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Morphological skills among native Arab kindergarteners with developmental language disorders

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ABSTRACT

This study tested morphological skills among 14 native Arab kindergarteners with developmental language disorder (DLD) (age; 5.51 ± 0.95 , 10 boys and 4 girls) and fifteen kindergarteners with typical language development (TD) (age; 5.49 ± 0.37 , 7 boys and 8 girls). The participants completed two tasks designed to assess the identification and production of inflectional morphology skills in Arabic. In the identification task, the participants were asked to choose between two alternatives of pseudowords, the one that corresponds to a conventional inflection in the language, based on the instruction they hear. In the production task, the participants were asked to produce an appropriate pronunciation of the pseudowords according to the requested inflection, without selecting from given alternatives. Pseudowords were used in both tasks to evaluate the efficiency of applying inflectional knowledge. The results showed that the performances of TD children were significantly higher than those of children with DLD, in both tasks. Additionally, children with DLD performed significantly better on the identification task than on the production task. These findings are discussed in light of the assumption that the difficulties in morphological skills in the group of native Arab children with DLD may result from general difficulties in acquiring language regularities.

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Introduction

Developmental language disorder (Hereafter: DLD) is a common developmental disorder and is one of the most prevalent disabilities among preschool-aged children, affecting approximately 7% of the population (Chilosi et al., 2023; Tomblin et al., 1997). However, it is important to note that language difficulties in DLD are not proportionate to the child's age and are not caused by intellectual, sensory, neurological, or mental disorders (Curtis et al., 2018). Difficulties in developing morphological skills, including the production and comprehension of morphological derivations and inflections, are considered as main characteristic of children with DLD (Bol & Kuiken, 1990; Ellis Weismer et al., 2011). For example, children with DLD may exhibit inefficiencies in both expressive and receptive morphology, alongside broader language

difficulties affecting phonological, syntactic, and semantic skills (Calder et al., 2022; Taha et al., 2021). The current study aims to investigate the ability of Arabic-speaking children with DLD to apply morphological regularities in inflecting new unknown words.

In this context, there is broad consensus among researchers that the early stages of language development play a critical role in enabling individuals to internalise the structural regularities of their native language – including phonological, syntactic, and morphological rules – which are subsequently applied during speech production (Amso & Davidow, 2012; Arciuli & Conway, 2018; Arnon, 2019; Aslin & Newport, 2009; Conway et al., 2010). As children grow, beyond their first year of life, they begin to recognise the regularities of the inflectional morphology within their native language (Ravid, 2019; Szagun, 2001). The acquisition of these morphological skills is thought to occur as a result of repeated exposure to morphological structures in different verbal contexts of their own native language (Ulicheva et al., 2021). The ability in acquiring these regularities mainly facilitates the accurate morphological inflections skills, contributing to vocabulary growth and efficiency (Bratlie et al., 2022; Fejzo et al., 2018; Gellert et al., 2021; Marsden et al., 2013).

In general, the study of language characteristics in children with DLD compared to TD children within specific linguistic contexts is, therefore, of great significance. For example, Leonard and Schroeder (2024) conducted a comprehensive review highlighting impact of different languages on the difficulties experienced by children with DLD. The various studies reviewed by Leonard and Schroeder indicate that specific linguistic characteristics of any language might significantly influence processing mechanisms of the native TD children as well as those with DLD of such language. Accordingly, it was recommended to emphasise the importance of expanding research across diverse linguistic backgrounds to better understand how the specific linguistic features of the language influence processing mechanisms among children with DLD. However, research findings consistently underscore the crucial role of morphological skills in the development of linguistic skills across languages (Boudelaa & Marslen-Wilson, 2001; Kirkici & Clahsen, 2013; Marslen-Wilson et al., 1994; Pizzuto & Caselli, 1992; Schiff et al., 2008; Zhou & Marslen-Wilson, 1995). Accordingly, Arabic, the native language of the participants in the present study, is a Semitic language, features a highly complex morphological system essential for word derivation and inflection (Abu-Rabia, 2002; Gwilliams & Marantz, 2015; Ravid & Farah, 1999; Taha, 2013; Taha & Saiegh-Haddad, 2017). Arabic is also characterised by diglossia, where two language varieties coexist: spoken Arabic, used in daily life and acquired naturally, and Standard Arabic, used for formal communication and learned through structured education (Saiegh-Haddad, 2003; 2004; Taha, 2013). Despite the linguistic differences between spoken and Standard Arabic, both varieties share significant morphological richness. Morphological and morphosyntactic regularities governing inflection in spoken Arabic are largely based on Standard Arabic rules. For example, the rules governing noun inflection according to number, person pronouns, and gender, as well as the tense inflection rules for verbs, are fundamentally similar in both Spoken and Literary Arabic. In terms of noun inflection by number, both Literary and Spoken Arabic follow a comparable inflectional process for nouns and verbs. For instance, in both varieties, the word '*qalam*' is used to represent 'one pen', *qalame:n* for 'two pens', and '*aqla:m*' in Literary Arabic versus '*iqla:m*' in Spoken Arabic to denote the plural 'pens'.

The difference observed in the plural form is not morphological in terms of number inflection, but rather phonological at the word level, distinguishing Literary from Spoken Arabic. Despite this phonological variation, the morphemic pattern that signifies the plural form – namely *a:—*remains consistent. In other words, the morphemic units that underlie the inflectional rules for nouns and verbs are, for the most part, shared between both the Spoken and Literary forms of Arabic.

Arabic words – including verbs, nouns, and adjectives – are typically derived from roots and patterns. Words with the same root share a semantic connection (Boudelaa et al., 2010). For example, the words < maktu:b - مَكْتُوب >; (letter), < ka:tib - كَاتِب >; (writer), and < kita:b - كِتَاب >; (book) all originate from the root < k.t.b - ك.ت.ب >, which conveys the meaning of writing. Roots generally consist of three or four sounds and altering their sequence results in a different root with a distinct meaning. Additionally, words derived from different roots but sharing the same pattern exhibit similar functional meanings. For instance, the words [< madrasatun > مَدْرَسَةٌ (school)], [< mazraʿatun > مَزْرَعَةٌ (farm)], and [< maysalatun > مَغْسَلَةٌ (laundry)] follow the same morphological pattern, مَفْعَلَةٌ (maʿfalatun), denoting a place where an activity occurs. Consequently, the development of typical language skills in Arabic is heavily reliant on the proper application of these morphological structures of inflectional morphology (Asadi et al., 2022; Ravid & Farah, 1999; Schwartz et al., 2016; Taha & Saiegh-Haddad, 2016).

For example, Abdalla et al. (2013) investigated types of noun plural inflections in Kuwaiti Arabic-speaking children with and without language impairment. Their findings showed that TD children were significantly more accurate in using the appropriate plural noun inflections than children with language impairment. Recently, Taha et al. (2021) demonstrated that Palestinian Arabic-speaking children with DLD exhibited significant difficulties in verb inflection tasks compared to their TD peers, particularly in marking tense and subject-verb agreement using a verb elicitation task. The task was created to assess Arabic-speaking children's ability to produce six third-person verb forms (present and past, masculine/feminine singular and plural). The task used 72 pictures, including 30 experimental pairs and 12 filler items, focusing on different gender and number combinations. Each verb was represented by a pair of images showing an activity before and after completion, depicting familiar daily actions. These findings suggest that morphological deficits in children with DLD may hinder their ability to process morphosyntactic structures and apply accurate inflections of verb forms. Similarly, the study conducted by Abdalla and Mahfoudhi (2024) assessed the morphological production skills of verbs based on tense inflections. This was achieved through a video-based scenario presented to TD participants and those with DLD. The findings revealed significant differences between the two groups, where the TD children demonstrated significantly higher performances. These disparities were evident in their ability to make the morphological production of verbs according to person and gender, with a particular emphasis on difficulties in producing verbs in the feminine gender.

Therefore, the main assumption of the current study is that children with DLD have difficulties in acquiring morphological regularities, and as a result, they will show impairments in applying correct morphological inflections based on the rules of Arabic morphology. Accordingly, it could be proposed that disorders in language development among native Arab children might be expressed as deficits on the level of acquiring inflectional regularities of the language morphology. These difficulties might disturb the abilities to

accurately inflect new words according to number, gender, tense, or pronouns (Schwartz et al., 2016).

As stated earlier, the Arabic language is characterised by complex morphological structures and regularities, both in its spoken and written forms. Since the ability to acquire such regularities is considered a key component of typical language development (Bogaerts et al., 2021), it is particularly relevant to examine how this function – applying morphological rules – differs between typically developing (TD) native Arabic-speaking kindergarten children and those with developmental language disorders (DLD).

Accordingly, the main aim of the present study is to examine the ability to apply morphological inflectional regularities among children with DLD, compared to their TD peers. The study was designed to assess this ability through two tasks intended to evaluate participants’ skills in producing and identifying morphological inflections (Schwartz et al., 2016). It is also of interest to investigate whether a difference exists between the ability to produce versus identifying morphological inflections among participants in the two research groups.

Method

Participants

Fourteen children with DLD were recruited from special kindergartens for children with DLD, and fifteen typically developing (TD) children were selected to serve as a control group (see Table 1). All the participants are native-Arabic speakers from north Israel. Each child with DLD had been referred to the special kindergarten following a professional diagnosis by certified practitioners in the education and healthcare systems – specifically, speech-language pathologists and developmental psychologists. In these special kindergartens, the participants receive treatment aimed at enhancing their language and communication skills. Data collection took place during the COVID-19 pandemic, within the time windows when access to participants was possible. During this period, children’s attendance at kindergartens was irregular due to lockdowns and restrictions on the number of individuals allowed in enclosed spaces. These limitations significantly delayed the ability to recruit a large sample.

The primary criterion for placement in these kindergartens was a confirmed diagnosis of DLD. According to professional reports from the kindergartens, the children exhibited expressive-phonological DLD, with deficits in phonological processing, as well as semantic and syntactic abilities (Bishop et al., 2017).

Table 1. Distribution of participants by age and gender.

Variables	Age		Participants(N)	
	M	SD	F	M
Typical	5.49(y)	.3	8	7
DLD	5.51(y)	.95	4	10

Abbreviations: y = years; F = Females; M = Males.

Given that the children with DLD had already undergone a thorough diagnostic process, a re-evaluation of their language abilities was deemed unnecessary for the purposes of this study. The reliability of their placement in special kindergartens supported their inclusion.

Prior to participation, parental consent was obtained for each child. Parents were also asked to complete a developmental background questionnaire, which included questions about any neurological or developmental conditions their child may have. Participation was voluntary, and parents could opt out of the questionnaire or withdraw their child from the study at any time. All participant names and identifying information were kept confidential. Based on the questionnaire responses, children for whom reports indicated the presence of neurological disorders (e.g. epilepsy, Tourette syndrome, cerebral palsy), sensory impairments (e.g. hearing or vision loss), or other Suspected conditions (e.g. Suspected underlying presence of ADHD) were excluded from the study. As a result, children with hearing impairments, attention deficits, or any neurological or emotional disorders were not included. All participants came from low- to middle-socioeconomic backgrounds, as classified by standard socioeconomic indices in Israel (Israel Central Bureau of Statistics, 2022).

Procedure and testing

Each child was tested individually in a quiet room within the kindergarten that had been designated for the study. The order of task presentation was randomised to control order effects. All test items were adapted to the northern Palestinian Arabic vernacular.

Two tasks were used to assess morphological identification and production skills (see [Appendix A](#) for additional examples and illustrations). Each task began with two practice items to ensure that the child understood the instructions:

Morphological identification task

This task, adapted from Schwartz et al. (2016), assessed morphological identification skills. Stimuli consisted of non-existent triconsonantal roots that followed Arabic phonotactic constraints. These roots were inserted into real morphological patterns in Arabic to form pseudowords. The test included 36 pairs of pseudowords representing six grammatical categories: gender, number (singular/plural), dual form, bound possessives, past tense, and present tense – each category comprising six items. All items were presented in random order.

Participants were instructed: ‘Listen to the pair of funny words I’m going to say. After you hear them, repeat them’. Then, the child was asked to choose the word that best fit a given grammatical category (e.g. ‘Which word, *Kfe:r* or *Kfe:r-e*: [كفيري/كفيري], refers to a girl?’). The task requires participants to identify the pseudoword that correctly matches the morphological features implied by the question. This process involves selecting the morphologically appropriate stimulus, and thus, is defined as a morphological identification task. Each correct response was awarded one point, while incorrect response received a score of zero. Accuracy was based on the total number of correct responses. Accuracy was scored as the total number of correct responses. The reported internal consistency for this test, according to Schwartz et al. (2016), is $\alpha = .82$.

Morphological production task

This task was adapted from Schwartz et al. (2016) to assess morphological production skills. Participants were shown 36 pairs of pictures depicting fictional objects or characters. For example, the examiner might present a picture of five identical fictional characters and say, ‘These are *Rafa:yim* (رفاييم)’, using a pseudoword in the plural form. The child would repeat the word, then be asked, ‘What do you call it when there is only one?’ prompting them to produce the singular form.

As in the identification task, this task included six grammatical categories with six items each: gender, number (singular/plural), dual form, bound possessives, past tense, and present tense. Each correct response was awarded one point, while incorrect productions received a score of zero. Accuracy was based on the total number of correct responses. The internal consistency of this task, based on the current sample, was $\alpha = .73$.

It is important to clarify that the first task is considered to assess identification processes, while the second task primarily examines production processes. In the first task, the participants were asked to choose between two alternatives of pseudowords, the one that corresponds to a conventional inflection in the language, based on the instruction they hear. Accordingly, the process involves identification of the appropriate inflection from existing alternatives. In contrast, in the second task, the participants were asked to produce an appropriate pronunciation of the pseudowords according to the requested inflection, without selecting from given alternatives. Therefore, this process involves producing a morphological inflection that corresponds to the instruction. As previously mentioned in the introduction, the study by Taha et al. (2021) investigated the feasibility of morphological production based on a task fundamentally similar to one where children were instructed to produce appropriate verbs in accordance with a depicted scenario.

Thus, performance in the first task reflects a process of identification of the appropriate inflection among given choices, while in the second task tests morphological production skills.

Results

In the first step, a one-sample t-test was conducted using a test value of 0.5 to ensure that DLD participants’ performance exceeded chance level. The results indicated that, for both the identification and production tasks, the performance was indeed significantly above chance $t(13) = 13.68, p < 0.001$ and $t(13) = 5.21, p < 0.001$, respectively.

In addition, a mixed-design analysis of variance (ANOVA) was conducted to examine differences between the two groups (TD vs. DLD) in their performance on the two morphological tasks: identification and production (see Table 2).

Table 2. Means and $\pm$ SDs for the performances on the morphological identification and production.

Production	Identification	Task
M SD	M SD	
84.52 9.72	82.73 7.94	Typical
36.06 25.51	60.67 16.45	DLD

The results revealed a significant interaction between group and task, $F(1, 28) = 13.97$, $p < 0.01$, $\eta^2 = .5$. Specifically, the TD group performed better on the production task than on the identification task, whereas the DLD group showed the opposite pattern.

Additionally, there was a significant main effect of task type, $F(1, 28) = 14.91$, $p < 0.001$, $\eta^2 = .53$, as well as a significant main effect of group, $F(1, 28) = 48.86$, $p < 0.001$, $\eta^2 = .79$.

A significant difference was found between the groups in morphological production performance, $F(1, 28) = 46.77$, $p < 0.001$, $\eta^2 = .63$, with the TD group scoring higher ($M = 84.52$, $SD = 9.72$) than the DLD group ($M = 36.06$, $SD = 25.51$). Similarly, a significant difference was observed in morphological identification performance, $F(1, 28) = 22.32$, $p < 0.001$, $\eta^2 = .45$, where the TD group again outperformed the DLD group ($M = 82.73$, $SD = 7.94$ vs. $M = 60.67$, $SD = 16.45$).

However, within-group comparisons showed no significant difference in performance between the two tasks for the TD group, $F(1, 14) = 0.15$, $p = 0.69$. In contrast, the DLD group exhibited a significant difference, $F(1, 13) = 19.94$, $p < 0.01$, $\eta^2 = .6$, with higher performance in the identification task ($M = 60.67$, $SD = 16.45$) compared to the production task ($M = 36.06$, $SD = 25.51$).

Discussion

Language development relies on the typical acquiring of morphological regularities (Boudelaa & Marslen-Wilson, 2001; Kirkici & Clahsen, 2013; Marslen-Wilson et al., 1994; Pizzuto & Caselli, 1992; Schiff et al., 2008; Zhou & Marslen-Wilson, 1995). Words in different languages are inflected during language production according to specific syntactic and morphological regularities. Thus, typical language skills are heavily influenced by the ability in acquiring these morphological regularities (Dressler et al., 2003; Ravid, 2019; Szagun, 2001). The current results showed that native Palestinian-Arabic children with TD performed significantly better than children with DLD in both the production and identification of morphological inflections. These lower performances among children with DLD, as compared to TD children, reflect difficulties in acquiring and applying the morphological inflectional rules of the language. It is important to note that the participants' performances should primarily be guided by their knowledge of the morphological inflection rules of Arabic. Since Arabic words are typically derived from root morphemes and inflected according to various morphological patterns, the language development of native Arabic speakers – particularly their vocabulary growth – is influenced by their ability to acquire these morphological regularities. Therefore, difficulties in the acquisition of these regularities may negatively impact overall language development (Marsden et al., 2013; Tallas-Mahajna et al., 2025). It is important to note that both tasks used in the current study consisted of unfamiliar items (pseudowords and pictures), meaning there was no prior formal learning or specific knowledge about the morphological inflections or production of these words.

As it was mentioned early, the intact development of morphological skills is crucial, as it underpins and facilitates the acquisition and refinement of other language domains. For instance, morphological skills are critical for syntactic skills development (Julien, 2007). In addition, language comprehension relies on the ability to understand the morpho-syntactic structure of spoken sentences, as well as the ability to produce typical morpho-syntactic structures during speech production (Sheridan & Smeaton, 1992).

Therefore, various studies have highlighted that poor morpho-syntactic skills are a key feature of children with DLD (Richards & Goswami, 2019; Scarborough & Dobrich, 1990; Van der Lely, 1997). This assumption was supported by the current results where native Arab children with DLD manifested lower performances in inflectional morphology skills as compared to children with TD. Moreover, it has been reported that typical language skills in Arabic are largely influenced by normal morphological and morpho-syntactic abilities (Asadi et al., 2022). Therefore, difficulties in acquisition of morphological regularities may impede the development of other language levels in native Arabic children with DLD.

The current results indicated that among TD participants, there was no significant difference in performance between the two morphological tasks. In contrast, the DLD group performed significantly better in the identification than in the production task. This finding, indicating difficulties in production of inflectional morphology, is consistent with previous studies on DLD and inflectional morphology (e.g. Abdalla & Mahfoudhi, 2024; Calder et al., 2022; Marchman et al., 1999; Moraleda-Sepúlveda & López-Resa, 2022; Taha et al., 2021). The prevailing theory posits that children with DLD struggle with morphological skills, which in turn impacts their grammatical and linguistic development, particularly their ability to produce inflectional morphology (Moraleda-Sepúlveda & López-Resa, 2022). The current findings showed that the DLD participants performed poorly in both identification and production of inflectional morphology compared to their identification performance. However, the proposed design of the current study does not address the cognitive basis for these poor morphological abilities. The design of the current study allows for the assessment of how participants apply morphological regularities during the process of morphological inflections. Based on these findings, it can be inferred that the poor acquiring of language regularities are fundamental to DLD in children. These difficulties hinder the acquiring of morphological regularities in their native language. This hypothesis was recently supported by the findings of Tallas-Mahajna et al. (2025), who showed that younger native Arab children with DLD demonstrated more limited verb pattern production (both in types and tokens) than their age-matched TD peers.

Limitations

The primary limitation of this study is the small sample size. Data collection occurred during COVID-19 restrictions, which made it challenging to gather data. Future replications of this study with a larger sample are recommended. Due to the relatively small sample size, further analyses such as error analysis and correlations were not feasible. Future research with a larger sample should focus on analysing errors made by participants, especially at the production level, as well as examining predictive variables and correlations between types of errors, background data, and performance in different tasks.

Another limitation of the study is the lack of control over variables related to the children's home language and literacy environment, such as the parents' years of education and the nature of literacy and language interactions at home (Hamilton et al., 2016). Controlling for these variables during data collection would help ensure better matching between and within the groups of participants.

Additionally, it would be valuable to explore the effect of socioeconomic status and educational and family factors on performance within the different groups. For example, research by Lara-Díaz et al. (2021) indicates that oral language performance and reading skills in children with DLD are influenced by socioeconomic, educational, and family factors.

Clinical and educational implications

Despite the limitations of a small sample size, the findings of the present study may contribute to the field of intervention for Arabic-speaking children with DLD. If the difficulties observed in the DLD group are attributed to impairments in the self-detection of morphological regularities, intensive intervention becomes essential to compensate for the deficit in morphological skills. Enhancing morphological skills in native Arab children is considered a key contributor to metalinguistic awareness and language skills in preschool children (Saiegh-Haddad, 2023). Intervention programs focusing on developing skills in morphological inflections, both in production and comprehension, could greatly benefit the language development of children with DLD. The task structures used in the current study can serve as a basis for designing future tasks aimed at optimising these skills. By practicing these skills, children may experience overall improvements in language production and identification.

Beyond interventions, the findings of this study contribute to the field of diagnosing children with DLD by providing a deeper understanding of the nature of their difficulties in morphological skills at both the identification and production levels. The tasks used in this study provide a foundation for developing diagnostic tools tailored to assess morphological production and identification skills in children. The advancement of diagnostic tools for language development disorders, particularly for Arabic-speaking children, is crucial, as there is a significant lack of such tools.

In conclusion, DLD presents challenges for children, with consequences that can impact various levels of language acquisition, including spoken and written skills (Saiegh-Haddad, 2023; Taha & Saiegh-Haddad, 2016). The ability to apply linguistic regularities, particularly morphological ones, is essential for children's early language development. The acquiring of these regularities plays a critical role in language acquisition.

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Compliance with ethical standards

The authors of the current manuscript declare that all parents of the participants in the current study gave their informed consent in writing prior to the inclusion of their children in the study. In addition, the authors declare that there are no conflicts of interest that could have direct or potential influence or impart bias on the work.

The current study and all its ethical standards were approved by the research and ethical committee of the graduate studies department in learning disabilities in Sakhnin College, Israel.

Data availability statement

The data that supports the findings of this study are available from the corresponding author, upon reasonable request.

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Appendix A

A) Examples for the Morphological identification test

Example 1: ‘Listen to the pair of funny words that I’m about to say. Once you hear them, repeat them’. The words <لُوبِي- لُوبَكُم > <lobkom-lobi >. In the next step the participant was asked to identify the word that suits a particular category (e.g. which word, <لُوبِي لُوبَكُم- > <lobko-lobi>, might be a word means that this subject is mine ‘not yours’}.

Example 2: ‘Listen to the pair of funny words that I’m about to say. Once you hear them, repeat them’. The words <صَوَامِيْر-صَوْمَر > <somar- swa:me:r > In the next step the participant was asked to identify the word that suits a particular category (e.g. which word, <صَوَامِيْر-صَوْمَر > <somar- swame:r>, refers just to one thing}.

Example 3: ‘Listen to the pair of funny words that I’m about to say. Once you hear them, repeat them’. The words <فَام-فَامَت > <fa:m- fa:mat > In the next step the participant was asked to identify the word that suits a particular category (e.g. which word, <فَام-فَامَت > <fa:m- fa:mat>, might be a word means that a girl did something}.

B) Examples for the Morphological production test

Example 1: The examiner pointed to the picture (non- familiar pseudo-object) with the five characters and said, ‘Those are Rafa:yim-رفاييم (A pseudoword that represent the plural on name of such pseudo-characters)’ and the child was asked to repeat after the examiner an exact word that s/he already heard (e.g. ‘Please say Rafa:yim-رفاييم’). Next, the examiner asked the child ‘What do you say when it is only one?’ And the child should produce a word that is a singular to the one s/he heard).



Example 2: The examiner pointed to the picture with the non-familiar character and said, ‘This is kabj-كَبج (A pseudoword that represent the singular name of such pseudo-characters)’ and the child was asked to repeat after the examiner an exact word that s/he already heard (e.g. ‘Please say kabj-كَبج’). Next, the examiner asked the child ‘What do you say when we have two?’ And the child should produce a word which represents the dual noun to the one s/he heard).

