Journal of Child Language Acquisition and Development – JCLAD
Vol: 10 Issue: 4 627-652, 2022

ISSN: 2148-1997

The acquisition of Hebrew Differential Object Marking: Between production and comprehension

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Received : 16.10.2022
Accepted : 20.12.2022
Published : 30.12.2022

Abstract

This study experimentally investigates the acquisition of Differential Object Marking (DOM) among a group of 34 Hebrew-speaking children aged 3;6-7;10. Previous research on the development of DOM crosslinguistically has largely reported early emergence, along with virtually errorless use, and adultlike performance approximately age 3;6. However, the data in these studies come almost exclusively from spontaneous speech analysis. Using a gradable acceptability judgment task, our findings reveal a very different picture. Specifically, we find that only the oldest children tested (7;0-7;10) begin to demonstrate sensitivity to the adult Hebrew DOM paradigm, but even their judgments are not yet fully adultlike. We discuss this striking mismatch between children's non-adultlike performance in comprehension and the early convergence demonstrated for production, as reported in the literature. Hence, in addition to the novel empirical findings that enrich DOM acquisition research, our study also highlights a fundamental methodological issue. It underscores the importance of assessing children's comprehension via their acceptability judgments, particularly gradable judgments, and demonstrates that relying solely on production data may lead to the wrong conclusions regarding children's true competence.

Keywords Differential Object Marking; DOM; Language development; Hebrew; Gradable acceptability judgment

1. Introduction

Differential object marking is a systematic, crosslinguistic phenomenon, whereby the direct object argument of a verb phrase is either marked or unmarked for case (e.g., Bossong, 1985, 2021). Whether an object is marked or not depends on whether it carries semantic properties such as definiteness, animacy, specificity, and/or referentially (e.g., Aissen, 2003). It is generally observed that more prominent object DPs (those that are animate, specific and/or definite) tend to trigger obligatory overt case marking, while less prominent ones are likely to be optionally marked or remain unmarked (e.g., Aissen, 2003; Grimm, 2005; Krause & von Heusinger, 2019 and references therein).

The L1 acquisition of DOM has been the center of several investigations in recent years, and available data to date represent a range of languages,

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beginning with the pioneering work of Rodríguez-Mondoñedo (2008) on the acquisition of Spanish DOM, and including languages such as Croatian and Russian (Hržica et al., 2015), Estonian (Argus, 2015), Korean (Chung, 2020), Lithuanian (Dabašinskienė, 2015), Romanian (Ticio & Avram, 2015, Avram & Tomescu, 2020), and Hebrew (Uziel-Karl, 2015). Overall, the consensus in the acquisition literature is that DOM generally emerges early in production (at approximately age 2), and that children crosslinguistically demonstrate early convergence on the target DOM paradigm, with fully adultlike performance already in the third year of life. However, available research is almost exclusively limited to spontaneous speech analysis. To date, only two studies have explored children's comprehension of the DOM paradigm: Ketrez (2015) in Turkish and Guijarro-Fuentes, Pires & Nediger, (2017) in Spanish. These two studies uncover a striking mismatch between children's non-adultlike performance on comprehension tasks and the early convergence demonstrated for production, as reported in the literature.

The aim of the current study is to test whether Hebrew acquiring children (aged 3;6-7;10) have converged on the adult Hebrew DOM paradigm. Our study is not only one of few available experimental works testing children's comprehension of DOM, but also the first to use a gradable acceptability judgment task rather than the more commonly used binary judgments task to test the acquisition of DOM. Dating back to as early as Chomsky (1965), it is a widely accepted view among linguists that acceptability judgments are inherently gradable (see, e.g., Schütze, 2016:62, Sprouse, 2007 and references therein), as opposed to grammaticality judgments, which are typically categorical – a sentence is either grammatical or not. It follows, then, that when asking speakers to make acceptability judgments it is better to allow for gradable response options, rather than using a binary acceptable-unacceptable paradigm (see also e.g., Jasbi, Schuster & Weiss, 2019; Perek & Hilpert, 2014: 270). A gradable paradigm, then, ensures that speakers' judgments are not artificially reduced to two binary response options and thus offers a more reliable measure of the speaker's linguistic knowledge (cf. Jasbi, Waldon & Degen, 2019; Katsos & Bishop, 2011).

The contribution of this study is, hence, twofold. First, by adding new findings from Hebrew, a language that has not received much attention in the context of DOM acquisition research, we contribute to the typology of DOM acquisition crosslinguistically. Secondly, and more broadly, our study highlights the limitation of production data in acquisition research. It underscores the importance of assessing children's comprehension via their acceptability judgments, particularly gradable judgments, and demonstrates that relying solely on production data may lead to the wrong conclusions regarding children's true competence.

1.1. Hebrew DOM

In Modern Hebrew, the accusative marker *et* is sensitive to the definiteness of the direct object DP, such that in colloquial speech, it obligatorily marks definite objects, and is unacceptable with indefinite objects (e.g., Avram & Armon-Lotem, 2005; Berman, 1982;, 1985; Danon 2001;, 2002;, 2008;, Givón, 1978; Siloni 1997; Wintner 2000, among many others). This is illustrated in (1):

(1) a. Gali axla **et** **ha**-tapuax.
Gali ate.3SG.F ACC the-apple
'Gali ate the apple.'

b. *Gali axla **et** tapuax.
Gali ate.3SG.F ACC apple
Intended: 'Gali ate an apple.'

In (1a), the direct object *ha-tapuax* ('the apple') is marked with the definite article *ha-*, indicating that it is a definite DP. Such a DP, being definite, is then generally assumed to require overt *et*-marking. Conversely, marking the indefinite object in (1b) with *et* results in ungrammaticality.

In a slight deviation from this commonly assumed binary distinction, we acknowledge a third option, one in which the definite object is not preceded by *et*, as in (2) below. We maintain that such a construction is in fact grammatical in Modern Hebrew, although its availability is highly restricted by pragmatics (mostly confined to written text, and very high register).

(2) ?Gali axla ha-tapuax.
Gali ate.3SG.F the-apple
'Gali ate the apple.'

The commonly assumed view in the literature on Modern Hebrew is that definite objects not preceded by *et* are not genuinely part of present-day speakers' grammars. Instead, the (admittedly marginal) availability of such construction is merely a residue of an archaic variety of Hebrew (e.g., Danon, 2001; 2008; Meir & Novogrodsky, 2021).

However, we believe our view is justified for several reasons. First, there is some acknowledgement in the literature that unmarked definite objects are not strictly speaking ungrammatical, or at least, that they should be treated differently than *et*-marked indefiniteness. For example, Danon (2001:1087) recognizes that speakers judge *et*-marked indefinites to be considerably worse than unmarked definite objects, and Glinert (1989:13) observes that *et* may be "occasionally omitted".

Further support for this comes from in an informal web search, which yielded the naturally occurring examples in (3)-(8) below.[3]

(3) im lo yaS'iru li brera, e'ezov **ha**-miflaga.
If not leave.FUT.PL to-me choice leave.1SG the-party
'If they leave me no choice, I will leave the party.'[4]

(4) ani xoSev Se-ani yaxol leharkiv memSala ve-leaxed **ha-**'am.
I think.SG.M that-I can.SG.M assemble.INF government and-unite.INF the-folk
'I think that I can assemble a government and unite the nation.'[5]

[3] Examples (7) and (8) are existential constructions. According to Hebrew prescriptive grammar, *et* is ungrammatical in such constructions, but in colloquial speech, they are *et*-marked. We thank an anonymous reviewer for pointing this out.
[4] https://www.inn.co.il/news/393486 accessed on 3/12/2021
[5] https://news.walla.co.il/item/3325086 accessed on 3/12/2021

(5) al-menat lezarez **ha-**halix.
In-order-to facilitate.INF the-process
'To facilitate the process.'[6]

(6) ha'im muskam Se-lata'agid yeS **ha**-zxut?
Whether agreed that-the-corporation there-is the-right
'Is it agreed upon that the corporation has the right?'[7]

(7) kedey lekabel **ha**-ptor […]
in-order-to receive.INF the-exemption
'to receive the exception'[8]

(8) hayu la ha-xaverim […] ve-hayu la **ha-**nesiot ha-metorafot.
were to-her the-friends and-were to-her the-travels the-crazy
'She had her friends from the kayaks, and she had the crazy travels.'[9]

These examples were found in insurance contracts, Knesset protocols, and online articles, and they all demonstrate the availability of unmarked definite objects in present-day Hebrew.

Finally, and likely the most convincing support for our view, comes from the findings of a formal preliminary questionnaire we conducted. Using a graded acceptability task, we asked 14 Hebrew speaking adults to rate the acceptability of precisely the three constructions of interest: *et*-marked definites, unmarked definites, and *et*-marked indefinites. The test items were simple sentences with two conjoined VPs, with the direct object occurring in the second conjunct. Both conjuncts were of daily conversation. Such an environment establishes the context as belonging to informal daily conversation, thereby highlighting the contrast between the three object-types. Particularly, the distinction between the marked indefinite objects, which are entirely ungrammatical, and the unmarked definite objects, which we take to be grammatical, but odd in everyday speech.

There were ten experimental items in each condition and 16 filler items, for a total of 46 experimental items. An example from each condition is illustrated in Table 1.

[6]https://www.shirbit.co.il/%D7%AA%D7%91%D7%99%D7%A2%D7%95%D7%AA/%D7%94%D7%9C%D7%99%D7%9A-%D7%99%D7%99%D7%A9%D7%95%D7%91-%D7%AA%D7%91%D7%99%D7%A2%D7%95%D7%AA/%D7%94%D7%A0%D7%97%D7%99%D7%95%D7%AA-%D7%9C%D7%94%D7%92%D7%A9%D7%AA-%D7%AA%D7%91%D7%99%D7%A2%D7%94/ accessed on 3/12/2021

[7]https://main.knesset.gov.il/Activity/Constitution/Pages/ConstProtocol331.aspx accessed on 3/12/2021

[8]https://www.health.gov.il/Subjects/MedicalAndHealthProfessions/GeneralMedicine/Pages/USMLE.aspx accessed on 3/12/2021

[9] https://xnet.ynet.co.il/articles/0,7340,L-5796868,00.html accessed on 3/12/2021

Journal of Child Language Acquisition and Development – JCLAD
Vol: 10 Issue: 4 627-652, 2022
ISSN: 2148-1997

Table 1
Design and material

Object-type	**Example**
et-marked definite	Shira yats'a me-ha-xeder ve-patxa ***et*** **ha**-xalon. Shira exited.3SG.F from-the-room and-opened.3SG.F ACC the-window 'Shira left the room and opened 'et' the window'
unmarked definite	?Mixael ala lamigraS ve-xataf **ha**-kadur.' Michael went-up.3SG.M to-the-pitch and-grabbed.3SG.M the-ball 'Michael got into the field and grabbed the ball.'
et-marked indefinite	*Shai yatsa lamesiba ve-lavaS ***et*** me'il. Shai went-out.3SG.M to-the-party and-wore.3SG.M ACC coat 'Shai went out to the party and wore a coat.'

Test items were pre-recorded by a native speaker to control for prosody effects and presented to the participants in a randomized order via the Qualtrics online platform. Participants were instructed to determine how likely it is for each sentence to be uttered by a native Hebrew speaker in daily conversation. Judgments were scored on a 5-point Likert scale of acceptability, with only the extreme options explicitly stated: 1 (*behexlet lo* 'absolutely not') and 5 (*behexlet ken* 'absolutely yes'). The middle option (3) was excluded from the scale to control for a potential central tendency bias (cf. e.g., Douven, 2018; Stevens, 1971) and in order to create a forced-choice scale (cf. Chyung, Swanson, Roberts & Hankinson, 2018). The findings of the questionnaire are summarized in Figure 1 below.

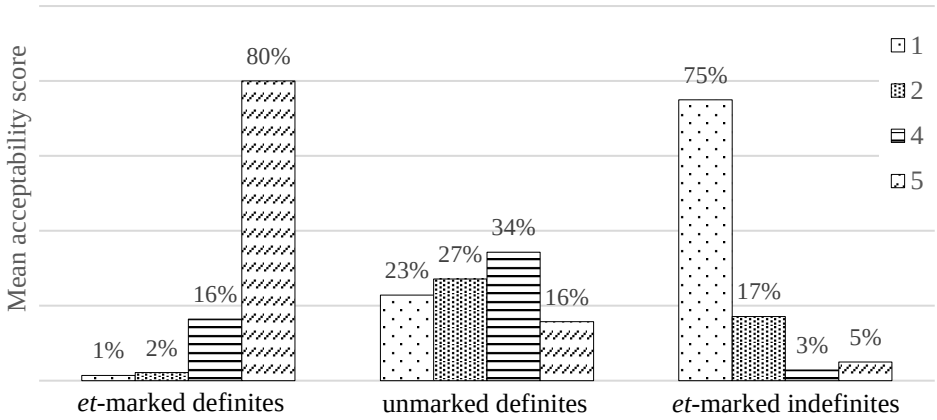

Figure 1. Distribution of average acceptability ratings across object types

As can be seen from the graph, *et*-marked definite objects were almost always judged to be acceptable, with only 3% 1-2 scores. This is virtually the mirror image of the judgments for *et*-marked definites, with only 8% 3-4 scores. The relatively low rates (75%) of full rejection (1 scores) in this condition is a rather surprising result for constructions that are taken to be entirely ungrammatical in the theoretical literature, as well as when informal judgments are elicited from native speakers. We will return to this in the discussion section. Of particular interest are the data for the unmarked definite objects. Here, the picture is very different from the acceptability pattern of the two other conditions, with almost equal distribution across response options. Notably,

exactly half of the data points were judged to be either fully acceptable (16%) or somewhat acceptable (34%), while the other half were judged as either entirely unacceptable (23%) or somewhat unacceptable (27%).

Taken together, both types of data (naturally occurring examples and experimental evidence) provide support for the view that unmarked definite objects are in fact part of adult Hebrew grammar, although they are not entirely natural in everyday conversation. Moreover, the essentially equal response distribution of the judgment data may point to pragmatic reasoning: the fact that this construction is neither unanimously acceptable nor unanimously unacceptable indicates that its acceptability is driven by pragmatic reasoning, rather than by grammatical knowledge (cf. Paltiel-Gedalyovich, 2011).

It should be clearly noted here that the pragmatic reasoning involved in the Hebrew DOM paradigm – and particularly, in judging the appropriateness of unmarked definite objects – relates to the intricate relationship between the social context (specifically, register) and the distinct linguistic element it permits (see Wagner et al., 2010). Importantly, the current study is not concerned with and does not explore how context affects the *meaning* of certain linguistic elements (cf. Ariel, 2010; Huang, 2014; Levinson, 1983; 2000; Stalnaker, 1972, among many others).

In sum, we take the DOM paradigm in adult Hebrew to be sensitive to the definiteness of the direct object in interaction with pragmatic considerations of register. Such a three-way distinction presents a potential learnability challenge. Particularly, the complex integration of (socio-)pragmatic and grammatical knowledge necessary for mastery of the target paradigm.

1.2. Crosslinguistic acquisition of DOM in L1: Production versus comprehension

For over a decade now, the crosslinguistic development of DOM has been the focus of considerable attention in acquisition research. Perhaps the earliest work on the acquisition of DOM is Rodríguez-Mondoñedo (2008), who examined the production of DOM in the spontaneous speech of four Spanish-speaking children aged 0;9-3;01. Out of a total of 990 occurrences of DOM objects in the samples, only 16 errors were found. Similar findings have since been obtained in several studies on L1 Spanish (e.g., Cole Callen & Miller 2021; Ticio & Avram, 2015).

An important contribution to the study of L1 DOM acquisition was made by Larisa Avram, who edited a 2015 special issue of *Revue Roumaine de Linguistique* that compiled studies that examined the topic in a variety of languages (e.g., Croatian and Russian: Hržica et al., 2015; Estonian: Argus 2015; Lithuanian: Dabašinskienė, 2015; Romanian and Spanish: Ticio & Avram, 2015). Using essentially the same methods, namely analysis of spontaneous production samples, all these studies report similar results to the ones found in Rodríguez-Mondoñedo (2008) for Spanish: children crosslinguistically begin to produce DOM at an early stage of development, with early convergence and virtually error-free performance.

In contrast to the spontaneous production data demonstrating early convergence, the rare existing experimental findings paint a very different picture. Ketrez (2015) conducted a large-scale grammaticality judgment task with 147 Turkish-speaking children aged 4-6. The contexts under

investigation were sentences in which case assignment interacted with negation in terms of scope assignment. Specifically, in adult Turkish, indefinite objects take wide scope over negation when they are overtly marked for accusative case; when such indefinites are not case marked, they are assigned narrow scope with respect to negation.

The data revealed that the youngest children (4-year-olds) were oblivious to the distinction between case-marked and non-case-marked objects in terms of their scope-taking properties, generally assigning narrow scope readings, regardless of case marking. An increase in wide scope assignment – and thus also in a distinction between case-marked and non-case-marked objects – starts to emerge around age 5. However, even at age 6, the Turkish-speaking children tested in the study did not yet demonstrate adult knowledge of DOM, despite an increase in wide scope interpretations in the context of case-marked objects.

An additional study using a judgment task is Guijarro-Fuentes, Pires & Nediger (2017). Following Torrego (1998, 2002), Guijarro-Fuentes et al. argue that the relevant features for DOM in Spanish are the animacy and specificity of the object; the agentivity (or at least [+human] feature) of the subject; and the semantics of the predicate. This analysis provides the theoretical background for a context-matching acceptability judgment task used in the study. The relevant results for the current study are the judgement data from the monolingual group (N=10), which indicated that even at age 10-15, these children have not yet acquired the full range of syntactic and semantic features involved in DOM. A more detailed exploration of the data reveals an interesting distinction: while the children demonstrate high accuracy with respect to the role of animacy, the other features determining the distribution of Spanish DOM seem to pose a challenge, resulting in delayed acquisition. We will return to this in the discussion section.

Overall, then, findings from research on the acquisition of DOM appear to reveal an interesting – and rather unexpected – asymmetry, whereby children's production of DOM crosslinguistically greatly precedes their comprehension of the target DOM paradigm.

1.3. Acquisition of et-marking

The development of the Hebrew definiteness system, which constitutes the domain for *et*-marking, has received some attention in the literature of the past three decades (e.g., Avram & Armon-Lotem, 2005; Berman, 1985; Zur, 1983). Yet, for the most part, *et*-marking in child Hebrew has not been investigated as an independent phenomenon, but rather as a mere by-product of research into the development of the Hebrew definiteness system, or as part of more general investigations into the longitudinal development of Modern Hebrew (cf. e.g., Berman, 2004; Lustigman, 2016).

The earliest large-scale investigation regarding Hebrew-speaking children's knowledge of the definiteness system was done by Zur (1983), who examined 123 typically developing (TD) Hebrew-speaking children between the ages of 1;10-12;0. Results from two elicitation tasks and an analysis of spontaneous speech show that children begin to produce *et*-marking around age 2;9. Zur further reports virtually error-free performance (only two

occurrences of *et*-marked indefinite objects) from the onset, and full convergence on the adult paradigm by 3;6 (see also Berman, 1985; 1993 for similar reports).[10]

Very recent data on the acquisition of *et*-marking can be found in Meir & Novogrodsky (2021). This study is concerned with monolingual and bilingual children with and without Autism Spectrum Disorder (ASD), and they too report only *et*-marking data insofar as it relates to knowledge of the Hebrew definite marker *-ha*. Still, the results of their monolingual TD controls are relevant to the current study. Using a sentence repetition task, 28 TD Hebrew speaking children aged 5;3-8;4 (mean 6;9) were prompted to describe what was happening in static pictures. The experimental material consisted of definite and indefinite NPs in both subject and object position. The results revealed ceiling performance: all definite objects were correctly marked by *et*, and indefinite objects were never preceded by *et*. An additional interesting finding of the study is that the accusative marker was never produced in subject position.[11] Given the age of the participants, and taken together with previous findings discussed above, these results are, of course, unsurprising.

Uziel-Karl (2015) was the first to not only directly examine the acquisition of *et* as an independent phenomenon from definiteness; she was also the only acquisitionist to treat *et*-marking as an instance of DOM. Similarly to the majority of previous crosslinguistic research into the acquisition of DOM, Uziel-Karl analyzed spontaneous speech data. The samples come from three monolingual Hebrew-speaking girls aged 1;5-3;0, and similar to findings from other languages (see subsection 1.2. above), Uziel-Karl concludes that "DOM in child Hebrew is almost flawless" (pp. 349). Notably, the 6% errors observed in the data include instances of both *et*-marked indefinite objects and unmarked definite objects. Hence, Uziel-Karl takes the two constructions to constitute the same type of ungrammaticality. This issue notwithstanding, Uziel-Karl's findings indeed demonstrate very early, and virtually flawless, convergence for Hebrew DOM.

Of particular interest to the current study are the results of Meir, Parshina, & Sekerina (2020). This study is uniquely relevant for two reasons. First, it directly probes *et*-marking (albeit not as an instance of DOM). Second, and more importantly, this study provides not only production but also comprehension data from the same participants. The children (N=10) were TD Hebrew-speaking monolinguals between the age of 4-7 (mean age 6;0).[12] Their production of *et*-marking was elicited using the same task as the one in Meir & Novogrodsky (2021). The comprehension data come from two Visual World eye-tracking experiments. The results reported by Meir et al. show that the

[10] Berman (1993) notes some non-adultlike occurrences in initial stages of production, but no quantitative data are provided.

[11] We should clarify here, that while the accusative marker is not *expected* in the subject position, it may occur sentence initially with topicalized objects. So, for example, as in the sentence:

(i) *et ha-seret ha-ze raiti etmol.*
'et' the-film the-this saw.1.SG yesterday
'This film, I saw (it) yesterday.'
Such examples in the input may cause the child to overgenerate the accusative marker to subject position.

[12] The main focus of Meir et al. (2020) is the performance of Russian-Hebrew bilinguals. We report only data from the monolingual controls.

monolingual Hebrew-speaking children were at ceiling in terms of their production of *et*-marking, systematically using the accusative marker with definite objects, and never producing *et*-marked indefinite objects. In contrast to their adultlike production of *et*, however, the same children did not show sensitivity to the accusative marker, as indicated by their inability to use the presence of *et* in the verbal stimuli to predict the upcoming referent. Hence, this study provides an initial indication that the production-comprehension asymmetry observed for the acquisition of DOM in Turkish and in Spanish may also be characteristic of the development of Hebrew DOM.

The aim of the current study is to directly address this issue by experimentally probing children's knowledge of the Hebrew DOM paradigm.

1.4. Current study

Similarly to the adult questionnaire, the task chosen for the experiment was a gradable acceptability task. Such a task – rather than a binary judgment task, traditionally used in acquisition studies – allows for more nuanced judgments to be elicited (cf. Jasbi, Waldon & Degen, 2019; Sikos, Kim & Grodner, 2019). This is particularly pertinent when the linguistic phenomenon tested involves pragmatic knowledge (cf. Katsos & Bishop, 2011), which is inherently graded, and therefore involves more diffused, less categorical intuitions than purely grammatical phenomena (cf. e.g., Ariel, 2010:42). Since *et*-marking is taken to involve pragmatic awareness (as we have argued for in subsection 1.1.), eliciting gradable, rather than binary judgments from children ensures that the child's true knowledge is revealed.

2. Methods

2.1. Participants

34 typically developing monolingual Hebrew-speaking children aged 3;6-7;10 were recruited from across Israel. The children were all recruited by the authors through personal acquaintance with their families. The families were middle-class families, mostly from Kibbutzim and Moshavim in the North and South of Israel. All children were strictly monolingual speakers of Hebrew, raised in strictly monolingual families, with no evidence of language, social, or cognitive impairment. The information regarding the child participants is presented in Table 2.

Table 2
Child participants' information

Group	**N**[13]	**Gender**	**Mean (months)**
3;6-4;10 year-olds	10	F=5/M=5	52.60
5;3-6;3 year-olds	14	F=3/M=11	67.93
7;0-7;10 year-olds	10	F=6/M=4	89.40

[13] Three additional children (aged 3;9, 4;0, and 5;0) did not complete the task since it became clear that they were following a response strategy, rather than providing. acceptability judgments. As soon as the experimenter realized this, the experiment was cut short for these children, and their (partial) data were excluded from the analysis.

A group of 14 Hebrew-speaking adults (F=11/M=3) served as controls. Adult participants provided their written informed consent. Parental written informed consent was obtained for each child prior to participation.

2.2. Design and material

The experimental conditions consisted of sentences with three types of direct objects: *et*-marked definite objects, unmarked definite objects, and *et*-marked indefinite objects. Following the discussion in subsection 1.1., conditions 1 and 3 are grammatical and ungrammatical, respectively, while condition 2 is formally grammatical, but highly restricted by register, and considered pragmatically odd in everyday, colloquial conversation. The experimental design is presented in Table 3 below.

Table 3
Example items from each condition

Condition	**Example**
Condition 1: *et*-marked definite object	Raz nixnas la-kita ve-axal **et ha**-karix. Raz entered.3SG.M to-the-classroom and-ate.3SG.M ACC the-sandwich 'Raz entered the classroom and ate the sandwich.'
Condition 2: unmarked definite object	?Dor halax la-sifriya ve-hexzir **ha**-sefer. Dor went.3SG.M to-the-library and-returned.3SG.M the-book 'Dor went to the library and returned the book.'
Condition 3: *et*-marked indefinite object	*Shai yatsa la-mesiba ve-lavaS **et** me'il Shai went-out.3SG.M to-the-party and-wore.3SG.M ACC coat 'Shai went out to the party and wore a coat'

The items used in the experiment were a subset of the items used in the adult questionnaire (subsection 1.1.). Out of a total of 10 items per condition in the adult questionnaire, we selected the 5 items that yielded the most clear-cut or prototypical response in each condition. So, in condition 1 it was the items that received the highest mean acceptability scores from the adults, while in condition 3 it was those that received the lowest average scores. Finally, for condition 2, the items selected were those that generated the highest mean rate of mid-scores.

To control for order effects, the items were randomized and arranged into three lists. Each participant was then randomly assigned one of the three lists.

2.3. Procedure

To probe Hebrew-speaking children's knowledge of the Hebrew DOM paradigm, we used an adaptation of the 3-point scalar acceptability procedure developed in Katsos & Bishop (2011). To supply an appropriate context for elicitation of acceptability judgments, participants were introduced to a puppet named Shula. Shula was presented by the experimenter as someone who knows Hebrew, but sometimes speaks "a little weird". The participant was then asked to help Shula learn to speak perfect Hebrew, by rewarding her different-sized strawberries, depending on how well she spoke. If Shula produces a perfect sentence, the participant will reward her with a large strawberry; if what she is saying is "a bit weird", she should be given a medium strawberry; if she is saying something "really strange", then she gets the small strawberry.

Journal of Child Language Acquisition and Development – JCLAD
Vol: 10 Issue: 4 627-652, 2022
ISSN: 2148-1997

The strawberries were paper-made and attached to a skewer, with the smallest strawberry on the left and the largest on the right. Each strawberry was twice the size of the previous one (see figure 2 below), and each point in the scale was explicitly produced with its label, namely, "the small strawberry," "the medium strawberry," and "the large strawberry."

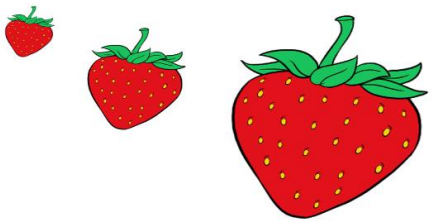

Figure 2. Different-sized strawberries serving as rewards

A second experimenter manipulated the puppet and played back the pre-recorded sentences for each experimental item.

We started each experimental session with a training session. The training included a total of nine sentences: three grammatical, three ungrammatical, and three grammatical but pragmatically odd. Items in the ungrammatical category consisted of subject-verb agreement violations, and the pragmatic anomalies in the latter category were achieved via the use of a high-register word or phrase inside a sentence that was otherwise colloquial and described an ordinary, everyday scene. An example from each category is provided in (9)-(11) below.

(9) ha-klavlav ha-katan navax. — Grammatical
the-puppy.SG.M the small.SG.M barked.3SG.M
'The little puppy barked.'

(10) *ha-yalda nixnesu la-gan. — Ungrammatical
the-girl entered.3.PL to-the-kindergarten
'The girl went into the kindergarten.'

(11) ha-banot telexna habayta lifnei redet ha-xashexa. — Pragmatically inappropriate in colloquial speech[14]
the-girls go.FUT.3PL.F home before set the-darkness
'The girls will go home before sunset.'

The procedure in the training was identical to the experimental procedure, except that the target response (the relevant-sized strawberry) for each item was provided by the experimenter, along with a clear explanation as to why that response was chosen. So, for example, if the sentence produced by Shula was pragmatically inappropriate, the experimenter would give her a medium-sized strawberry and explain (to both Shula and the child) that what Shula said was "a little weird", and therefore she gets a medium strawberry. After three items, the experimenter would begin to elicit judgments from the child before providing the target. Children who seemed unable to understand the

[14] The pragmatic anomaly is in terms of register. The verbal inflection used is archaic (a future form of the third person feminine plural that is essentially no longer in use in modern Hebrew). In addition, the phrase *redet ha-xashexa*, which translates as 'sunset', is a literary phrase that would ordinarily not be used by a native speaker in everyday speech.

task were excluded from the study (see footnote 9 in subsection 2.1.). The experimental procedure for the adult controls was the same as for the children.

3. Results and analysis

We wanted to see at what age Hebrew-speaking children demonstrate adultlike performance with respect to the Hebrew DOM paradigm. Before examining the child data, we first need to establish what the adult response pattern looks like. The three response options (small, medium, large strawberry) were coded as 1, 2, and 3, respectively. The average ratings of the adult controls for each object type are summarized and plotted in Figure 3.

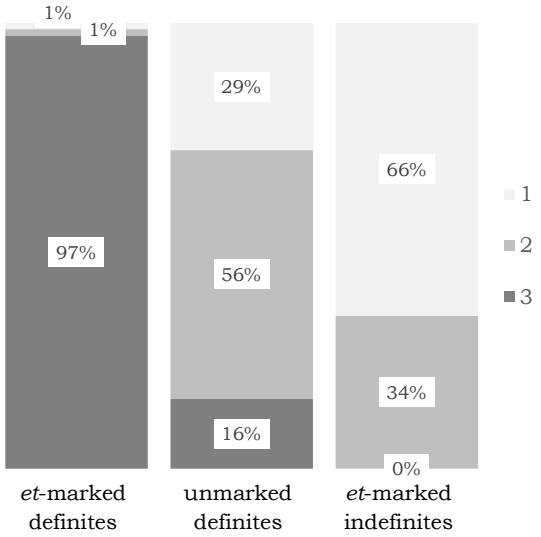

Figure 3. Mean response distribution across conditions (Adults)

As Figure 3 reveals, adult speakers behaved as expected, providing judgments that are very similar to the ones we found in the preliminary questionnaire. Items with *et*-marked definite objects were rated as fully acceptable 97% of the time. In contrast, *et*-marked indefinite objects generated 66% 1-scores, 34% 2-scores, and no 3-scores. While most judgments in this condition consist of full rejection, it should be noted that 66% 1-scores is nonetheless rather low, and quite unexpected, given that *et*-marked indefinites are deemed to be entirely ungrammatical, both by informal native intuitions and throughout the literature. Interestingly, as the reader may recall, these scores resemble the scores from the adult questionnaire (only 75% 1-scores on a 4-point scale). The acceptability ratings of unmarked definite objects were much more dispersed, with full acceptance and full rejection at 16% and 29%, respectively, and the majority of datapoints (56%) rated as 2.

If we look at a summary of the adults' average ratings in Figure 4, the DOM pattern that emerges is clear: items with *et*-marked definite objects are judged as fully acceptable, with mean scores at near-ceiling (2.96). This is in contrast to the mean ratings of items with *et*-marked indefinites, which only receive an average rating of 1.34. As expected, the mean acceptability ratings of sentences that consist of unmarked definite objects fall approximately in the middle of the other two object types (1.87), with a slight preference towards rejection.

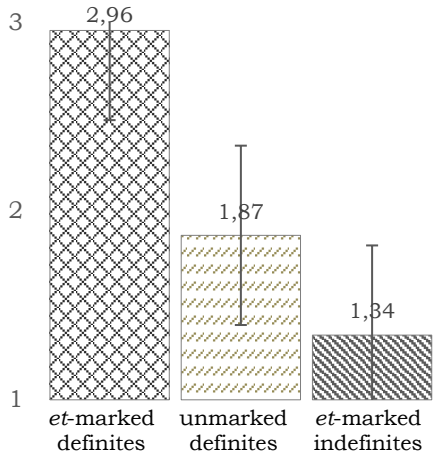

Figure 4. Mean ratings across conditions (Adults)

Having established the adult DOM pattern, we can now examine the response distribution in the three child groups. These are presented in Figure 5 below.

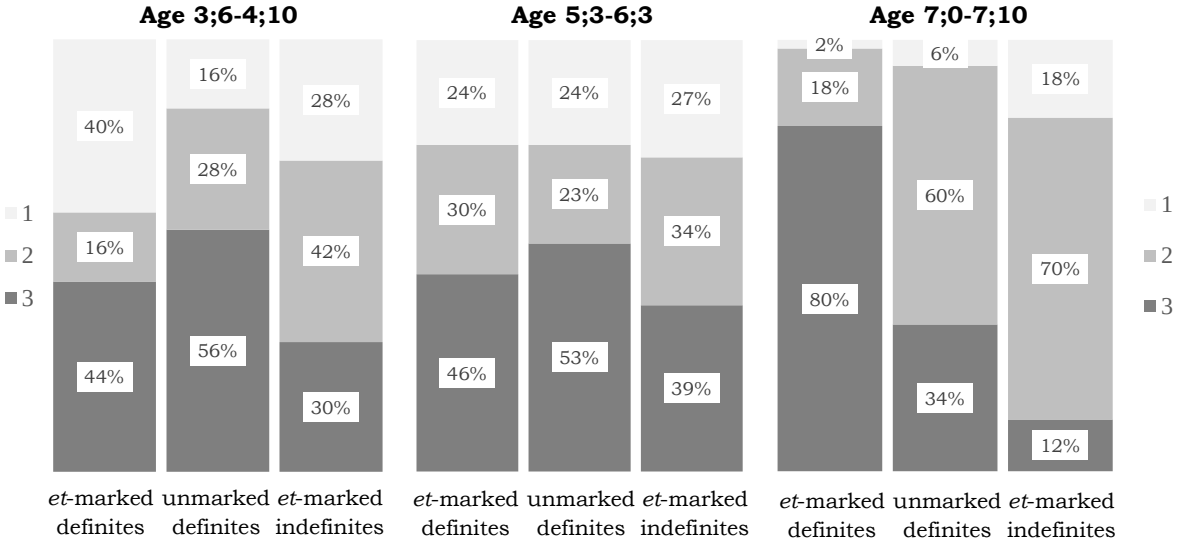

Figure 5. Mean response distribution across conditions (children)

As is immediately apparent from the graphs, the children's response patterns in all three groups are different from the ratings provided by the adults. In the youngest age group, judgments seem quite random, with little to no traceable pattern. The ratings provided by the 5;3-6;3 year-olds are quite evenly interspersed, with essentially the same response distribution regardless of object type.

In contrast to the data of the 3;6-6;3 year-olds, the response pattern of the oldest children begins to resemble the target DOM paradigm. While the distribution of judgments is itself not yet adultlike in any of the conditions, the data demonstrate a distinct response pattern for each condition, indicating that children at this age have developed some sensitivity to the differences between the three object types. Most notable, though, are the unexpectedly low rate of 1-scores in condition 3 (18%) and the rather reduced rate of 3-scores in condition 1 (only 80%, compared to the adults' 97%). This indicates that even the oldest children tested have not yet fully acquired the adult paradigm.

A summary of mean scores per condition for each age group (Figure 6) clearly illustrates the differences.

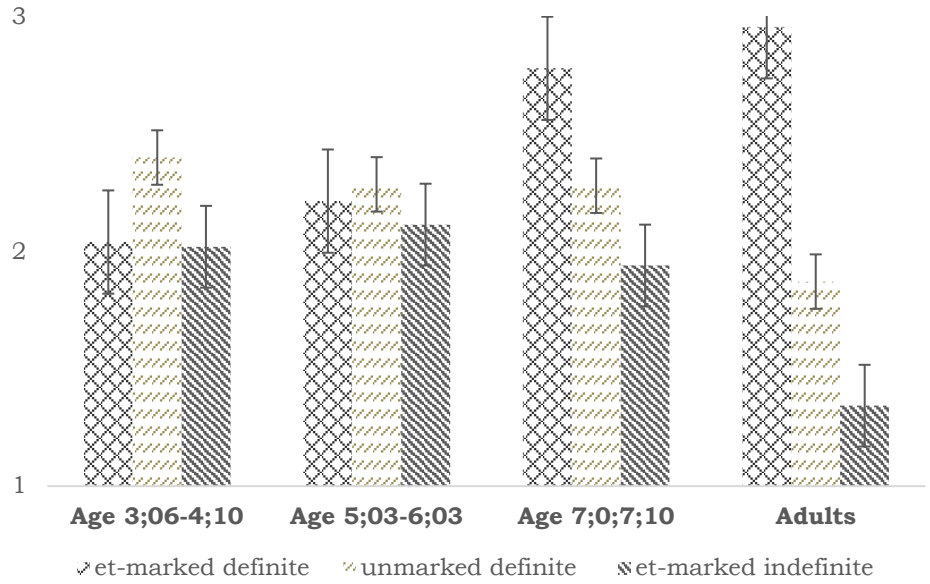

Figure 6. Summary of mean ratings across conditions for all participants

The descriptive statistics are summarized in table 4. Starting with the two younger age groups, we can see that indeed, on average, the children provided similar responses regardless of object type. At the same time, there is also considerable variance, as indicated by the relatively high standard deviation. Systematic distinctions between object types are only observed for the oldest children.

Table 4
Summary of descriptive statistics

		Object type		
		***et*-marked definites**	**unmarked definites**	***et*-marked indefinites**
3;06-4;10	**Mean Response**	2.04	2.40	2.02
	Std	0.92	0.76	0.77
5;03-6;03	**Mean Response**	2.21	2.29	2.11
	Std	0.81	0.84	0.81
7;0-7;10	**Mean Response**	2.78	2.28	1.94
	Std	0.46	0.57	0.55
Adults	**Mean Response**	2.96	1.87	1.34
	Std	0.27	0.66	0.48

An ordinal logistic regression with repeated measures, using a general mixed model, was used to analyze the results. We first wanted to test for subject (participant) effect and for item effect. To test for a subject effect, ordinal logistic regression of Response vs. Participant, Age group and Condition was used. In this model the Participant effect was significant ($p<0.001$), which due

to some participants consistently opting for higher scores across the board. To test for item effect, the same regression was used, with Response vs. Item and Age group, separately for each Condition was used. For Condition 1 (*et*-marked definites), no significant item effect was observed (p=0.33). For Condition 2 (unmarked definites), there was a significant item effect (p=0.007), and for Condition 3 (*et*-marked indefinites) we observed a marginally significant effect (p=0.06). To examine these effects more closely, we also tested for item within each condition for each age group. No significant item effect was observed for any of the conditions, as can be seen in table 5.

Table 5
Item effect by age group and condition

Condition 1: *et*-marked definites		**Condition 2: unmarked definites**		**Condition 3: *et*-marked indefinites**	
Age group	***p-value***	**Age group**	***p-value***	**Age group**	***p-value***
3;06-4;10	0.6918	**3;06-4;10**	0.5977	**3;06-4;10**	0.4136
5;03-6;03	0.0715	**5;03-6;03**	0.0702	**5;03-6;03**	0.4301
7;0-7;10	0.5975	**7;0-7;10**	0.1639	**7;0-7;10**	0.5745
Adults	1.0000	**Adults**	0.4860	**Adults**	0.7701

For the main analysis, we first wanted to test the interaction effect of age group and condition. In this model, subject and item were treated as random effects, so the model was adjusted for noted subject and item effects. The analysis yielded a significant interaction of age group*condition (p<0.001). A significant main effect of age group was also found in each condition (p<0.001, p=0.011, and p<0.001 for conditions 1, 2, and 3, respectively).

We also wanted to compare participants' responses in each condition within age group. The results of the analysis are presented in Table 6.

Table 6
Comparison of conditions in each age group

Age group	**Conditions compared**	***p-value***
3;06-4;10	1-2	0.0402
	1-3	0.8746
	2-3	0.0165
5;03-6;03	1-2	0.5410
	1-3	0.4544
	2-3	0.1790
7;0-7;10	1-2	<.0001
	1-3	<.0001
	2-3	0.0041

Adults	1-2	<.0001
	1-3	<.0001
	2-3	<.0001

For the youngest children, the analysis reveals that the response pattern for *et*-marked definites was significantly different from the judgments of unmarked definites. The difference between unmarked definites and *et*-marked indefinites was also significant. Interestingly, the difference between the children's judgments of *et*-marked definites and their judgments of *et*-marked indefinites was not significant. For the 5;3-6;3 year-olds none of the comparisons were significant, confirming the observation of no systematic distinction between the three object types. In contrast to the two younger age groups, both the 7;0-7;10 year-olds and the adult controls provided significantly different judgments in each of the comparisons, indicating clear and systematic differentiation between the various object types.

Finally, and importantly, we wanted to see whether the performance of the oldest children was adultlike. To this end, we used the model again to compare the responses of the 7;0-7;10 year-olds to the adult responses. What we found was that the children's response patterns were significantly different from the adults' in all three conditions ($p=0.015$, $p=0.034$, and $p<0.001$ for conditions 1, 2, and 3, respectively), which indicates that even at age 7;10 Hebrew-speaking children have not yet converged on the adult DOM paradigm.

4. General discussion

While the crosslinguistic acquisition of DOM has received considerable attention over the past three decades, such research has mainly been limited to production data. Our study is one of only a handful of previous studies to probe children's comprehension of DOM. In contrast to what has been observed in production, namely early convergence and virtually flawless performance, results from our graded acceptability task reveal that Hebrew-speaking children are not yet adultlike even at age 7;10. As such, our study provides further evidence that children's production of DOM significantly outpaces their sensitivity to the adult paradigm. How can we account for this asymmetry?

One plausible explanation is that the children's poor performance may simply be an artifact of the complex task demands. Grammaticality or acceptability judgment tasks have been among the most widely-used tools in acquisition research of the past several decades. It has been clearly demonstrated that children as young as 2 understand these tasks and are capable of providing systematic acceptability judgments when prompted to do so in the appropriate experimental setting (Becker 2007, Crain & McKee 1985, McDaniel, Cairns & Hsu 1990, Rice, Wexler & Redmond 1999, Theakston 2004, de Villiers & de Villiers 1972, 1974, and many more). However, in our study we used a gradable judgment task, rather than the more traditional binary judgment paradigm. It could be argued that a graded rather than a binary acceptability task is too cognitively demanding for young children.

The findings of Lingwall Odio (2018) provide some support for such a claim. Lingwall Odio used a version of Katsos & Bishop's (2011) "strawberry task", as well as a binary forced-choice grammaticality judgment task (Unsworth 2014), to investigate the grammatical acceptability of Spanish

copular verbs among a group of 57 monolingual Spanish speaking children aged 4;6-10;9.[15] While all the children were able to provide reliable judgments in the binary forced-choice task, the youngest 14 participants (aged 4;6-5;11) were unable to complete the ternary judgment task reliably, which Lingwall Odio argues is "due to the more complicated nature and overall cognitive demands" of the task (p. 57). Hence, the response patterns of the youngest age group in our study (3;6-4;10) may well be an artifact of the overall cognitive complexity of the task, rather than a true reflection of the children's knowledge regarding the DOM paradigm.

On the other hand, Ambridge, Pine, Rowland & Young (2008) have convincingly shown that children as young as 4;1 can in fact provide reliable graded acceptability judgements using the 5-point “smiley-face” scale shown in Figure 7.

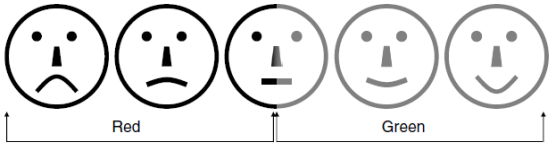

Figure 7. The five-point rating scale developed by Ambridge et al. (2008)

Ambridge and colleagues have since successfully used this graded acceptability judgment paradigm to test various linguistic phenomena with children aged 4 and up (see Ambridge & Rowland 2013, Bidgood et al. 2021 and references therein). So, while the performance of our youngest participants may have been confounded by task demands, it seems unlikely to assume that methodological concerns can also account for the data in the two older age groups (age 5;3-6;3 and 7;0-7;10). Instead, we think that our findings accurately reflect the learning challenge posed by the intricacies of DOM in adult language more broadly, as well as the language-specific factors involved in the adult Hebrew DOM paradigm.

For adult language crosslinguistically, it has long been argued that DOM presents a complex interaction between core-grammatical (syntactic-semantic) features and pragmatic-discourse constraints (e.g., Aissen 2003, Bossong 1991, Cassarà & Mürmann 2021, Dalrymple & Nikolaeva 2011, von Heusinger 2008, Wall & Obrist 2021). Given that DOM is an interface phenomenon, and taken together with robust independent evidence that such phenomena are key loci of delayed acquisition (e.g., Chien & Wexler 1990, Rothman & Guijarro-Fuentes 2012), it is not surprising that the acquisition of DOM will present a challenge for children.

In addition to the inherent complexity of interface phenomena more broadly, the learnability challenge may be further exacerbated by what Bossong refers to as the general "squishiness" of DOM (Bossong 2021: 24); namely, the fact that "the boundary between the presence and absence of object marking is fluid" (ibid.) and that "in most languages there are

[15] Lingwal Odio's study compares the monolingual group to a group of 34 Spanish-English bilingual speakers of similar ages.

transitional zones where marking and non-marking are both possible" (ibid.). This indeed seems to be characteristic of Hebrew DOM, assuming – as we have argued for in subsection 1.1. – that the Hebrew *et*-marking paradigm does not consist simply of a clear-cut, binary, syntactic-semantic choice between obligatorily marked definite objects and obligatorily unmarked indefinite objects. It involves instead a three-way distinction that crucially requires additional discourse-pragmatic knowledge. Such a complex paradigm would naturally be challenging for children to master.

Moreover, the fact that Hebrew DOM is closely tied to definiteness, itself a phenomenon involving the interface of grammar and pragmatics (e.g., Givón 1978, Heim 1982, 2011, Kamp 1981, Szabó 2000), may also help explain its particularly delayed acquisition. Previous studies on the acquisition of Hebrew have indeed shown a relatively prolonged trajectory. Zur (1983) presents the first systematic investigation of the acquisition of the Hebrew definiteness system. She argues that while Hebrew-acquiring children begin to use the definite determiner already in the very early stages of syntactic development, even school-age children do not yet seem to correctly produce the definite determiner in all its possible environments (Zur 1983:19). Notably, Zur's analysis of spontaneous speech reveals that even 5-6 year-olds still produce 15% erroneous definite marking. Error-free performance was only achieved by the 7-8 year-olds.

One other relevant study is Avram & Armon-Lotem (2005), who tested 32 Hebrew-speaking children aged 2-5 using an elicited production task. They report that up to age 4 Mean 4;6), omission of the definite article was found in 13% of discourse-related definite contexts and 21% of non-discourse-related definite contexts. Full convergence was attested only for the 5-year-olds. More recent data on the acquisition of the Hebrew definite system can be found in work by Meir, Armon-Lotem and colleagues (e.g., Meir & Novogrodsky 2021, Meir, Parshina & Sekerina 2020, Meir, Walters & Armon-Lotem 2017). While their main focus is on atypical and/or bilingual acquisition, the data from their TD monolingual controls are very relevant for the present study. Overall, it is observed that TD monolingual Hebrew speakers have not yet fully converged on the adult definiteness system before age 5;6.

A comparison of our findings for Hebrew with existing literature on the acquisition of DOM in other languages reveals a similar discrepancy between production and comprehension. As mentioned above, to our knowledge, there are only two other existing studies that use acceptability judgment tasks to test knowledge of DOM among TD monolingual children: Ketrez (2015) for Turkish and Guijarro-Fuentes, Pires & Nediger (2017) for Spanish. Similar to the current study, both these studies report data that challenge the neat picture of seemingly early DOM acquisition that emerges when only spontaneous speech is considered. Ketrez finds that even at age 6, Turkish-speaking children do not yet have full mastery of the various semantic and syntactic features involved in the adult Turkish DOM paradigm.

One potential source for the difficulty is argued to be the complexity of the structures tested, namely, the interaction between accusative marking and scope assignment in the context of negation. Ketrez contextualizes his findings with earlier crosslinguistic research that reports children's difficulties with

scope assignment, and particularly, wide scope interpretations of indefinites (see Ketrez 2015 for references).

The second – related – explanation offered by Ketrez for children's non-adultlike performance is that wide scope interpretations of accusative-marked indefinite objects are rarely found in Turkish child directed speech. Such interpretations are more frequent in written language, so as children learn to read, they may begin to receive this type of input. With time and more frequent exposure to written language, children eventually master the target structure.

The results of Guijarro-Fuentes et al. for Spanish are even more remarkable, with non-adultlike performance even for 10-15 year-olds. Moreover, the authors compare the results of their acceptability judgment task to data from Guijarro-Fuentes & Marinis (2011). Guijarro-Fuentes & Marinis tested 10 monolingual Spanish speakers aged 12-15 using a Completion Task (elicited production). While participants did not perform at ceiling in either of the tasks, accuracy levels in the judgment task were significantly lower than those reported by Guijarro-Fuentes & Marinis for elicitation.

Interestingly, Guijarro-Fuentes et al. (2017) discuss the delayed acquisition attested in their study in light of the claim that monolingual Spanish speaking children master the Spanish DOM by around age 3 years (as made by Rodríguez-Mondoñedo 2008). They argue that the discrepancy can be the result of Rodríguez-Mondoñedo relying solely on spontaneous speech. Recall, that the relevant features for Spanish DOM are the animacy and specificity of the object; the agentivity (or at least [+human] feature) of the subject; and the semantics of the predicate. Guijarro-Fuentes et al. propose that the animacy feature may be the primary feature for Spanish DOM, and that this primacy is what accounts for its early mastery, as attested in naturalistic data. Hence, using only spontaneous speech, Guijarro-Fuentes et al. argue, does not target all the relevant DOM features involved in Spanish DOM, and may consequently provide an inaccurate representation of the child's grammar.

A similar argument can be made for the acquisition of Hebrew DOM. The primary feature responsible for the distribution of DOM in adult Hebrew is definiteness. This is the feature mastered early by Hebrew acquiring children, as attested in spontaneous speech data such as the ones analyzed by Uziel-Karl (2015). The secondary feature of register, which regulates the optional marking of definite objects, is not easily targeted in spontaneous speech data. It is only when the full range of features is targeted, as may only be done using acceptability judgments, that children's true errors are revealed.

Such an asymmetry between poor performance on judgment or comprehension tasks, coupled with early adultlike production, particularly in spontaneous speech, has been observed for a variety of linguistic phenomena and has received considerable attention in the acquisition literature (for an overview, see Grimm, Müller, Hamann & Ruigendijk 2011, Hendriks 2014, Hendriks & Koster 2010). Previous accounts propose a number of sources for this unexpected mismatch. These include claims about the different methodological demands involved in production versus comprehension tasks (Brandt-Kobele & Höhle 2010, Hirsh-Pasek & Golinkoff 1996), as well as extralinguistic explanations such as limited processing capacities (Grodzinsky

& Reinhart 1993, Reinhart 2004, 2006), an immature pragmatic system (Chien & Wexler 1990, Thornton & Wexler 1999), or children's difficulty with explicit meta-linguistic reasoning (Davies & Katsos 2010, de Villiers & Johnson 2007, Johnson et al. 2005). Others have argued that the asymmetry reflects a genuine psycholinguistic phenomenon, in that production and comprehension are not two instantiations of one psycholinguistic process (Hendriks 2014, Hurewitz et al. 2000, Ünal & Papafragou 2016).

With respect to research on the acquisition of DOM, it is easy to see that methodology is a major – perhaps **the** major – contributing factor to the observed asymmetry. Beyond purely methodological explanations, all previous accounts attempt to explain the production-comprehension asymmetry observed for phenomena that involve competing or alternative **interpretations**. It is therefore difficult to see how these accounts could be extended to linguistic phenomena such as the acquisition of Hebrew DOM, which, crucially, does not involve comparison operations of the relevant type. Particularly, whether a DP is *et*-marked or not has no effect on interpretation *per se*; it therefore seems unlikely that the children's non-adultlike performance in judgments may be the result of the various interpretive operations argued to be the source of difficulty in the works cited above.

In sum, the findings of the current study provide further support for the mismatch between children's early production of DOM and their sensitivity to the paradigm, which was first observed for Turkish and Spanish. As such, it further highlights the importance of methodological choices in child language research. Specifically, it underscores how relying solely on spontaneous production data may lead to fundamentally inaccurate conclusions about children's true competence with respect to a particular linguistic phenomenon.

It remains to be seen whether other DOM languages will reveal a similar production-acceptability asymmetry as we have found for Hebrew, and as Ketrez and Guijarro-Fuentes et al. have found for Turkish and Spanish, respectively. Given the genealogical distance of the three languages already tested, we expect that this will indeed be revealed for the acquisition of DOM crosslinguistically. Further research is also needed in order to determine what may be the source of such a substantial discrepancy between production and acceptability judgments, as currently available accounts of the asymmetry are seemingly unable to provide an adequate explanation.

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