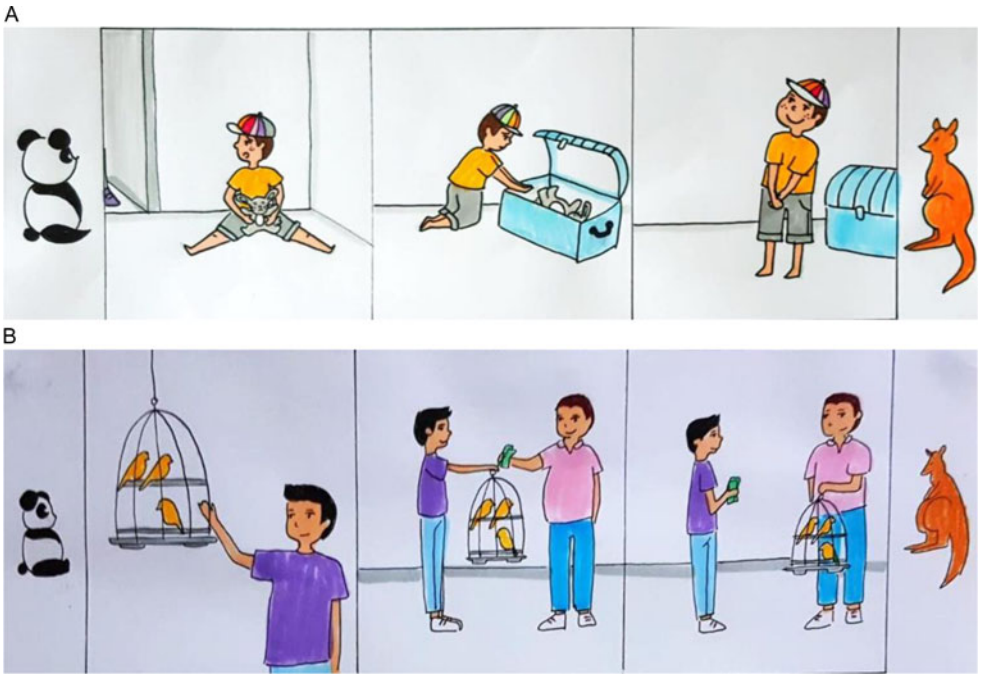

Fig. 2. Sample target items (A and B) for the two conditions in the picture selection task

4 sentences with SOV word order and 4 sentences with OVS word order as well as 4 animate and 4 inanimate DOs in both definite/specific and non-referential (incorporated) conditions.

(5) Definite/specific
Çocuk oyuncağ-ı sakla-dı.
boy toy-ACC hide-D.PAST.3SG
'The boy hid the toy.'
(6) Non-referential (incorporated)
Adam kuş sat-tı. .
man bird sell-D.PAST.3SG
'The man sold a bird/birds.'

All the experimental items were pseudo-randomized, and care was taken to ensure that no two consecutive items included the same condition type nor the same type of target item within the same condition type. Half of the participants were given the sentences in the initial randomized order, while the other half were given the sentences in the reversed randomized order. The left-right position of the pictures and the puppet that gave the right answer were counterbalanced. The order of the tasks was also counter-balanced. The two tasks took an average of 40 minutes to complete. All the participants were tested either in their homes or in their schools. Participants' productions in the story retelling task were audio-recorded and transcribed for analysis.

Results

The analyses for both tasks were computed by R with the version 3.5.2 (R Core Team, 2018) using the *lme4* package (Bates, Maechler, Bolker & Walker, 2015). The pirate plots were produced using the *yarrr* package in R (Phillips, 2017). For the story retelling task, a binomial linear mixed-effects model (Jaeger, 2008; Linck & Cunnings, 2015) was performed on the relationship between response accuracy rates and speaker type (monolingual and bilingual) as well as age (adult, 7–14-year-old school-age child, 3–6-year-old younger child and young adult). For the picture selection task, animacy and word order were also added to the model as variables. Three items in the picture selection task were excluded from the analyses as they consistently elicited incorrect judgments in all groups. Two of the omitted items had OVS word order, one with an inanimate accusative-marked DO and one with an animate unmarked DO, whereas the third one had SOV order with an inanimate unmarked DO. The full model for the story retelling task included subjects as random effects. For the picture selection task, variable selection for models was done in a backward stepwise selection method using the Akaike Information Criterion (AIC). The full model including both subjects and items as random effects (AIC = 1744.7) and the model with only subjects as random effects (AIC = 1644.6) did not converge. Random effects for items only were entered into the final model, which had the lowest AIC value (1630.2), indicating that this model was the best fit for the data. In both models, the group levels were compared using treatment coding in which each level was compared to the reference level (monolingual adults) and the intercept was the cell mean of the reference level. Post-hoc comparisons were computed by using Estimated Marginal Means from the *emmeans* package (Lenth, Singmann & Love, 2018).

Story retelling task

Participants' answers were coded for presence and absence of DOM with bare and specific DOs. For the bare DOs, those that were appropriately left unmarked were coded as 'correct' whereas those that were incorrectly marked with a case marker (overuse)

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were coded as 'incorrect', as demonstrated in (7) below. In (7), the participant sees the 'wolf' for the first time in the pictures; and therefore, the DO must receive a non-specific interpretation (Göksel & Kerslake, 2005). For the specific DOs, those that were appropriately marked with the accusative marker were coded as 'correct' whereas those that were incorrectly left unmarked (omission) or marked with another case marker (substitution) were coded as 'incorrect', as shown in (8) and (9), respectively. In (8), the participant talks about a specific 'wolf' that previously appeared in the pictures. Therefore, the omission of the accusative marker in (8) was coded as 'incorrect'. In (9), the participant is halfway through the story and talks about a specific little girl. Therefore, the replacement of the accusative marker *–(y)I* with the dative (indirect object) marker *–(y)A* was coded as 'incorrect'.

(7) Overuse error
Yol-da bir kurt-u gör-üyor.
way-LOC a wolf-ACC see-PROG.3SG
'She sees a (specific) wolf on the road'

(8) Omission error
O da kurt arı-yor.
she and wolf look for-PROG.3SG
'And she is looking for a wolf/wolves.'

(9) Substitution error
Sonra kırmızı kız-a bekli-yor.
then red girl-DAT wait for-PROG.3SG
'Then it (the wolf) is waiting for the girl.'

As displayed in Table 2, the analysis of the data revealed that simple effects of speaker type ($z(4154) = 1.48$, $p = .14$) and age for school-age children ($z(4154) = -.06$, $p = .95$) on the response accuracy rates were not significant. This indicates that the accuracy rates of the first-generation immigrants ($M = 97.1$, $SE = .57$) and the monolingual school-age children ($M = 98.7$, $SE = .47$) were not significantly different from the monolingual adults' ($M = 98.5$, $SE = .44$) Similarly, the younger monolingual children (3–6-year-olds) ($M = 96.4$, $SE = .73$) patterned with the monolingual adults ($z(4154) = 1.71$, $p = .09$). The model output, however, revealed an interaction between speaker type and age, indicating that the difference in the mean accuracy rates of the first-generation immigrants and the school-age children in the heritage group ($M = 87.4$, $SE = 1.48$) was significant as opposed to no such difference between the adults and the school-age children in the monolingual group. Accordingly, the child heritage speakers showed significantly lower accuracy rates than the first-generation immigrants ($z(4154) = 2.49$, $p = .01$). Similarly, the adult heritage speakers ($M = 74.2$, $SE = 1.61$) also showed significantly lower mean accuracy rates as compared to the monolingual adults ($z(4154) = 5.43$, $p < .001$), as also shown in Figure 3, which displays the distribution in each group (density curve), the mean (line), raw data (points) and the 95% Confidence Interval (colored band).

Post-hoc comparisons between groups further revealed significant differences between the child heritage speakers and the age-matched monolingual children ($z(4154) = 4.896$, $p < .001$) as well as the younger monolingual children ($z(4154) = 2.307$, $p = .007$), showing that the accuracy rates of the child heritage speakers were significantly lower as compared to these groups. However, no significant differences were found between the child and adult heritage speakers ($z(4154) = -1.41$, $p = .49$), who also showed significantly more variable performance as compared to the first-generation immigrants ($z(4154) = -5.43$, $p < .001$).

Table 2. Mixed-effects regression modeling results of accuracy rates in the story retelling task with the factors Speaker type (reference level = Monolingual) and Age (reference level = Adult)

	Estimate	SE	z ratio	*p*
Intercept	-5.16	.5514	-9.36	< .001***
Speaker type				
Bilingual	1.03	.69	1.48	.14
Age				
School-age children (ages 7–14)	-.05	.77	-.06	.95
Younger children (ages 3–6)	1.20	.70	1.71	.09
Adult heritage speakers	3.16	.58	5.43	< .001***
Speaker type * Age				
Bilingual * School-age children	2.44	.98	2.49	.01*

R code: glmer(Response ~ Speaker type * Age + (1 | Participant))

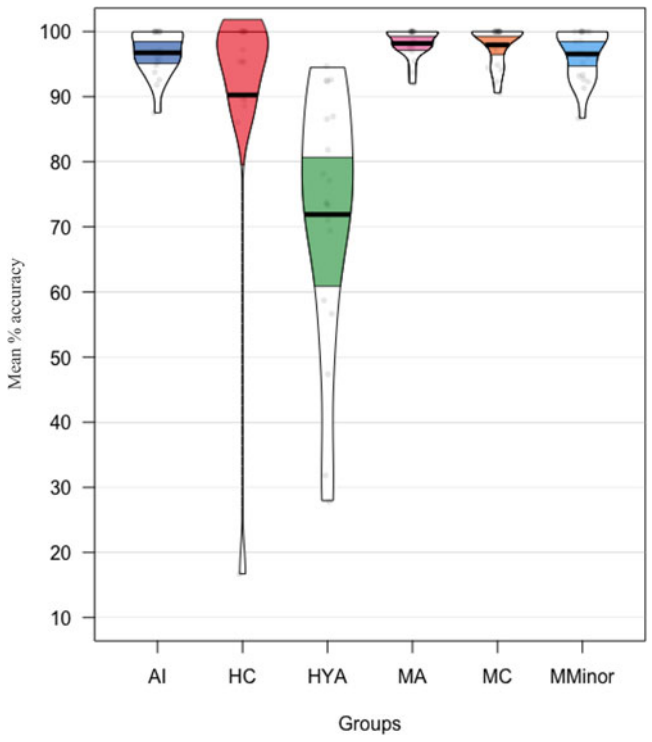

Fig. 3. Mean accuracy percentages by speaker type and age in the story retelling task (AI: Adult (first-generation) immigrant, HC: Heritage (school-age) child), HYA: Heritage young adult, MA: Monolingual adult, MC: Monolingual (school-age) child, MMinor: Monolingual (younger) child)

An error analysis was also performed to further gain insights into the nature of the variability that is observed in the heritage groups. The number of omission, substitution and overuse errors was calculated and compared across all the groups, as displayed in Table 3 below. The results showed that the majority of the errors in both adult and school-age child heritage groups included omission of the DOM marker *–(y)I* in obligatory contexts, which constituted 20% (148 instances) and 10% (52 instances) of their overall DOM production, respectively. The second most common

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Table 3. Error analysis in story retelling task

			Incorrect use		
		Correct use	Omission	Substitution	Overuse
United States (immigrants)	First-generation immigrants	863 (97.1%)	8 (.9%)	–	18 (2%)
	Adult heritage speakers	551 (74.2%)	148 (19.9%)	11 (1.5%)	33 (4.4%)
	School-age child heritage speakers	443 (87.4%)	52 (10.2%)	1 (.1%)	12 (2.3%)
Turkey	Adults	738 (98.5%)	1 (.2%)	–	10 (1.3%)
	School-age children	597 (98.7%)	–	–	8 (1.3%)
	Younger children	637 (96.4%)	3 (.45%)	1 (.15%)	20 (3%)
Total		3829 (92%)	212 (5%)	13 (.3%)	111 (2.7%)

Note. Percentages are given in the parentheses.

error type that was found in the adult (4.4%) and child (2.3%) heritage speaker groups was overuse errors. The younger monolingual children also made overuse errors to a similar extent to the heritage groups with 20 instances (3%) in total. The majority of the substitution errors were found in the adult heritage speakers' group with 11 (1.5%) instances in total, nine out of which resulted from the replacement of the DO (accusative) marker *–(y)I* with the indirect object (dative) marker *–(y)A*. In contrast, the ratio of omission, overuse and substitution errors was either substantially lower or non-existent in all the other groups as compared to the heritage groups.

Overall, the findings showed that the first-generation immigrants were monolingual-like in producing the Turkish DOM marking, while the child and adult heritage speakers were significantly the least accurate groups. The error analysis revealed that the majority of the errors observed in the heritage groups included omission errors, which was then followed by overuse and substitution errors. The first-generation immigrants as well as the monolingual adults and the school-age monolingual children, on the other hand, showed very few instances of omission and substitution errors. However, the younger (3–6-year-old) monolingual children were comparable to the heritage groups in the ratio of overuse errors they made.

Picture selection task

All responses were coded as 'correct' if participants chose the puppet (panda vs. kangaroo) who described the event better for the given picture, and 'incorrect' otherwise. The mean accuracy percentages were lower and standard errors were larger in all groups in this task as compared to the story retelling task.

The model output revealed no simple effects of speaker type ($z(1560) = 5.10$, $p = .10$) and age for school-age children ($z(1560) = 2$, $p = .34$) on the response accuracy rates, as shown in Table 4. This indicates that the accuracy rates of the first-generation immigrants ($M = 78.5$, $SE = 2.55$) and the monolingual school-age children ($M = 80.8$, $SE = 2.45$) were not significantly different from the monolingual adults' ($M = 86.1$, $SE = 2.01$), as also displayed in Figure 4. The significant interaction between

Table 4. Mixed-effects regression modeling results of accuracy rates in the picture selection task with the factors Speaker type (reference level = Monolingual) and Age (reference level = Adult)

	Estimate	SE	z ratio	*p*
Intercept	-2.40	.46	-5.19	< .001***
Speaker type				
Bilingual	.84	.16	5.10	.10
Age (Monolingual)				
School-age children (ages 7–14)	.63	.31	2	.34
Younger children (ages 3–6)	1.98	.3	6.6	< .001***
Adult heritage speakers	1.63	.3	5.41	< .001***
Speaker type * Age				
Bilingual * School-age children	.753	.271	2.783	< .001***
Animacy				
Inanimate	.08	.62	.132	.89
Word order				
OVS	.32	.84	.38	.71

R code: glmer(Response ~ Speaker type * Age + Animacy + Word order + (1 | Item))

speaker type and age showed that the accuracy rates of the child heritage speakers ($M = 65.4$, $SE = 2.96$) were significantly lower than those of the first-generation immigrants ($z(1560) = 2.78$, $p < .001$), whereas no such difference was found between the adults and the school-age children in the monolingual group. The simple effects of age for the younger (3–6-year-old) monolingual children ($M = 57.3$, $SE = 3.07$) ($z(1560) = 6.6$, $p < .001$) and the adult heritage speakers ($M = 64.2$, $SE = 2.98$) ($z(1560) = 5.41$, $p < .001$) also indicated that the two groups were significantly less accurate compared to the monolingual adults. Lastly, the model output revealed no simple effects of animacy and word order on the response accuracy rates, suggesting that all groups

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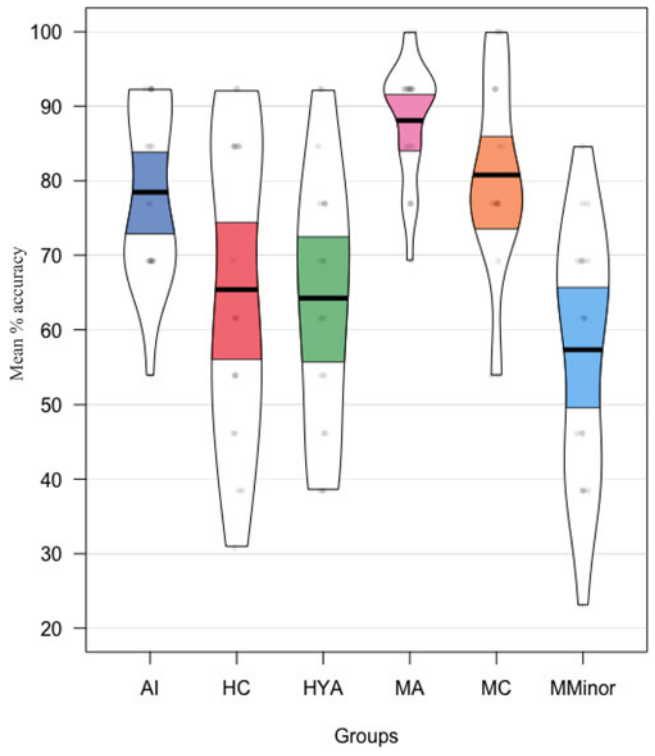

Fig. 4. Mean accuracy percentages by speaker type and age in the picture selection task (AI: Adult (first-generation) immigrant, Heritage (school-age) child), HYA: Heritage young adult, MA: Monolingual adult, MC: Monolingual (school-age) child, MMinor: Monolingual (younger) child)

showed similar performance across different animacy and word order conditions.

Post-hoc group comparisons further revealed significant differences between the school-age monolingual children and the younger (3–6-year-old) monolingual children ($z(1560) = -4.85$, $p < .001$), the school-age child heritage speakers ($z(1560) = 3.33$, $p = .01$) and the adult heritage speakers ($z(1560) = 5.41$, $p = .005$), suggesting that the school-age monolingual children showed significantly higher accuracy rates as compared to these groups. No significant differences, on the other hand, were found between the younger monolingual children, the school-age child heritage speakers ($z(1560) = -1.595$, $p = .60$) and the adult heritage speakers ($z(1560) = -1.35$, $p = .76$).

The overall results of the picture selection task showed that the adult heritage speakers, the school-age child heritage speakers and the younger (3–6-year-old) monolingual children were significantly less accurate than the first-generation immigrants, as well as the monolingual adults and the school-age monolingual children who performed similarly.

Taken together, the first-generation immigrants and the school-age monolingual children patterned with the monolingual adults in both tasks. The younger (3–6-year-old) monolingual children, on the other hand, showed task effects: they showed higher accuracy on DOM in the story retelling task as compared to the picture selection task. Crucially, however, the child and adult heritage speakers were significantly the least accurate groups in both tasks along with the younger monolingual children in the picture selection task.

Comprehension-production asymmetries have previously been reported for the acquisition of other linguistic phenomena in children as well. For instance, research has shown that pronouns are used productively in spontaneous production by children as young as 3-years-old (Bloom, Barss, Nicol & Conway, 1994); however, target-like interpretation of pronouns in picture-selection tasks does not occur until after the age of 6 (Brandt-Kobele & Höhle, 2010, p. 1922; Chien & Wexler, 1990). This discrepancy has often been attributed to an experimental artifact, pragmatic considerations, cognitive development, and the grammar. Regarding young children's poor performance in the picture selection tasks, Brandt-Kobele and Höhle note (2010, p. 1922):

"[A] picture-selection task demands further abilities from children – namely, storing linguistic and visual information in parallel, comparing the information and finally making a decision. It may be hypothesized that these additional demands might not be fully developed in children at age 3."

Thus, to better understand whether the age effect observed in the younger monolingual children's group was associated with the cognitive complexity of the picture selection task, the school-age (7–14-year-old) and the younger (3–6-year-old) monolingual children were merged into one group, and a linear mixed-effects regression model with random effects for subjects and items was computed to assess the relationship between age and accuracy rates in the picture selection task. The model revealed simple effects of age ($z(520) = -5.5$, $p < .001$), indicating that accuracy on the task increased with age in monolingual children. We take this finding to mean that the task effects in younger monolingual children are likely due to the cognitive demands of the task. By contrast, the school-age child heritage speakers and the adult heritage speakers displayed consistent lower accuracy rates in both tasks as compared to age-matched monolingual children and monolingual adults, suggesting that variability in their knowledge of DOM is not likely to be a task effect but it may be related to their grammar.

Individual variation in child heritage speakers

So far, we have shown that variability in adult heritage speakers with respect to Turkish DOM can be traced back to childhood since child heritage speakers also show variability in their comprehension and production of Turkish DOM, as measured by the tasks used in this study. To better understand the source of this variability, further analyses were performed on the child heritage data. The visualizations of their overall accuracy rates in both tasks collectively revealed two major clusters below and above the accuracy rate of 50%. Therefore, we further divided this group into two: those who fell below 50% (LA = low accuracy, n = 6), and those who performed above chance level (HA = high accuracy, n = 14). A one-way ANOVA on the mean accuracy rates yielded a significant difference between the HA group ($M = 84.2$, $SD = 10.6$, range = 61–96) and the LA group ($M = 25.1$, $SD = 6.6$, range = 19–35; $F(1,18) = 157$, $p < .001$). In addition, the younger children constituted the majority of the LA group ($M_{age} = 9$, $SD = 2.2$, range = 7–13) whereas most of the older children were in the HA group ($M_{age} = 11$, $SD = 2.8$, range = 7–14), as also indicated by a one-way ANOVA that was performed on age ($F(1,18) = 5.16$, $p < .036$).

A multiple regression analysis was also performed to investigate other factors including L1 experience and L1 exposure which might have affected their performance. The HA group used Turkish more frequently on a daily basis and had higher parental ratings of Turkish ($M = 3.8$, $SD = .9$, range = 2–5) than the LA group ($M = 2.4$, $SD = 1.4$, range = 1–4). Regarding L1 Turkish

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exposure, the amount of parental input was lower in the LA group (45%) than in the HA group (71%). However, none of these differences were found to be significant, perhaps because our sample size was too small. Lastly, only 1 out of 6 children in the LA group was reported to frequently watch TV, read books and stories in Turkish, while 9 out of 14 children in the HA group were doing both on a regular basis. Therefore, we suggest that the degree of language development in child (and eventually adult) Turkish heritage speakers may be affected by input and use of the language in childhood.

Comparison of child heritage speakers and their parents

Twelve out of 20 participants in the child heritage and first-generation immigrant groups were related. Their performance in each task was compared using binomial linear mixed-effects regression models to investigate whether the variability observed in child heritage speakers can be attributed more directly to the input they received from their parents.

As Table 5 shows, parents ($M = 97.2$, $SE = .72$) showed significantly higher accuracy rates than their children ($M = 67.6$, $SE = 2.46$) in the story retelling task ($z(898) = 2.4$, $p = .018$). Similarly, the performance of parents ($M = 75.6$, $SE = 3.45$) was significantly better than their children's ($M = 64.1$, $SE = 3.85$) in the picture selection task ($z(312) = 1.98$, $p = .048$).

Moreover, as shown in Figure 5, the performance of each child-parent pair did not necessarily follow the same pattern. Although parents generally performed better than their children in both tasks, there were cases where children showed higher accuracy rates than their parents, particularly in the picture selection task. Overall, these findings indicate that the main source of variability found in the child (and eventually adult) heritage group is not likely to be the quality of parental heritage input. However, although the parents (first-generation immigrants) were the main source of input in Turkish for the child heritage speakers tested in this study, we acknowledge that other factors

Table 5. Mixed-effects regression modeling results of accuracy rates in the story retelling task and picture selection task with the factor Age (reference level = Adult parent)

	Estimate	SE	z ratio	*p*
Story retelling task				
Intercept	-4.009	.555	-7.219	.009**
Age				
Child	4.606	1.953	2.359	.018*
Picture selection task				
Intercept	-2.006	.764	-2.626	< .001***
Age				
Child	1.411	.715	1.975	.048*

R code: glmer(Response ~ Speaker type * Age + (1 | Participant))

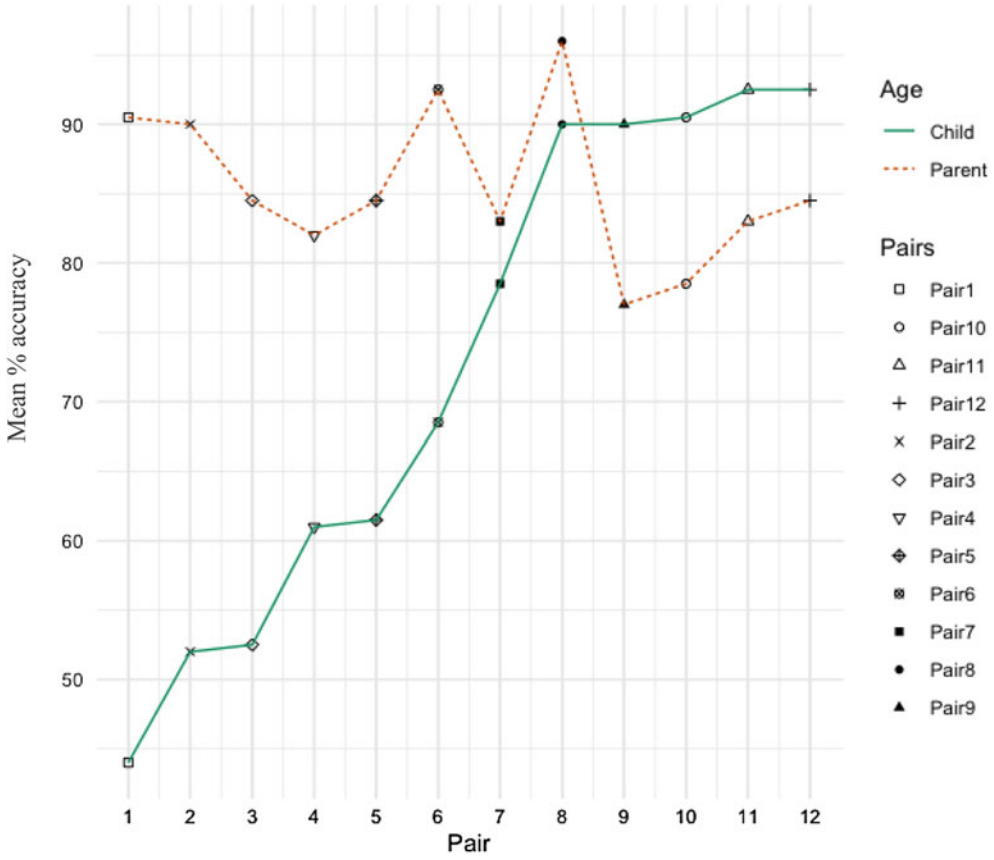

Fig. 5. Individual variation in accuracy in both tasks by child heritage speakers and their parents

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such as input that the child heritage speakers receive from their friends, relatives or heritage language teachers might also play a role in their acquisition of Turkish DOM.

Discussion

Adult heritage speakers show variability in their use of DOM in Turkish (Krause & Roberts, 2020; Şahin, 2015) and in many other languages (Montrul et al., 2015). The main goal of this study was to investigate whether such variability can be traced back to early stages of heritage language development. To this end, second-generation adult and school-age child Turkish heritage speakers and first-generation Turkish immigrants (in most cases the parents of the child heritage speakers) living in the U.S. were compared to monolingual adults, school-age monolingual children (aged 7–14) as well as younger monolingual children (aged 3–6) in Turkey in their knowledge of the Turkish DOM (*–(y)I*) using a story retelling task and a picture selection task. The results of the monolingual adults and children showed that accusative marking with specific objects is productively used as early as age 3 in production; however, its full acquisition does not occur by around age 6 in comprehension/judgment in Turkish (see also Ketrez, 2015). The first-generation adult Turkish immigrants in the U.S. did not differ from the monolingual adults in Turkey in both tasks, suggesting that the first-generation immigrants with an average of 15 years of residence in the U.S. do not exhibit signs of L1 attrition (Montrul et al., 2015). The child and adult heritage speakers, however, were the least accurate groups in both tasks along with the younger monolingual children in the picture selection task. Because the heritage groups showed variability and divergent attainment in both comprehension and production of the accusative *–(y)I*, this is suggestive of a representational problem, at the level of their abstract grammatical knowledge, and not just a task effect.

A lively debate in heritage language acquisition is whether the omission and simplification of required morphology observed in adult heritage speakers stems from incomplete acquisition in childhood caused by reduced exposure and use of the language during the school age period (Montrul, 2018) or by potentially different input they are exposed to since they grow up in a language contact situation (Pires & Rothman, 2009). Sorace (2020, p. 204) writes, "Parental input affected by attrition is … transmitted to the next generation of heritage speakers, who regularize variable input as part of their grammar." While these two possibilities are logical and somehow supported by recent research, some linguistic data seem to be more consistent with one possibility than the other. For example, variability with DOM, other case marking (ergative, Montrul et al., 2012), gender and number agreement, and complex tenses (Silva-Corvalán, 2014) are less likely to be related to changes in the grammars of first-generation immigrants, whereas the erosion of dative case with dative experiencer subjects in Spanish may be (Montrul, 2016b; Pascual y Cabo, 2018). There are, however, exceptions to both possibilities. For instance, although the DOM knowledge is reported to be intact in first-generation immigrants of such languages as Romanian and Hindi, first-generation Spanish immigrants with an average of 22 years of residence in the U.S. show certain degree of attrition of Spanish DOM (Montrul et al., 2015; Montrul & Sánchez-Walker, 2013). Regarding this discrepancy, Montrul et al. (2015) argue that Hindi does not have articles marking definiteness and specificity in contrast to Spanish; and therefore, the DOM marker is needed more in Hindi than in Spanish to mark definite and specific DOs, which in turn results in better retainment of knowledge of Hindi DOM in this group. Similar to Hindi, Turkish has an indefinite article *bir* 'one', but there are no articles marking definiteness and specificity. Therefore, a reason why first-generation Turkish immigrants show intact knowledge of DOM in Turkish might be that the accusative marker is used more frequently to mark specificity in Turkish as compared to the use of DOM marker 'a' in Spanish.

Daskalaki et al. (2020), who tested Greek-speaking heritage speakers and their parents, found that there was a relationship between the variability in subject position in Greek observed in child heritage and second-generation immigrant parents' groups, who were adult heritage speakers of Greek. However, no such relationship was found between child heritage speakers and first-generation immigrant parents, suggesting that the first-generation immigrants were not really attrited. Similarly, in the present study, we tested child heritages speakers as well as first-generation immigrants (who were in most cases their parents) and showed that DOM in first-generation Turkish immigrants is not attrited. To further confirm that parental input quality is not likely to be the reason why child and adult heritage speaker groups show variability with respect to Turkish DOM as found in the whole group analyses, additional analyses were computed on the 12 related parent-child dyads. The results revealed monolingual-like performance in the parental group as compared to extensive variability in the child heritage group in both tasks. This analysis further supports our initial findings, suggesting that the incomplete acquisition of DOM in child heritage speakers of Turkish is not likely due to the quality of early parental input in the heritage language (Karayayla, 2020; Montrul, 2008). Instead, the quantity of input that child heritage speakers receive from their parents in childhood, especially when the children are schooled exclusively in the majority language in the mandatory school system, seems to be crucial for heritage language development.[3]

Further evidence that the variability of DOM in the child heritage speakers is likely due to delayed and eventually incomplete acquisition due to insufficient input comes from their comparison with the two monolingual children's groups – namely, age-matched and younger (3–6-year-old) monolingual children. Despite the variability that was revealed in both tasks in the child heritage group, no significant difference was found between the child heritage speakers and the younger monolingual children in the picture selection task. The difficulty in the younger monolingual group can be attributed to the cognitive complexity of the picture selection task, as shown by additional analyses that revealed a significant positive correlation between age and accuracy in monolingual children's groups in the picture selection task. This finding suggests that the amount of difficulty that monolingual Turkish children showed decreased as they grew older, and they eventually performed adult-like in late childhood (Ketrez, 2015; Ketrez & Aksu-Koç, 2009). The design of the picture selection task was adapted from Ünal and Papafragou (2016) because it was argued to be cognitively less demanding than other similar designs, in which two pictures (instead of one) and a target sentence are presented at the same time. However, this task might still have posed challenges for the younger monolingual children since they still needed to figure out whether the object was specific or not for each picture and map the accusative marker *–(y)I* to its

[3]As one of the reviewers correctly pointed out, since only one of the parents was tested, the observed findings might also be a result of consistently testing the parent with stronger Turkish, and that the other parent might have provided attrited input.

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meaning. In the case of the child heritage speakers, however, their poor performance in the picture selection task cannot be attributed to the cognitive complexity of the task since they were significantly the least accurate group in the story retelling task as well. Additional analyses also revealed age effects in this group, suggesting that morphological acquisition is affected by length of exposure to input in this group as in the monolingual children's groups. Accordingly, the younger child heritage speakers were less accurate than the older ones. Further analyses showed that the younger child heritage speakers had less L1 Turkish exposure through parental input, watching TV or reading books in Turkish, and that they used Turkish less frequently on a daily basis compared to the older child heritage speakers. Although these factors did not reach significance, we take these findings to suggest that the quantity of early input matters greatly in heritage language acquisition, and that the acquisition of DOM in Turkish continues throughout early and late childhood. While we can certainly state that the school-age child heritage speakers tested seem to show delayed acquisition of DOM, we cannot tell if they are at an earlier or a comparable stage as compared to the younger (3-to-6-year-old) monolingual children, who outperformed them in the story retelling task. Finally, the variability that is observed in the adult heritage speaker group in both tasks suggests that heritage speakers of Turkish show incomplete acquisition of DOM in early adulthood.

In sum, the findings of the current study confirmed our predictions: the accusative and DOM marker *–(y)I* in Turkish is vulnerable to delayed acquisition in early childhood and to incomplete acquisition in young adulthood in heritage speakers of Turkish. Given that the first-generation immigrants (in most cases the parents of the child heritage speakers) did not show any signs of attrition with respect to DOM, it can be argued that the Turkish DOM is not vulnerable to L1 attrition in adulthood, and that the observed variability in the heritage groups in both tasks is more likely due to insufficient input in the early years of heritage language development than to changes in parental input or L1 attrition in later years.

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List of supplementary materials

Appendix S1: List of Experimental Stimuli in the Picture Selection Task
Table S1: Mean Self-/Parental Ratings in Turkish and English Language Skills in the Immigrant Groups

Competing interests. The authors declare none.

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