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Research Report

Morphosyntactic abilities of toddlers with hearing impairment and normal hearing: evidence from a sentence-repetition task

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Abstract

Background: While considerable research exists on morphosyntax of school-age children with hearing impairment (HI), little is known about development of morphosyntax at younger ages. Some studies show that young children with HI have a delay in language abilities compared with children with normal hearing (NH); conversely, other studies show evidence that they achieve age-appropriate language development.
Aims: To investigate whether characteristics of morphosyntactic development displayed by young children with HI are unique or whether they are similar to those of NH children.
Methods & Procedures: Fifty-four Hebrew-speaking children (15 with HI and 39 with NH), aged 22–40 months, completed a novel Hebrew sentence repetition (SRep) task designed to evaluate morphosyntactic abilities. Accuracy on the total correct structure, repetition of content and function words, and repetition of specific morphemes were compared across groups.
Outcomes & Results: At the earliest stages of combining words to sentences, toddlers in both groups showed a large variation in morphosyntactic development, with no significant difference between the two groups. Children with HI and NH showed similar results for the acquisition of morphemes and various syntactic structures. In the group of children with HI, hearing capability accounted for 28% of the variance of the SRep task.
Conclusions & Implications: The findings suggest typical morphosyntax capacity at the onset of language development among of children with HI who are diagnosed early and receive intensive intervention.

Keywords: hearing impairment, language development, syntax, sentence repetition.

What this paper adds
Previous studies on morphosyntactic development of children with HI had mixed results. Some show that children with HI as a group display a gap in their language abilities as compared with children with NH. In contrast, other studies reported that individual children reach age-appropriate language development. The current study is the first to assess morphosyntactic development of young children with HI as compared with that of children with NH on a sentence-repetition task, supporting intact morphosyntactic capacity at the early stage of combining words. Taken together early diagnosis, early intensive intervention and auditory-accessible language input during initial stages of language acquisition support typical syntactic acquisition during this critical age of language acquisition.

Introduction

Several studies have explored language abilities of school-age children with hearing impairment (HI) and specifically their morphosyntactic abilities (for an overview, see Moeller *et al.* 2007). However, little is known about the development of morphosyntax of younger children. Earlier studies showed that children with HI have severe language deficits compared with children with normal hearing (NH) (e.g., Bishop 1983). The last decade has brought considerable advances in earlier identification of children with HI and in hearing aid technology, with new evidence about language skills of children with HI using cochlear implants (CI) and hearing aids (HA). The findings about language abilities of children with HI using CI and HA are mixed.

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Children with HI as a group are reported to have delayed language abilities as compared with children with NH (e.g., Boons *et al.* 2013, Friedmann and Szterman 2006, Friedmann *et al.* 2008, Tuller and Delage 2014, Tomblin *et al.* 2005, Tur-Kaspa and Dromi 2001). Some studies suggested that despite CI and HA, morphosyntactic development is impaired (e.g., Friedmann and Szterman 2006, Tuller and Delage 2014). Conversely, some children with HI achieve age-appropriate language development and show no signs of delay or impairment (e.g., Boons *et al.* 2013, Norbury *et al.* 2001). The latter findings indicate that language deficits in children with HI are not severe or present at all.[1]

Few studies have investigated the initial stages of morphosyntactic acquisition of children with HI. It is not clear how children with HI develop morphosyntactic abilities from the onset of combining words into sentences. The current study is devised to close this gap by exploring the performance of toddlers with HI and with NH on a sentence-repetition (SRep) task.

Early morphosyntactic acquisition in NH children

In typical language acquisition, children start combining words towards the end of their second year of life (e.g. 'That doggie'). Here, we specifically focus on Hebrew early morphosyntactic acquisition as it is the target language of the current study. Hebrew is a Semitic language with rich morphology (for a detailed description of Hebrew grammar, see Berman 1978). Hebrew verbs, nouns and adjectives are derived by a root and a pattern. For example, the root *K-T-V* has a core meaning 'to write' and numerous words can be derived using prefixes, suffixes and infixes: *KaTaVti* 'I wrote', *hit-KaTaVnu* 'we wrote to each other', *KaTuV* 'written', *KaTaVa* 'article', *KTiVa* 'writing'. Hebrew preschoolers show an awareness of root-pattern morphology across different tasks (Berman 2000, Clark and Berman 1984, Novogrodsky and Kreiser 2015). Hebrew verbs are inflected for the features of number, person and gender. Adjectives and nouns agree in number and gender (e.g., *yalda yafa* 'girl.FEM.SG beautiful.FEM.SG', *yeladim yafim* 'children.MASC.PL beautiful.MASC.PL'). Hebrew marks definiteness with the particle *ha-* (e.g., *ha- yalda ha- yafa* 'DEF-girl DEF-beautiful') and uses an accusative marker *et* in front of definite nouns (e.g., *kibalti et ha- mixtav* 'I received the letter'). Thus, Hebrew-speaking children have to acquire inflectional and derivational paradigms.

Verbal inflections marking number and gender appear first, followed by marking for tense and later for person features (Armon-Lotem and Berman 2003). For example, Armon-Lotem and Berman (2003) show that the three children studied in their sample correctly marked verbs for gender and number at the ages of 1;7–1;9, while the appropriate marking of person was observed in these children several months later (i.e., 1;10–2;1). Similarly, Ashkenazi *et al.* (2016) demonstrated that Hebrew-speaking toddlers, who were followed longitudinally for 6 months from the ages 1;8–2;4, used a variety of verb patterns and verb inflections. Verbal inflectional morphology is reportedly acquired by the age of 3 (Berman 1985). During initial stages of combining words, the language of Hebrew-speaking children, similarly to the language of toddlers speaking other languages, is telegraphic: 2-year-old children omit the infinitival prefix *le-*, definite marker *ha-*, prepositions and subordinators (Berman 1985, Berman and Lustigman 2012). Towards the third year, Hebrew-speaking children use a wide range of grammatical elements such as: definite marker *ha-*, accusative marker *et*, conjunction *ve-*, prepositions *le-* to mark dative relationships, and locative prepositions *al-*, *ba-* (e.g., Berman 1985, Berman and Lustigman 2012).

Hebrew is a subject–verb–object (SVO) language (Givón 2014), but it allows flexible word order (Ravid 1977). At ages 2–3 years, Hebrew-speaking children manifest word order flexibility. Toddlers aged 1;6–2;11 produce different word orders in their spontaneous speech, following the constraint of the language (Friedmann, 2007). For example, Hebrew-speaking toddlers use SV and VS word orders with unaccusative verbs (e.g., 'the-plate broke' *ha-calaxat nishbera* / 'is broken the-plate' *nishbera ha-calaxat*), while keeping sentences with unergative verbs (e.g., '*ha- yalda caxaka* 'the-girl laughed') predominately in an SV word order. During the third year of life, children's sentences become longer and they produce simple and even complex structures (Berman 1985, Friedmann *et al.* 2011).

Hebrew is a morphologically rich language. As discussed above, Hebrew-speaking toddlers show evidence of morphology development at a young age. Two- to three-year-old toddlers acquire verbal inflections and plurals and start showing evidence of definiteness and preposition acquisition (Berman 1985, Armon-Lotem and Berman 2003, Lustigman 2013). The nature of the language might affect language development of children with HI, as these features are salient in their input. In the current study, we explore this question.

Language abilities of HI children

Morphosyntactic abilities of school-age children with HI have been extensively investigated. Some studies report that children with HI might demonstrate problems across different morphosyntactic phenomena (e.g., Friedmann and Szterman 2006, Tuller and Delage 2014, Wimmer *et al.* 2017). The gap in the morphosyntactic abilities of children with HI can be attributed to input differences. Children with HI deficiently perceive input due to their HI, which taxes their language performance (for an overview, see Moeller and Tomblin 2015). Yet, studies report that some children with HI reach age-appropriate language development and show no signs of delay or impairment such as good understanding of word order in sentences (Spencer 2004), understanding plural regular forms and pronouns based on the CELF test (Boons *et al.* 2013), and finite verb morphology (third person and tense) (Norbury *et al.* 2001).

As for Hebrew-speaking, school-age children, there is evidence that morphosyntactic systems are not as well developed among children with HI as compared with age-matched NH children. For example, Tur-Kaspa and Dromi (2001) looked at grammatical abilities of children with HI at ages 11–13 years and found that most common grammatical errors were problems with obligatory morphological markers, grammatical agreement and omission of a major syntactic constituent in a sentence. Similarly, Hebrew-speaking children with HI at ages 7–11 demonstrated difficulties with comprehension and production of constructions derived by syntactic movement (Friedmann and Szterman 2006, Friedmann *et al.* 2008).

Less is known about language abilities of young HI children. Do they demonstrate deviations in morphosyntactic development from the onset of combining words? Most previous literature focusing on children's lexical abilities using indirect observations (i.e., questionnaires completed by parents) provide inconclusive evidence on lexical development. Some children with HI are reported to show age-appropriate levels of lexical knowledge, while others do not reach norms of children with NH. For example, group findings show that only one-third of the children perform similarly to their NH peers (e.g., Rinaldi *et al.* 2013, Välimaa *et al.* 2018). Interestingly, Tomblin *et al.* (2005) showed that expressive skills of English-speaking children with HI were within the range expected for children with NH; however, the performance of children with HI showed a downward trend over a period of 24 months. The authors suggest that the expressive language skills of children with HI and children with NH are initially similar, but the rate of language growth in children with HI does not keep pace with children with NH. We return to this view in our discussion of the current findings.

Less is known about the morphosyntax of toddlers. Wimmer *et al.* (2017) looked at the comprehension of *wh*-questions in a group of German-speaking children with HI at ages 3–4 and reported that as a group they showed more problems compared with children with NH. Grammatical development of three Hebrew-speaking toddlers with HI and three aged-matched toddlers with NH was compared over a 2-year period by Herzberg (2010). The three female toddlers received a CI at the age of 12–18 months. No differences were found between the groups for production of plural morphology. Children with HI showed a slight, 3-month delay in verbal morphology. These findings suggest that children with HI with early implantation have similar patterns of morphosyntax at initial stages of language acquisition.

Several factors have been suggested to impact language development in children with HI (for an overview, see Geers and Brenner 2003, Moeller and Tomblin 2015). These include maternal education, severity and type of HI, age of impairment, age of intervention and speech perception capacity (e.g., Newman *et al.* 2006). We briefly discuss here factors that have been linked to hearing function. Hearing severity affects language outcomes negatively (Nicholas and Geers 2006). Early intervention and early CI implantation positively affect language outcomes. Children who are implanted in their first year show better language scores than children who are implanted between ages 1 and 2 years (Dettman *et al.* 2007, Geers and Nicholas 2013, Houston and Miyamoto 2010). Speech perception measures represent the function of the hearing system beyond hearing loss severity, type of hearing device and hearing experience. Children with better speech perception show better language outcomes (e.g., Eisenberg *et al.* 2016, Houston and Miyamoto 2010). In the current study, hearing function is tested indirectly using parental questioners.

Parental questionnaires are often used to assess auditory capability in toddlers, due to difficulties measuring speech perception directly, at this young age. For example, the Infant–Toddler Meaningful Auditory Integration Scale (IT-MAIS) assessment tool (Zimmerman-Phillips *et al.* 2000) has been linked to children's successful language mastery (e.g., for a study on Hebrew-speaking toddlers, see Ben-Itzhak *et al.* 2014).

To sum up, at school age, children with HI present morphosyntactic gaps compared with their peers, which might be linked to ongoing deficits in auditory and linguistic experience. The findings indicate that toddlers begin to acquire morphosyntax similarly to their NH peers.

Sentence repetition as a window for children's morphosyntactic competence

SRep tasks are widely used to assess children's morphosyntactic abilities (e.g., Seeff-Gabriel *et al.* 2010) and have been successfully used with young children (e.g., Devescovi and Caselli 2007, Friedmann 2007). They were shown to be effective in identifying deaf, school-age children with and without specific language impairment (SLI) when tested in sign modality (Marshall *et al.* 2014). The SRep task is complex: it involves auditory perception of the stimuli and reproduction of them.

The rationale behind it is that when children repeat sentences, they do not repeat passive sequences of sounds. The task involves syntactic knowledge, language processing, memory and production (e.g., Polišenská *et al.* 2015). SRep tasks are reliable tools for assessing typical and atypical language acquisition among different populations (Armon-Lotem and Meir 2016, Conti-Ramsden *et al.* 2001, Marshall *et al.* 2014, Theodorou *et al.* 2017).

In the current study, we developed a SRep task for exploring early morphosyntactic development among Hebrew-speaking children. The task included only sentences with two-, three- and four-content words and structures that are typical for children at this early stage of language acquisition (Berman 1985, Friedmann 2007, Friedmann and Lavi 2006).

Purpose of the current study

This study investigated whether patterns of morphosyntactic development displayed by young children with HI are unique or similar to those of NH peers. Prior findings reported mixed results. Some studies found that as a group, children with HI perform significantly lower than children with NH, and others reported that some school-age children with HI show age-appropriate language skills. The study explored patterns of morphosyntactic acquisition of children with HI and children with NH at the onset of combining words.

First, we evaluated the validity and reliability of a novel SRep task for assessing morphosyntactic skills in children with NH.[2] Second, we determined whether the accuracy of repetition of sentences of varying length and syntactic structure is different/similar between children with HI and children with NH. Third, we determined which factors affect repetition accuracy among the HI group.

Methods

Participants

Fifty-four children aged 22–40 months participated in the study, 15 children with HI and 39 children with NH.

Children with HI

Fifteen participants aged 24–37 months were recruited from three intervention centres in Israel. All underwent a universal newborn hearing screening.[3] They were diagnosed with bilateral sensorineural, mild-to-profound hearing loss and participated in a daily intervention programme or individual intervention programmes.[4] Table 1 summarizes individual demographic information for the HI children. They all used bilateral HA or a CI and a HA. Five participants used simultaneous communication (spoken and signed language) and 10 used aural–oral communication. None had additional cognitive/neurologic deficits based on reports from their speech–language therapists. Note that age of intervention for children using a CI was earlier than seen in table 1. For children using HA, hearing age was calculated based on when the HA was fitted. For children using a CI, hearing age was calculated from the age of CI activation. However, these children used HA before implantation. For example, participant 1 was 34 months old with hearing age of 22 months. This child started intervention before the age of 6 months using bilateral HA and received a CI at the age of 12 months.

Children with NH

Thirty-nine children with NH (26 boys and 13 girls) aged 22–40 months were recruited from three preschools in northern Israel and through personal communication. They all had typical hearing and no developmental impairment based on parental interview and teachers' reports.

The two groups (children with HI and children with NH) did not differ with respect to gender distribution or chronological age (table 2).

Parents of all children who participated in the study provided signed informed consent. The University of Haifa and the Israel Ministry of Social Affairs and Social Services Ethics Committees approved the study.

Materials

Vocabulary size and linguistic stage

The Hebrew Communicative Development Inventory (H-CDI) (Maital *et al.* 2000), a questionnaire completed by the child's parent, was used to assess children's linguistic stage and vocabulary size. Previous studies have revealed that the H-CDI is a valid, reliable tool for assessing children's linguistic abilities (e.g., Feldman *et al.* 2005, Maital *et al.* 2000). Grammatical stage was based on eight questions concerning common scenarios and the child's spoken response in these scenarios. The response varied from (1) one word, (2) word combination, (3) simple sentences and (4) varied response (e.g. 'What does your child say when he does not want to go to sleep? (1) No, (2) Not sleep, (3) I don't sleep, (4) I don't want to sleep now). The grammatical stage was based on the highest sum of responses for that stage (e.g., a child who received five out of eight responses representing simple sentences (3) was given a simple-sentence stage).

Auditory capability of children with HI

Auditory capability was measured only for the children with HI, using the Hebrew Infant Toddlers Meaningful Auditory Integration Scale (IT-MAIS) (Ben-Itzhak

Table 1. Information about participants with hearing impairment ($n = 15$)

Child	CA (months)	Hearing age (months)	Gender	Hearing device	Hearing loss	CM	IT-MAIS (%)
1	34	22	Boy	CI + HA	SN profound	AO	83
2	32	13	Boy	HA + HA	SN moderate–severe	AO	80
3	26	20	Boy	HA + HA	SN severe	AO	83
4	27	24	Boy	HA + HA	SN moderate–severe	SC	83
5	27	12	Girl	CI + HA	SN profound	SC	80
6	24	18	Girl	Bone HA	Conductive moderate–severe	SC	75
7	25	14	Boy	HA + HA	SN moderate–severe	SC	93
8	36	27	Girl	CI + HA	SN profound	AO	90
9	32	16	Boy	CI + HA	SN profound	AO	85
10	37	34	Boy	HA + HA	SN severe	AO	73
11	28	16	Boy	CI + HA	SN profound	AO	85
12	32	14	Boy	HA + HA	SN moderate–severe	AO	68
13	36	12	Girl	HA + HA	SN moderate	AO	65
14	27	24	Boy	HA + HA	SN moderate–severe	AO	80
15	29	24	Girl	HA + HA	Conductive moderate–severe	SC	83

Note: CA, chronological age; CI, cochlear implant; HA, hearing aid; SN, sensorineural; CM, communication mode; AO, aural–oral; SC, simultaneous communication; IT-MAIS, Hebrew Infant Toddlers Meaningful Auditory Integration Scale.

Table 2. Demographic information of the participants in each group

Demographics	Children with hearing impairment ($n = 15$)	Children with normal hearing ($n = 39$)	Results for Levene's test for equality of variances (F- and p-values)	Results for group comparisons
Gender	10 boys, 5 girls	26 boys, 13 girls		$\chi(1) = 0.00, p = 1.00$
Chronological age (months)			$F = 1.09, p = .30$	$t(52) = 0.74, p = .46$
Mean	30	29		
SD	4	5		
Hearing age (months)			$F = 0.81, p = .37$	$t(52) = 5.68, p < .001$
Mean	19	29		
SD	6	5		
CDI score	253	369	$F = 0.14, p = .71$	$t(52) = 3.27, p < .001$
Mean	126	113		
SD				

et al. 2014). This questionnaire, completed by a parent, is a sensitive tool for assessing spontaneous responses to sound in the child's everyday environment. The total score for 10 questions on a 0–4 scale ranges from 0 to 40 (e.g. 'Is your child aware of environmental sounds at home?' Never–always). These 10 questions tap into three principal areas: vocalization behaviour, alerting to sounds and deriving meaning from sound. Raw scores were converted into percentages. An audiology report was received for each participant including age, hearing age, hearing device, severity of hearing loss and communication mode (table 1).

Sentence-repetition task

The SRep task was developed as part of the current study. The task includes 54 sentences split into nine structures with six sentences each (table 3). Structures previously reported to be found in toddlers' production (Berman 1985, Friedmann and Lavi 2006) were included in the task. The stimulus sentences included content words (nouns, verbs and adjectives) and function words (definite articles, prepositions and conjunctions). The stimulus sentences varied from two to four content words (table 3). Sentences consisting of two content words included four types of syntactic structures: nominal sentences, sentences with unergative verbs, sentences with unaccusative verbs in VS order and sentences with unaccusative verbs in SV order.[5] Sentences consisting of three content words included three types of syntactic structures: simple sentences with accusative verbs in SVO order, sentences with unergative verbs and an adjunct, and null subject coordination sentences. Sentences consisting of four content words included two types of syntactic structures: simple sentences with accusative verbs that take two obligatory internal arguments in SVOO order and coordination sentences with unergative verbs in each clause. Sentences differed in the number of morphemes (range = 3–10) and in the number of syllables (range = 3–14). There were significant correlations between these two measures ($r = .89$, $n = 54$, $p < .001$). Half the sentences per type

Table 3. Examples of stimuli used in the sentence-repetition (SRep) task per structure, with metrics of length (in words, syllables, morphemes)

	Structure	Example	Number of content words	Number of syllables, mean (range)	Number of morphemes, mean (range)
1	Nominal	*ha- oto adom* DEF-car.MASC red.MASC 'The car is red'	2	5.67 (5–7)	3.83 (3–5)
2	Unergative	*ha- tinoket yeshena* DEF- baby.FEM sleeps.FEM 'The baby is sleeping'	2	4.83 (3–7)	3.83 (3–6)
3	Unaccusative VS	*nigmar ha- xalav* finished.MASC DEF-milk.MASC 'The milk is finished'	2	5.67 (4–7)	4.33 (3–5)
4	Unaccusative SV	*ha- delet niftexa* DEF door.FEM opened.FEM 'The door opened'	2	6.17 (5–9)	5.17 (4–8)
5	SVO	*ha-yeled bana migdal* DEF boy built.MASC tower 'The boy built a tower'	3	7.50 (6–9)	5.00 (4–7)
6	SV + adjunct	*ha- shoter kafatz ba-gina* DEF- policeman jumped in+DEF yard 'The policeman jumped in the yard'	3	7.83 (6–9)	5.67 (5–7)
7	Null subject coordination	*dana shara ve- rakda* dana sang and danced 'Dana sang and danced'	3	7.67 (6–9)	5.83 (5–7)
8	SVOO	*ha- yalda shalxa tmuna le-aba* DEF- girl sent picture to- father 'The girl sent a picture to the father'	4	9.83 (7–12)	6.50 (5–8)
9	Coordination sentence	*saba tas ve- savta nasa* grandpa flew and grandma travelled 'The grandpa flew and the grandma travelled'	4	11.17 (8–14)	8.50 (7–10)

included masculine gender (examples 1, 3, 5 and 7) and half feminine gender (examples 2, 4, 6 and 8). Sentences with masculine gender and feminine gender had the same number of syllables ($t(46) = 1.45$, $p = .15$). However, sentences with the subject in the feminine gender included significantly more morphemes than sentences with masculine gender ($t(46) = 2.77$, $p = .01$). In Hebrew, a masculine form is unmarked, while feminine morphemes mark the noun, adjective and verb. The task included lexical items known to toddlers at this age. Five experienced speech and language therapists and teachers who work with toddlers evaluated the sentences of an earlier version as matching for children in this age range. Based on this feedback, a few words were replaced.

Procedure

Participants were tested individually in a quiet room. The task was presented orally. The examiner sat in front of the child without covering her mouth and produced each sentence once. After repeating each sentence, the child received a disk, which was part of a puzzle game, or a building block to build a tower. This was given regardless of correct response. If the child gave more than one response while trying to repeat the sentence, the most accurate response was noted. We used a coding system that did not penalize children for consistent developmental phonological errors (e.g., phoneme deletions and/or substitutions). Upon cooperation of the child, one to two breaks were given. All participants completed the task in one session. The testing was recorded and transcribed by the third author and coded separately be the second author. Before the test, the task was explained and followed by a practice session. This included three trials: one-word '*aba*' (dad), and two-word combinations: '*boker tov*' (good morning), and '*shalom yeled*' (hello child). During practice, if the child erred, the examiner repeated the stimuli correctly. All children including those using simultaneous communication completed the trial stage, suggesting that they perceived the spoken stimuli. All children responded solely in spoken modality. Three children who did not repeat the practice stimuli were not tested (one with HI and two with NH).

Coding

We employed three coding schemas on sentence, word and morphology levels. First, we coded children's responses for the correct sentence structure. According to this coding scheme, lexical substitutions were allowed and children were not penalized for the omission of definiteness, while omission of any constituent was scored as an error (see examples 1 and 2, while examples 3 and 4 would be coded as correct responses.

Target structure SVO:

ha- yalda axla tapuax.
DE- girl ate.FEM apple

'The girl ate an apple.'
Child's responses:

(1) *tapux*
apple

(2) *yalda axla*
girl ate.FEM

(3) *yalda axla tapuax*
girl ate.FEM apple

(4) *ha- yalda axla tapuax*
DEF- girl ate.FEM apple

The second coding scheme counted the number of correctly repeated content and function words and noted the number of omissions. Raw scores were converted into ratios by dividing the number of correctly repeated words (content or function) by the number of content and function words in the stimuli sentences.

The third coding scheme reflected correct use of morphosyntax: definite determiner '*ha-*' in determiner phrases (DPs), correct use of prepositions in prepositional phrases (PPs) and verbal inflections. Unlike the first coding scheme (correct sentence structure), this coding scheme was intended to grasp children's ability to produce the specific morphemes. For this purpose, we looked at DPs that included the definite determiner and a noun (e.g., *ha- yalda* 'DEF girl'). Responses were coded as correct if the child correctly repeated the full DP (determiner plus noun) and incorrect if the child repeated a bare noun (e.g., *yalda* 'girl'). Instances in which the child did not repeat the noun at all were excluded from the analysis. The repetition of prepositions in PPs, i.e., preposition plus noun, (e.g., *ba- gina* 'in+DEF 'yard'), was analyzed using an identical coding schema as for definite determiners. For verbal inflections, only responses with a subject and a verb were explored. Responses in which either a subject or a verb was omitted were excluded from the analysis. For example, responses in which a [Number], [Gender] or [Person] mismatch was observed were coded as erroneous (e.g., *dana* ∗*halax* 'dana.FEM went.MASC').

Results

The results for the study showed that the SRep task had good compliance rate of 95%: 54 of 57 participants (15 with HI and 39 with NH) understood the instructions of the task and completed it, while three participants (one with HI and two with NH) did not complete the practice stimuli and were not tested. This adds to the few studies reporting on compliance rate in toddlers (for an overview, see Hodges *et al.* 2017).

Validity and reliability of the sentence repetition task in Hebrew for toddlers

To answer the first question, we verified the reliability and validity of the novel SRep task developed for this study.

Interrater reliability

To test interrater reliability, 11% of the data (two children with HI and four children with NH) were independently re-transcribed and recoded by the first author. Interrater reliability was high, at 96% (range = 89–100%). Disagreements were resolved upon discussion.

Internal reliability

To determine the internal consistency of the SRep task, we first applied a split-half method for the entire test. A Spearman–Brown estimate (.97) and Cronbach's alpha (part 1: $\alpha = .95$; part II: $\alpha = .95$) indicated good internal reliability for the entire test. Next, we determined the internal consistency for each structure (six sentences within each structure) using a Cronbach's alpha analysis. Internal consistency also showed good internal reliability across all structures (nominal sentences: $\alpha = .88$;

Table 4. Accuracy for correct repetition of content and function words per group

	Children with hearing impairment ($n = 15$)	Children with normal hearing ($n = 39$)
Content words	0.60 (0.17)	0.64 (0.24)
Function words	0.36 (0.23)	0.50 (0.33)

Note: Values are mean (SD).

unergative: $\alpha = .84$; unaccusative SV: $\alpha = .88$; unaccusative VS: $\alpha = .85$; SVO: $\alpha = .90$; SV plus adjunct: $\alpha = .91$; null subject coordination: $\alpha = .90$; SVOO: $\alpha = .89$; coordination sentence: $\alpha = .88$).

Concurrent validity

Concurrent validity of the SRep task was assessed in the group of children with NH. Three measures were used. First, there were significant correlations between the SRep scores and chronological age (Pearson's $r = .66$, $n = 39$, $p < .001$). Second, there were significant correlations between SRep scores and vocabulary size as measured by the CDI scores (Pearson's $r = .74$, $n = 39$, $p < .001$). Importantly, the third measure showed significant correlations between a valid measure of child syntactic development, the CDI grammatical stage and the novel SRep task (Spearman's $r = .84$, $n = 39$, $p < .001$). All three measures indicated that concurrent validity of the SRep task was high and it is valid for assessing children's language development.

Comparison of children with HI and children with NH

Comparison of SRep total scores in children with HI and children with NH

To answer the second research question whether children with HI show different patterns of morphosyntactic acquisition, we compared children's total scores on the SRep task. An independent *t*-test revealed that children with HI performed on a par with children with NH ($t(52) = 0.99$, $p = .33$, Levene's test: $F = 2.39$, $p = .13$). As shown in figure 1, both groups showed high variability in performance. However, more children in the NH group performed better on the SRep task.[6]

Word type effect in children with HI and children with NH

Subsequently, we compared the accuracy of repetition of content and function words (table 4). A two-way mixed-model analysis of variance (ANOVA) with Group (children with HI, children with NH) as a between-subject factor and Word type (content, function) as a within-subject factor was conducted. No violation of equality of variance was observed as determined by Box's test of equality of variance ($F = 0.72$, $p = .54$). The results indicated that there was a significant effect of Word type ($F(1,52) = 129.25$, $p < .001$, partial $\eta^2 = .71$), no significant effect of group ($F(1,52) = 1.25$, $p = .27$), and a significant Word type∗group interaction emerged ($F(1,52) = 8.59$, $p = .01$, partial $\eta^2 = .14$). The effect of Word type indicated that children in both groups repeated significantly more content words (mean = 0.63) than function words (mean = 0.43) ($p < .001$). Yet, as a follow up on the interaction, group differences did not reach significance either on content words ($p = .56$) or on function words ($p = .14$).

Morpheme type effect among children with HI and children with NH

Further, we compared the two groups on the use of definite determiner *ha-*, prepositions and verbal inflections. A two-way mixed model ANOVA with Group (children with HI, children with NH) as a between-subject factor and morpheme type (definiteness, preposition, SV agreement) as a within-subject factor was conducted. Violation of equality of variance was observed as determined by Box's test of equality of variance ($F = 4.70$, $p < .001$). Mauchly's test indicated that the assumption of sphericity has been violated (Mauchly's $W = 0.89$, $p = .046$), thus the Greenhouse–Geisser correction was applied. The analysis showed a significant effect of morpheme type with Greenhouse–Geisser correction ($F(1.80, 93.39) = 30.78$, $p < .001$, partial $\eta^2 = .37$), no effect of Group ($F(1.52) = 0.20$, $p = .66$) and significant Morpheme type*group interaction ($F(1.80,93.39) = 3.49$, $p = .04$, partial $\eta^2 = .06$). The effect of morpheme type was further investigated using pair-wise comparisons with a Bonferroni correction for multiple comparisons. The analysis showed that children were significantly more accurate on SV agreement as compared with producing a definite morpheme in a DP or a preposition in a PP (both comparisons at $p < .001$), while no differences were found between the use of definiteness in DPs and the use of prepositions in PPs ($p = .98$) (table 5). A significant Morpheme type*group interaction was followed up by paired wise comparisons of groups, yet no two comparisons reached significance.

To sum up this subsection, no differences were found between the two groups on the total scores of the SRep task, on the repetition of content and function words and on repetition of the three types of morphemes. Across the two groups, content words were repeated

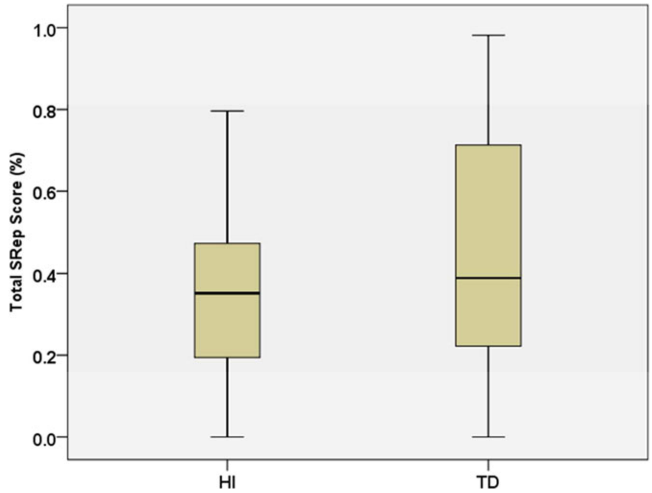

Figure 1. Total accuracy scores on the sentence-repetition (SRep) task per group (hearing impairment versus normal hearing). [Colour figure can be viewed at wileyonlinelibrary.com]

Table 5. Accuracy of morpheme repetition per group

Morpheme	Children with hearing impairment ($n = 15$)	Children with normal hearing ($n = 39$)
Definite determiner (definite determiner plus noun)	0.61 (0.27)	0.70 (0.32)
Preposition (preposition plus noun)	0.57 (0.31)	0.68 (0.37)
Verbal inflections	0.96 (0.7)	0.87 (0.30)

Note: Values are mean (SD).

more accurately than function words and verbal inflections were repeated more accurately than the definite determiners *ha-* and prepositions.

Sentence length effect between children with HI and children with NH

To assess the effect of sentence length on the SRep performance in children with HI and children with NH, a two-way mixed model ANOVA with Group (children with HI, children with NH) as a between-subject factor and Length (two-, three- and four-word) as a within-subject factor was performed (figure 2). Box's test of equality of variance showed a violation of variance ($F = 2.83$, $p = .01$). Mauchly's test indicated that the assumption of sphericity has been violated ($W = 0.67$, $p < .001$), thus the Greenhouse–Geisser correction was applied. The results showed a robust effect of Length ($F(1.51,78.33) = 99.47$, $p < .001$, partial $\eta^2 = .66$), no significant effect of Group ($F(1,52) = 1.26$, $p = .27$) and no significant Length*group interaction ($F(1.51,78.33) = 0.67$, $p = .47$). Post-hoc analysis for the main effect of Length using pair-wise comparisons with a Bonferroni correction indicated that two-word sentences were repeated significantly more accurately than three- and four-word sentences (both comparisons $p < .001$), and the scores for three-word sentences were significantly higher than those for four-word sentences ($p < .001$).

We further compared the percentage of children in each group who repeated more than half the sentences correctly per length. Most children in both groups correctly repeated two-word sentences (children with HI: 73%; children with NH: 72%). A chi-square test indicated no significant difference between children with HI and children with NH ($\chi(1) = 0.01$, $p = .91$). The percentage of children who correctly repeated more than half the three-word sentences was lower across both groups (children with HI: 20%; children with NH: 31%), and there were no significant differences between groups ($\chi(1) = 0.63$, $p = .43$). In the four-word sentences, no children in the HI group successfully repeated more than half the sentences correctly, while in the NH group, seven children demonstrated mastery of four-word sentences. A chi-square test indicated a marginal group difference on four-word sentences ($\chi(1) = 3.09$, $p = .08$). To sum up, the effect of length was similar across both groups. Accuracy decreased as the sentences lengthened.

In addition to the effect of length in words reported above, we further explored the effect of length in syllables and morphemes for two-content-word sentences. There were significant correlations between correct repetition of a sentence and its length in syllables (Spearman's $r = .09$, $p < .001$) and in morphemes (Spearman's $r = .08$, $p = .001$). The increased number of syllables and the increased number of morphemes were linked to declines in performance.

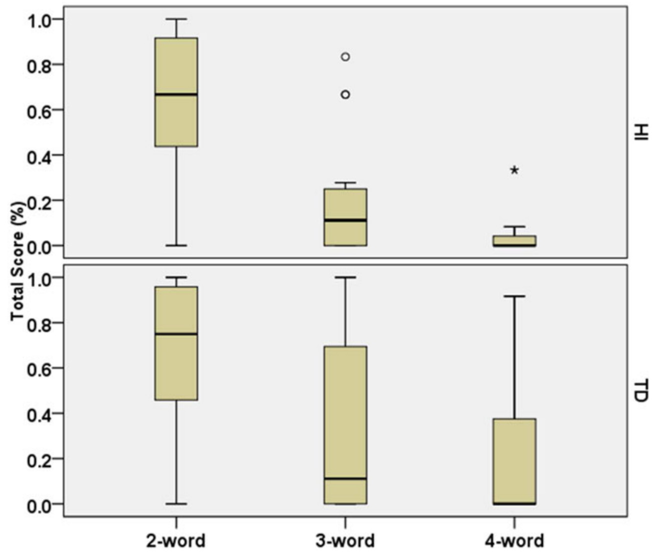

Figure 2. Accuracy scores on the sentence-repetition (SRep) task per sentence length and group. [Colour figure can be viewed at wileyonlinelibrary.com]

Syntactic structure effect on SRep accuracy in children with HI and children with NH

To evaluate the effect of syntactic structure on the correct repetition of sentences, we analyzed only the two-content-word sentences, because the total success rate for both groups was low on the three- and four-content-word sentences. Four structures were manipulated within two-content-word sentences. A two-way mixed model ANOVA with group (children with HI, children with NH) as a between-subject factor and structure (nominal; unergative; unaccusative VS; unaccusative SV) as a within-subject factor was applied. Box's test of equality of variance showed no violation of variance ($F = 1.18, p = .30$). Since Mauchly's test indicated that the assumption of sphericity has been violated ($W = 0.66$, p = .001), we applied the Greenhouse–Geisser correction. Results showed a main effect of Structure ($F(2.46, 127.94) = 3.81, p = .02$, partial $\eta^2 = .07$), no significant effect of group ($F(1,52) = 0.22, p = .64$) and a marginal Structure*group interaction ($F(2.46, 127.94) = 2.44, p = .08$). The mean accuracy scores for different two-content-word sentences were similar: nominal = 0.66, unergative = 0.58, unaccusative with VS word order = 0.69, and unaccusative with SV word order = 0.66. Follow-up pair-wise comparisons with a Bonferroni correction indicated that unaccusative sentences with SV and VS word order were repeated significantly better that unergative sentences were (both comparisons at $p = .02$).

To sum up, the effect of morphosyntactic structure on SRep accuracy revealed no differences between the two groups.

Predictors of performance on SRep in children with HI

To answer the third question, we explored factors that might potentially affect morphosyntactic development in children with HI (table 6). We found no significant correlations between SRep performance and chronological age or between SRep performance and hearing age (table 6). Significant correlations were found between SRep scores and auditory capabilities (as measured by the IT-MAIS test). Children with better functional hearing capabilities performed more accurately on the task (table 6). It should be noted that no significant correlations were found between IT-MAIS and chronological age (Spearman's $r = -.22$, $n = 15$, $p = .43$) or between IT-MAIS and hearing age (Pearson's $r = .22$, $n = 15$, $p = .43$). In addition, for the current sample of children with HI, we found neither associations between SRep scores and communication mode used by the child, nor between SRep scores and type of hearing device the child used. Hearing capability (as measured by IT-MAIS) accounted for 28% of the variance in children's morphosyntactic abilities ($R^2 = .28$; $F(1,14) = 4.98, p = .04$).

Discussion

The current study explored morphosyntactic abilities of children with HI and children with NH at early stages of combing words into sentences, using a novel SRep task designed for toddlers. Its main objective was to assess whether patterns of morphosyntactic development displayed by young children with HI are similar to

Table 6. Correlation between sentence-repetition (SRep) measures and background measures and auditory capabilities (IT-MAIS) for the hearing impairment group ($n = 15$)

	Chronological age	Hearing age	Type of hearing device	Communication mode	IT-MAIS
r	Pearson	Pearson	Spearman	Spearman	Spearman
Total SRep score	$r = .32$ $p = .24$	$r = .02$ $p = .95$	$r = .36$ $p = .19$	$r = .30$ $p = .29$	$r = .59$ $p = .02$

those of young children with NH. Previous research on preschool- and school-age children brought conflicting evidence. Some studies showed that as a group, children with HI perform significantly worse than do children with NH. This line of research supports the claim that linguistic abilities of children with HI are impaired (e.g., Friedmann and Szterman 2006, Tuller and Delage 2014). Conversely, studies demonstrated that some children with HI attain age-appropriate linguistic abilities. The results showed that at initial stages of morphosyntactic development, children with HI do not differ from children with NH.

This study confirmed that children's language in both groups at initial stages of combining words into sentences is frequently telegraphic (for Hebrew, see Berman 1985). Both groups of children followed the same language developmental trajectory beginning with content words. This was reflected in more accurate repetition of content words as compared with function words. It should be noted that no group differences were observed for the accuracy of repetition of content words and function words. Importantly, children with HI did not demonstrate delay in the acquisition of functional words at this developmental stage, as compared with children with NH.

The two groups showed similar performance on all three types of morphemes: definite determiner, prepositions and verbal inflections. Both groups of children were significantly more accurate on verbal inflections as compared with determiners and prepositions. These results confirm previous findings showing that verbal inflections appear early in the repertoire of Hebrew-speaking toddlers; during the second year (e.g., Armon-Lotem and Berman 2003, Ashkenazi *et al.* 2016, Lustigman 2013) compared with definiteness and prepositions that are acquired around the age of 3 (Berman 1985).

The accuracy of repetition in both groups (HI and NH) was affected by the same factors. Length effects were observed in both groups. Children were more accurate with sentences consisting of two-content words; accuracy declined significantly on sentences consisting of three- and four-content words. Interestingly, seven children in the NH group successfully repeated more than half the four-content-word sentences correctly, while in the HI group, no child showed this pattern. These results might signify the beginning of the morphosyntactic gap observed in preschool age (Tomblin *et al.* 2005) and school-age children with HI (e.g., Boons *et al.* 2013, Friedmann and Szterman 2006, Friedmann *et al.* 2008, Tuller and Delage 2014, Tur-Kaspa and Dromi 2001).

The effect of syntactic structure was explored for two-content-word sentences; and the observed effect was similar in both groups. We hypothesized that structures with syntactic movement (sentences with unaccusative verbs with an SV word order) would be more challenging for children with HI. The findings demonstrated the opposite, children in both groups repeated sentences with unaccusative verbs with an SV word order better than sentences with unergative verbs. These findings are contradictory to the findings of Friedmann and Lavi (2006) regarding children with typical language development. One explanation for this discrepancy could be the difference in sentence length across the two studies. In the current study, children were required to repeat two-content-word sentences including unaccusative and unergative verbs, while Friedmann and Lavi included four-content words in their sentences. As discussed in the previous section, the gap between the groups emerged for four-content-word sentences. Future studies should explore the sensitivity of children with HI to this syntactic complexity using longer sentences.

The results also indicated that morphosyntactic development in both groups at initial stages is more subject to individual differences: Children with HI and children with NH showed large variations in their morphosyntactic development. The current findings agree with those of previous studies that showed large variation in children's morphosyntactic abilities (e.g., Devescovi and Caselli 2007). As for children with NH, the results indicated developmental trajectory, older children received higher scores on the task. As children with NH matured cognitively and linguistically and gained more experience with language, their scores on the SRep task increased.

A possible explanation for the lack of significant differences between the two groups (HI and NH) can be the wider degree of variability in language performance of typically developing children (in the current study the children with NH) in this age range. Children with HI may not be significantly different from the NH group, but still tend to fall in to the lower range of typical.

As the range of 'typical' performance narrows with age the difference between the two groups might become more apparent. Future studies should further explore this question.

In the group of children with HI, morphosyntactic development was linked to hearing capability (as measured by IT-MAIS), while chronological age and hearing age, which are the measures of accumulated hearing experience in time, did not correlate with the SRep performance. The measure of hearing age reflects the time of using a hearing device (CI or HA), but it does not measure hearing function, which reflects auditory capability. Hearing device also did not influence performance: no associations were found between the hearing device (CI or HA) and SRep performance. These findings also support the importance of auditory capacity beyond the type of hearing device.

Children with HI performed significantly lower on a lexical task, their CDI scores were significantly lower than those of NH peers. This might be indicative of an opening linguistic gap between the two groups. We assume that when indirect input and incidental language experience are added to language acquisition equation, the gap between children with HI and children with NH grows. It has been suggested that language skills of children with HI and children with NH are initially similar; however, the rate of language growth in children with HI does not keep pace with children with NH (Tomblin *et al.* 2005). The current findings support this assumption. A complementary explanation is the proximity in communication. Young children and toddlers are likely to be closely located to their parents and caregivers, as infants and toddlers seek close proximity to their parents (Siegel 1999). This proximity in communication makes the input audible and facilitates access to linguistic input in children with HI (Ambrose *et al.* 2014). Thus, at earlier stages of languages development, the audible input is sufficient to trigger similar grammatical development in children with HI and NH. Moreover, as children get older and the physical distance between a child and a parent during conversational interactions gets larger, this disrupt the auditory access to linguistic input in older children with HI, thus the gap between children with HI and NH start widening for morphosyntactic development.

Future longitudinal studies should identify the linguistic acquisition stage at which this gap occurs in order to explore ways to prevent it. For children in this age range, auditory capabilities were shown to be the key for morphosyntactic development. This confirms previous findings showing the relationship between auditory capabilities and language acquisition (measured by direct measurement of speech perception (Newman *et al.* 2006) and by parental questionnaires (Ben-Itzhak *et al.* 2014; Ching and Hill, 2007). For children with HI, the findings of no correlations between chronological age or hearing age, and performance on the SRep task should not negate the importance of these factors on morphosyntactic development. The current findings highlight the importance of auditory capability measures at early stages of language acquisition of children with HI (Ben-Itzhak *et al.* 2014, Ching and Hill, 2007).

The current findings emphasize the primary intact language capacity of children with HI. The results concur with the previous suggestion that morphosyntactic abilities in children with HI are not impaired (Norbury *et al.* 2001). Yet, other studies report that in elementary school and even earlier, children with HI present significant gaps in their morphosyntactic abilities (Boons *et al.* 2013, Friedmann and Szterman 2006, Tomblin *et al.* 2005, Tuller and Delage 2014) and intensive intervention programs show positive effect on language skills (e.g., Geers and Brenner 2003). In the current study, all children used hearing devices (HA and CI) from early age and received intensive interventions. Thus, one possible explanation is that the direct language input and intensive intervention program that these children receive provide sufficient linguistic input to establish the first stages of word combination. Thus, clinical implications are suggested on the child level and the group level. With each child, parents and practitioners should carefully look for morphosyntactic progress that is seen in typical development. At the group level, children with HI should receive intensive direct language input during preschool age, a critical age for language acquisition. This direct and focused language input is crucial until children can use complementary visual sources such as reading for linguistic input.

Conclusions

This study demonstrated similar patterns of morphosyntactic acquisition between children with HI and children with NH at the early stage of morphosyntactic acquisition. Children with HI and children with NH showed similar performance on different measures of a SRep task: repetition of the target structure, sentences of different length (two- to four-content-word sentences), content and function words and different morphemes. These patterns showed similar effects across children with HI and children with NH, suggesting that the primary morphosyntactic capability of children with HI is intact and similar to that of children with NH. We suggest that for children with HI, the gap found in their morphosyntactic capacities during language acquisition is caused by deficient access to language input rather than by primary deficit in language capacity.

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Notes

1. Additional disabilities within the group of children with HI affect language outcomes negatively (Boons *et al.* 2013).
2. There are four other established repetition tasks in Hebrew, yet they are all developed for older children. Friedmann's task includes four-word sentences derived by wh-movement (Friedman 2007, Friedman and Lavi 2006). Armon-Lotem and Meir's (2016) task is developed for kindergarten children aged 5–6 and above. The Goralnik test (ages 3–6 years) (Cohen-Mimran *et al.* 2016, Goralnik 1995) includes a subtest of a SRep task with five sentences in which the simpler structure is a subject coordination sentence. The forth task is part of Katzenberg's test Katzenberger (2015) for ages 4–7 including complex syntactic structures.
3. In Israel, from 1 January 2010, the Israeli Ministry of Health issued a universal newborn hearing screening in all hospitals in the country (e.g., Gilbey *et al.* 2013).
4. An individual intervention programme means the child is in mainstream education with children with NH and receives communication and language intervention, including intensive audiological intervention once a week.
5. The structures for two-content-word sentences (2–4) in table 3 followed Friedmann and Lavi (2006), aiming to explore different syntactic structures within the same length.
6. As the difference between the scores on H-CDI among children with HI and children with NH reached significance, an additional analysis was carried out comparing children with HI and children with NH matched on vocabulary scores. We matched children with HI ($n = 12$) to a subset of children with NH ($n = 12$) on CDI scores ($t(22) = .20, p = .84$). Similarly to the results reported for the entire sample, the analysis showed that when the two groups were matched on vocabulary, the difference between the two groups on the total SRep scores was not significant ($t(22) = .14, p = .89$).

References

Ambrose, S. E., Vandam, M. and Moeller, M. P., 2014, Linguistic input, electronic media, and communication outcomes of toddlers with hearing loss. *Ear and Hearing*, **35(2)**, 139–147.

Armon-Lotem, S. and Berman, R. A., 2003, The emergence of grammar: early verbs and beyond. *Journal of Child Language*, **30**, 845–877.

Armon-Lotem, S. and Meir, N., 2016, Diagnostic accuracy of repetition tasks for the identification of specific language impairment (SLI) in bilingual children: evidence from Russian and Hebrew. *International Journal of Language and Communication Disorders*, **51**, 715–731.

Ashkenazi, O., Ravid, D. and Gillis, S., 2016, Breaking into the Hebrew verb system: a learning problem. *First Language*, **36**, 505–524.

Ben-Itzhak, D., Greenstein, T. and Kishon-Rabin, L., 2014, Parent report of the development of auditory skills in infants and toddlers who use hearing aids. *Ear and Hearing*, **35**, e262–e271.

Berman. R. A., 1978, *Modern Hebrew Structure* (Tel Aviv: Universities Press).

Berman. R. A., 1985, *Acquisition of Hebrew* (Hillsdale, NJ: Lawrence Erlbaum).

Berman. R. A., 2000, Children's innovative verbs vs. nouns: structured elicitations and spontaneous coinages. In L. Menn and N. Bernstein-Ratner (eds), *Methods for Studying Language Production* (Mahwah, NJ: Erlbaum), pp. 69–93.

Berman, R. A. and Lustigman, L., 2012, HARSP: a developmental language profile for Hebrew. In M. J. Ball, D. Crystal and P. Fletcher (eds), *Assessing Grammar: The Languages of LARSP* (Communication Disorders Across Languages series) (Bristol: Bristol Language Series), pp. 43–76.

Bishop, D. V. M., 1983, Comprehension of English syntax by profoundly deaf children. *Journal of Child Psychology and Psychiatry*, **24**, 415–434.

Boons, T., De Raeve, L., Langereis, M., Peeraer, L., Wouters, J. and Van Wieringen, A., 2013, Expressive vocabulary, morphology, syntax and narrative skills in profoundly deaf children after early cochlear implantation. *Research in Developmental Disabilities*, **34**, 2008–2022.

Ching, T. Y., and Hill, M. (2007). The parents' evaluation of aural/oral performance of children (PEACH) scale: Normative data. *Journal of the American Academy of Audiology*, **18**(**3**), 220–235.

Clark, E. V. and Berman, R., 1984. Structure and use in the acquisition of word formation. *Language*, **60**, 542–590.

Cohen-Mimran, R., Reznik-Nevet, L. and Korona-Gaon, S., 2016, An activity-based language intervention program for kindergarten children: a retrospective evaluation. *Early Childhood Education Journal*, **44(1)**, 69–78.

Conti-Ramsden, G., Botting, N. and Faragher, B., 2001, Psycholinguistic markers for specific language impairment (SLI). *Journal of Child Psychology and Psychiatry*, **42**, 741–748.

Dettman, S. J., Pinder, D., Briggs, R. J., Dowell, R. C. and Leigh, J. R., 2007, Communication development in children who receive the cochlear implant younger than 12 months: risks versus benefits. *Ear and hearing*, **28(2)**, 11S–18S.

Devescovi, A. and Caselli, M. C., 2007, Sentence repetition as a measure of early grammatical development in Italian. *International Journal of Language and Communication Disorders*, **42**, 187–208.

Eisenberg, L. S., Fisher, L. M., Johnson, K. C., Ganguly, D. H., Grace, T., Niparko, J. K. and the CDaCI Investigative Team., 2016, Sentence recognition in quiet and noise by pediatric cochlear implant users: Relationships to spoken language. *Otology and Neurotology*, **37(2)**, e75–e81.

Feldman, H. M., Dale, P. S., Campbell, T. F., Colborn, D. K., Kurs-Lasky, M., Rockette, H. E. and Paradise, J. L., 2005, Concurrent and predictive validity of parent reports of child language at ages 2 and 3 years. *Child Development*, **76**, 856–68.

Friedmann, N., 2007, Young children and A-chains: the acquisition of Hebrew unaccusatives. *Language Acquisition*, **14**, 377–422.

Friedmann, N., Aram, D. and Novogrodsky, R., 2011, Definitions as a window to the acquisition of relative clauses. *Applied Psycholinguistics*, **32**, 687–710.

Friedmann, N. and Lavi, H., 2006, On the order of acquisition of A-movement, Wh-movement and V-C movement. In A. Belletti, E. Bennati, C. Chesi, E. Di Domenico and I. Ferrari (eds), *Language Acquisition and Development* (Newcastle: Cambridge Scholars Press), pp. 211–217.

Friedmann, N., Novogrodsky, R., Szterman, R., Preminger, O., Abraham, W. and Van Gelderen, E., 2008, Resumptive pronouns as a last resort when movement is impaired: relative clauses in hearing impairment. *Current Issues in Generative Hebrew Linguistics*, **134**, 267–290.

FRIEDMANN, N. and SZTERMAN, R., 2006, Syntactic movement in orally trained children with hearing impairment. *Journal of Deaf Studies and Deaf Education*, **11**, 56–75.

GEERS, A. and BRENNER, C., 2003, Background and educational characteristics of prelingually deaf children implanted by five years of age. *Ear and Hearing*, **24**, 2s–14s.

GEERS, A. E. and NICHOLAS, J. G., 2013, Enduring advantages of early cochlear implantation for spoken language development. *Journal of Speech, Language, and Hearing Research*, **56(2)**, 643–655.

GILBEY, P., KRAUS, C., GHANAYIM, R., SHARABI-NOV, A. and BRETLER, S., 2013, Universal newborn hearing screening in Zefat, Israel: the first two years. *International Journal of Pediatric Otorhinolaryngology*, **77(1)**, 97–100.

GIVÓN, T., 2014, *On Understanding Grammar* (NY: Academic Press).

GORALNIK, E., 1995, *Language Screening Test for Hebrew-Speaking Preschool Children* (Netanya: Gai Agencies).

HERZBERG, O., 2010, Early morphosyntactic and lexical development in young hearing-impaired Hebrew-speaking children with cochlear implants compared with normally hearing peers. Unpublished doctoral dissertation, Tel-Aviv University.

HODGES, R., MUNRO, N., BAKER, E., MCGREGOR, K. and HEARD, R., 2017, The monosyllable imitation test for toddlers: influence of stimulus characteristics on imitation, compliance and diagnostic accuracy. *International Journal of Language and Communication Disorders*, **52**, 30–45.

HOUSTON, D. M. and MIYAMOTO, R. T., 2010, Effects of early auditory experience on word learning and speech perception in deaf children with cochlear implant: implications for sensitive periods of language development. *Otology and Neurology*, **31(8)**, 1248–1253.

KATZENBERGER, I., 2015. *The Katzenberger language assessment for preschool children*. (Mishmar Hasharon, Hebrew: Guy Agencies).

LUSTIGMAN, L., 2013. Developing structural specification: Productivity in early Hebrew verb usage. *First Language*, **33**(**1**), 47–67.

MAITAL, S. L., DROMI, E., SAGI, A. and BORNSTEIN, M. H., 2000, The Hebrew Communicative Development Inventory: language specific properties and cross-linguistic generalizations. *Journal of Child Language*, **27**, 43–67.

MARSHALL, C., MASON, K., ROWLEY, K., HERMAN, R., ATKINSON, J., WOLL, B. and MORGAN, G., 2014, Sentence repetition in deaf children with specific language impairment in British Sign Language. *Language Learning and Development*, **11**, 237–251.

MOELLER, M. P. and TOMBLIN, J. B., 2015, An Introduction to the outcomes of children with hearing loss study. *Ear and Hearing*, **36 Suppl**., 4s–13s.

MOELLER, M. P., TOMBLIN, J. B., YOSHINAGA-ITANO, C., CONNOR, C. M. and JERGER, S., 2007, Current state of knowledge: language and literacy of children with hearing impairment. *Ear and Hearing*, **28**, 740–753.

NEWMAN, R., RATNER, N. B., JUSCZYK, A. M., JUSCZYK, P. W. and DOW, K. A., 2006, Infants' early ability to segment the conversational speech signal predicts later language development: a retrospective analysis. *Developmental Psychology*, **42**, 643–655.

NICHOLAS, J. G. and GEERS, A. E., 2006, Effects of early auditory experience on the spoken language of deaf children at 3 years of age. *Ear and Hearing*, **27(3)**, 286–298.

NORBURY, C. F., BISHOP, D. V, and BRISCOE, J., 2001, Production of English finite verb morphology: a comparison of SLI and mild–moderate hearing impairment. *Journal of Speech, Language, and Hearing Research*, **44**, 165–178.

NOVOGRODSKY, R. and KREISER, V., 2015. What can errors tell us about specific language impairment? Semantic and morphological cuing in a sentence completion task. *Clinical Linguistics and Phonetics*, **29(11)**, 812–825.

POLIŠENSKÁ, K., CHIAT, S. and ROY, P., 2015, Sentence repetition: what does the task measure? *International Journal of Language and Communication Disorders*, **50**, 106–118.

RAVID, D., 1977, Several aspects of the problem of the order of elements in general Israeli Hebrew. *Hebrew Computational Linguistics*, **11**, 1–45.

RINALDI, P., BARUFFALDI, F., BURDO, S. and CASELLI, M. C., 2013, Linguistic and pragmatic skills in toddlers with cochlear implant. *International Journal of Language and Communication Disorders*, **48**, 715–725.

SEEFF-GABRIEL, B., CHIAT, S. and DODD, B., 2010, Sentence imitation as a tool in identifying expressive morphosyntactic difficulties in children with severe speech difficulties. *International Journal of Language and Communication Disorder*, **45**, 691–702.

SIEGEL, D., 1999, *The Developing Mind: How Relationships and the Brain Interact to Shape Who We Are* (New York, NY: Guilford).

SPENCER, P. E., 2004, Individual differences in language performance after cochlear implantation at one to three years of age: child, family, and linguistic factors. *Journal of Deaf Studies and Deaf Education*, **9(4)**, 395–412.

THEODOROU, E., KAMBANAROS, M. and GROHMANN, K. K., 2017, Sentence repetition as a tool for screening morphosyntactic abilities of bilectal children with SLI. *Frontiers in Psychology*, **8**, 2104. https://doi.org/10.3389/fpsyg.2017.02104

TOMBLIN, J. B., BARKER, B. A., SPENCER, L. J., ZHANG, X. and GANTZ, B. J., 2005, The effect of age at cochlear implant initial stimulation on expressive language growth in infants and toddlers. *Journal of Speech Language and Hearing Research*, **48**, 853–867.

TULLER, L. and DELAGE, H., 2014, Mild-to-moderate hearing loss and language impairment: how are they linked? *Lingua*, **139**, 80–101.

TUR-KASPA, H. and DROMI, E., 2001, Grammatical deviations in the spoken and written language of Hebrew-speaking children with hearing impairments. *Language, Speech and Hearing Services in Schools*, **32**, 79–89.

VÄLIMAA, T., KUNNARI, S., LAUKKANEN-NEVALA, P. and LONKA, E., 2018, Early vocabulary development in children with bilateral cochlear implants. *International Journal of Language and Communication Disorders*, **53(1)**, 3–15.

WIMMER, E., ROTHWEILER, M. and PENKE, M., 2017, Acquisition of who-question comprehension in German children with hearing loss. *Journal of Communication Disorders*, **67**, 35–48.

ZIMMERMAN-PHILLIPS, S., ROBBINS, A.M. and OSBERGER, M. J., 2000, Assessing cochlear implant benefit in very young children. *Annals of Otology, Rhinology and Laryngology*, **185(Suppl.)**, 42–43.