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Language Competence and Executive Functions among English‑Hebrew Bilingual School age Children

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Content

1. Introduction

Bilingual children experience changes in proficiency level over time and often changes in dominance between the two languages. Moreover, similarities in the performance of emerging bilinguals with typical language development (TLD) and monolinguals with Specific Language Impairment (SLI) cause difficulties and sometimes even misdiagnosis, yielding a challenge in searching for an effective measure that will differentiate between the groups.

The proposed study investigates the language proficiency of a group of English-Hebrew bilingual school age children (ages of 8-9) whose language abilities were first evaluated when they were in preschool (age 5-6). In preschool, some of these children demonstrated a profile of TLD while others were suspected as having SLI. This follow up study aims to evaluate their current performance in both languages and compare it with the profiles obtained in preschool years. Testing will also measure executive function abilities in order to examine the relationship between these abilities and language performance. The thesis aims to improve our understanding of the linguistic changes that occur over time searching for a possible relation to executive function abilities, that could help distinguish between bilingual children with TLD and SLI.

1.1 Bilingualism

Kohnert (2010) gives a broad definition of bilingualism. She refers to the period between birth and adolescence as the most varying period of communication development in which an individual is being exposed to two or more languages. This includes both simultaneous bilinguals, who learn two languages from birth, and sequential bilinguals who begin their exposure to a second language (L2) only during childhood. Differences in opportunities and social circumstances are expected to influence the proficiency level in the two languages in both groups, even though the two languages may also play important role in the speaker daily life. Moreover, age and learning opportunities may also influence the proficiency of the two languages, which will be manifested by fluctuation of the mastery level between the two languages. (Kohnert, 2010).

Variations in the performance of bilingual children who speak the same two languages cam arise due to age of onset of bilingual exposure, length of exposure to each language, and language dominancy (Paradis 2010). Likewise, different partners, different settings and different purposes cause different performance in bilingual children (Kohnert, 2010). Differences in performance, observed by Bialystok, Luk, Peets and Yang (2010) who examine the receptive vocabulary of bilingual and monolingual children and found that the significantly lower performance of bilinguals, were mainly confines to words that were part of home life and less for school vocabulary. Thus, when trying to identify language difficulty in the bilingual population, we should take into account this variability in the linguistic performance and skills of the

bilingual child and examine both languages to have a comprehensive picture of the language abilities (Kohnert 2010).

The two languages of bilingual speakers also impact their linguistic representation. The bilingual speaker has two active representational systems that are constantly competing with each other. Thus, general cognitive processes are required in order to handle this competition (Bialystok 2007). These cognitive processes are all component of the executive function (Kroll and Bialystok 2013, Bialystok 2007,). It has further been suggested that bilingualism yields a cognitive advantage in metalinguistic and metacognitive awareness, abstract and symbolic representations, attention control and problem solving. (Adesope et al 2010).

1.2 The linguistic profile of bilinguals with SLI

Specific language Impairment (SLI) also known as Developmental Language Delay (DLD) (Bishop, Snowling, Thompson & Greenhalgh, 2017) is a developmental disorder that is manifested by a difficulty in acquiring language, which is not secondary to other disorders (Kohnert 2010, Paradis 2010). SLI is characterized mostly with delay in the onset of the first words and word combination, difficulties mainly in language production and limitation in grammatical ability, e.g., in the use of agreement and/or tense and complex sentences with non-canonical word order. These delays result in language performance below age matched peers (Leonard 1998). By definition, the presence of SLI in a bilingual population is expected to be manifested through difficulties in both languages (Hakansson, Salameh & Nettelbladt 2003).

Despite the unique characteristics associated with SLI, many studies report similarities in the linguistic profiles of bilinguals with TLD and monolinguals with SLI (Gutierrez-Clellen et al. 2008, Kohnert et al. 2009, Marinis and Saddy 2013, Paradis 2010, Armon-Lotem 2012). Kohnert et al. (2009) found an overlap in performance between typical L2 learners and children with SLI on tasks that involved speeded naming and word recognition. Moreover, Marinis and Saddy (2013) found that both L2 learners with TLD and monolingual with SLI had lower performance on grammatical and vocabulary tasks comparing to TLD monolinguals, and both groups demonstrated difficulties in comprehension of passive off-line tasks. This similarity led Crago and Paradis (2003) to ask whether bilingualism and SLI are two of a kind, as both populations omit, for example, agreement and tense morphemes in English.

These similarities in the linguistic profiles of bilinguals with TLD and monolinguals with SLI cause a great difficulty in diagnosing SLI in bilingual population (Armon-Lotem, Meir & De Jong 2015, Paradis 2010, Armon-Lotem 2012). This diagnostic challenge is amplified by the lack of standardized assessments for bilinguals. Thus, while in the monolingual population, SLI is identified by the performance on a battery of standardized norm referenced language tests, in the bilingual population a parallel

measurement does not exist yet and researchers are facing a big challenge in trying to develop such a tool (Kohnert, 2010).

Any assessment of bilingual children must take into account differences in dominance between the languages. Kohnert (2010) claims that experience and opportunities for the two different languages should be taken into account during assessment since this factor influences the proficiency level in each of the languages causing variation in the dominancy. Gutierrez-Clellen et al. (2008) found that comparing verb accuracy in the weaker language of children with TLD may yield poor results which are similar to the affected children (SLI), by this confirming that reference to the weaker language of a bilingual with TLD may cause mistakes in diagnosis. Moreover, Kohnert (2010) mentions the need to separate "differences from disorder" when diagnosing the bilingual population. In her article, Kohnert (2010) reviews three standards of comparison that are being used by researchers: comparing bilinguals to monolinguals, comparing bilinguals to bilinguals, and comparing within the bilingual group across languages. A comparison of bilinguals to monolinguals is done, for example, by Bialystok et al. (2010) who examine the receptive vocabulary (using PPVT test) of 3-10 years old bilingual and monolingual children and found consistent differences between the groups, with significantly lower performance for bilinguals comparing to monolinguals mostly on words that are part of home life. Armon-Lotem (2014) compared bilingual children with TLD to monolingual SLI children while studying bilinguals with L2 Hebrew. There she found that even though there are similarities in inflection errors and preposition errors among children, the groups can be differentiated by the quantity of errors and by the type of errors. Similarly, Buas et al (2017) compared bilingual Spanish- English speaking children to monolingual English-speaking school age children on processing-based measures and found that the processing-based measures that involve verbal working memory are better at diagnostic purposes with bilingual children. Comparison of bilinguals to bilinguals were done by Vasiliki and Nerys (2018) who studied Welsh–English bilingual children of early school age with TLD and with SLI, on production tasks of verbal and nominal morphology in Welsh and found that the children with SLI preformed worse than the children with TLD on all tasks suggesting that this comparison can differentiate between the groups. Similarly, Armon-Lotem and Meir (2016) compared Russian-Hebrew bilingual children with TLD from children with SLI and found that both tasks of Sentence Repetition (SR) and Non-Word Repetition (NWR) were very accurate in distinguishing the two groups. Likewise, Altman et al (2016) who compared retold narratives of English-Hebrew bilinguals with TLD to bilinguals with SLI in both L1 and L2, and found that the use of microstructure measures differentiates the two groups and uncovers L1 and L2 differences. This last study also demonstrates comparison of performance in the two languages. These three comparison methods have different aims and limitations, and ideal assessment should be done using a combination of methods.

1.3 Executive functioning, bilingualism and SLI

Executive functions (EF) are an important set of skills and processes that operate in the frontal cortex and are involved in daily decision-making, behavior and thinking processes, (Daniels et al, 2006; Iluz-Choen and Armon-Lotem, 2013). The executive functions which are most frequently tested and which seem to be involved in the operation of two representational language systems in bilinguals are shifting, updating working memory, inhibition, attention and sorting (Miyake et al 2000, Daniels et al 2006, Biyalistok 2007, Iluz-Choen and Armon-Lotem 2013, Byalistok &Martin 2004). Byalistok (2007) argues that bilingualism influences the development of executive processing because bilingual children constantly face executive demands to control attention and inhibit misleading information, due to the competition between their two languages. This leads to earlier development in attention control comparing to monolinguals (Bialystok 2007, Bialystok &Martin 2004). Furthermore, Grundy and Timmer (2017) found that typical bilinguals have greater memory capacity then typical monolinguals apparently as a result of managing two languages that compete for selection. That is, studies addressing the relation between language and cognitive processes in bilinguals often examine the bilingual advantage in executive functions.

SLI, by contrast, seems to have a negative effect on executive functions. Henry et al. (2012), for example, studied monolingual children divided into three groups: children with SLI, children with TLD and children with low language function (LLF), and found that children with SLI and LLF had significantly lower performance then children with TLD on 6 out of 10 tasks that involve EF abilities. Their results did not distinguish between children with SLI and children with LLF, implying that weak EF is associated with even moderate degree of language impairment. Likewise, an examination of executive functioning in bilingual children, made by Iluz-choen and Armon-Lotem (2013) shows that bilingual children with high language proficiency (HLP) outperform bilingual children with low language proficiency (LLP) on tasks that involve generic executive functions (inhibition, sorting and shifting). The results for the HLP group suggest that language proficiency in bilinguals might be an outcome of the general degree of executive function abilities. Likewise, Engel de Abreu, Cruz-Santos & Puglisi (2014) who examine Portuguese-Luxembourgish bilingual children (mean age: 8 years) found that bilingual children with SLI had lower performance than bilinguals with TLD on selective attention and interference suppression. Yet, the bilingual SLI children still preformed similar to monolingual children in these domains of executive function suggesting that bilingualism may play a role as a protective factor against some of the cognitive limitation associated with SLI in monolinguals. Finally a recent study by Laloi de Jong & Baker (2015) found that forward digit span was a the most useful EF task to differentiate between children with SLI and children with TLD in both bilingual and monolingual population, in children older than 5 years old. The researchers claimed that this task taps phonological STM and therefore it confirms that the phonological STM is impaired in the SLI population.

Such differences led Kohnert (2010) to suggest that the identification of SLI should involve assessment of general cognitive processes in which weakness are often associated with SLI. This suggestion aims to

overcome the difficulties in linguistic differentiation between bilinguals and monolinguals which is less reliable in identifying children with SLI, then comparing bilinguals to each other. Yet, Henry et al.'s (2012) observation that EF did not distinguish between children with SLI and children with LLF suggests a decreased sensitivity of the EF tasks to help differentiate between the population with TLD and SLI and calls for more studies to address this point.

2. Research Questions

The present thesis aims to evaluate the linguistic performance of school age English-Hebrew bilingual children (ages 8-9) who have already been assessed once in preschool (age 5-6) in order to learn about developmental trajectories in bilingual children with a particular focus on language dominance and language delays. This follow up study compares the performance of bilingual children who were tested with a variety of linguistics tasks in preschool to their performance three years later in order to answer the following questions:

1) Would the linguistic gaps observed at the age of 5-6 between children (TLD/SLI) and within each individual (Hebrew/English) persist into the present study at the age of 8-9?
   a) Would children with high performance in at least one language (TLD) and children with low performance in both languages (SLI) at the age of 5-6 show a similar profile the age of 8-9?
   b) Would language dominance at the individual level change?
2) Is there a relationship between children linguistic performance and their performance on tasks that involve Executive Functioning skills? Is there a difference between the TLD group and the SLI group in their performance on the executive functioning tasks? Are the executive function tasks sensitive enough to differentiate TLD from SLI?

3. Hypotheses

Based on the above literature, it is hypothesized that:

1) At the group level, the linguistic gaps that were observed (TLD/SLI) would still emerge. Nonetheless they may have narrowed compared to the previous study.
   a) The original assignment as TLD/SLI is expected to be still valid for the children.
   b) At the individual level, changes in language dominance are expected. Children who were dominant in their heritage language (HL), English, are expected to narrow the gap between the two languages, while children who were already dominant in their societal language (SL), Hebrew, are expected to have little or even no change in the gap between the languages, and remain Hebrew dominant. Finally, children with SLI are expected to show greater improvement in Hebrew in which treatment is provided than in English. Yet, the linguistic difficulties would express in a similar form.

2) A relation is expected between the linguistic profile and executive function tasks where at the group level, the TLD group would outperform the SLI group in the executive function tasks. At individual level, a positive correlation is expected between the performance on linguistic tasks and the performance on executive function tasks. Yet, it is not expected to be sensitive enough in order to differentiate between the groups.

4. Methods

4.1 Participants

The participants will be 30 bilingual children (Hebrew – English) ages 8-9 years old, who were tested in both languages when they were 5-6 years old, in preschool. These children will be select randomly out of the 120 children who were examined between the years 2012- 2014 (Altman et al, 2016). According to the data collected at the pre-school age, half of the children will show low language abilities in both languages, that puts them at risk for SLI, while the other half will show proper linguistic abilities in at least one language. Parents will be contacted in order to obtain their consent for a second meeting which will take place in the children's home. In choosing children, we will take into account the age of exposure to Hebrew, and parental concern. All of the children at the time of second testing will live in the same town.

4.2 Stimuli

The stimuli include a battery of Hebrew and English linguistic tests in addition to tasks that involves executive functioning abilities. The Hebrew and the English tasks include Sentence Repetition and Non-Word Repetition tasks in which the target words follow the phonotactic rules of the target language (Hebrew/English), moreover, a story telling task will be administered in both languages in order to evaluate the overall language ability. The three tasks were developed as part of COST Action IS0804 (Armon-Lotem, De Jong, & Meir, 2015). In addition, two tasks that involve cognitive abilities will be used: 1. Tower of Hanoi to test planning abilities as a more complex executive functioning skill (Humes,Welsh, Retzlaff, & Cookson, 1997). 2. Fast Mapping based task of word learning to test learning and memory skills (Goldstein, Altman & Armon Lotem, 2015).

4.2.1 Sentence Repetition

Sentence repetition is known to be a task which identifies language impairment among monolingual and bilingual population (Meir et al 2015, Armon-Lotem et al 2016). The task enables a quantitative and qualitative comparisons between the two languages and it can be used after 12 months of exposure to L2 (Meir et al 2015). The rational of this task is based on the "regeneration hypothesis" (Potter and Lombardi 1990) which suggests that conceptual representations and lexical entries are used when regenerating a sentence, and that the syntactic structure of the sentence is being derived from the verb. Hence, when

repeating a sentence, the participants are using their grammatical system in order to process, analyze and reconstruct the target sentence. Therefore, if a specific grammatical structure has not been acquired yet, one, usually, would not be able to repeat a sentence which builds of this specific structure. (Potter and Lombardi 1990, 1992)

The task in this study was developed as part of COST Action IS0804 (Armon-Lotem, De Jong, & Meir, 2015) and it includes parallel versions of the two languages. The short English version contains 30 sentences distributed over 11 different structures (see appendix A, table 1), while the Hebrew version contains 30 sentences distributed over 10 different structures (3 sentences per structure) (see appendix A, table 2). All sentences were controlled for syntactic complexity across the languages. Within each language, length of the sentences, vocabulary and several grammatical properties were monitored to minimize the impact of bilingualism on the children's performance. The sentences, are recorded and integrated into a power-point presentation, and will be presented throw headphones and the children will be asked to repeat the sentences while watching the presentation.

4.2.2 Non‑Word Repetition

This task was found to be reliable in identifying children with SLI effectively as it taps onto underlying linguistic representations at the morpho-phonological level (Armon-Lotem et al 2016, Thordardottir and Brandeker, 2013). It is a good diagnostic tool since the requirements of language knowledge in this task are minimal making it useful for bilinguals. Nonetheless, while testing bilingual children, language-specific (LS) knowledge should be controlled for as the level of exposer and experience in a specific language might influence the performance in the NWR task of the same language (Armon-Lotem, De Jong, & Meir, 2015). In order to overcome this challenge, COST action IS0804 developed a Non-Word Repetition which is quasi universal (Chiat, 2015). The English version of the NWR test consists of two sub-tests: 1. quasi universal (QU) test for English which contains 16 items (Appendix A – table 3) 2. Language specific test for English which contain 24 items (Appendix A – table 3). The Hebrew version contains one list of 24 quasi-universal items (Appendix A – table 4). All items are recorded and integrated into a power-point presentation. The items will be presented throw headphones and the children will be asked to repeat the items while watching the presentation.

4.2.3 Story telling

In order to assess the natural and overall level of each language, a story telling task will be used. The children will be asked to tell a story following a six picture sequences for each story, once in Hebrew and once in English. The two stories that were developed as part of LITMUS-MAIN (Gagarina et al. 2012, 2015) are "The cat and the boy" and "The dog and the boy" (see Appendix B). The stories will be in a folder and the children will first be instructed to go over the pictures and to tell the story while looking at

the pictures once again. The sessions will be recorded and later on transcribed and coded for microstructures elements.

4.2.4   Tower of Hanoi task (TOH)

Tower of Hanoi is a task developed by Humes, Welsh, Retzlaff, & Cookson (1997) and used to assess executive functions. It is associated with planning that builds on inhibition (Miyake 2000), and working memory (Ross et al 2007). In this task a number of disks of different sizes are place in an ascending order on the first of 3 rods. The aim of the task is to move all the disks to the third rod by keeping three simple rules: 1. Moving only one disk at a time 2. Every disk must be place on one of the rods in order to take another disk and 3. A bigger disk cannot be placed on top of a smaller one. During the experiment, the children are first given the instructions and the experimenter gives an example by moving two disks and emphasizing the rules. Later on, the children are asked to move the two disks by themselves and after succeeding, the test starts with first moving three disks and later four disks. This task was chosen as it is age appropriate and taps multiple skills.

4.2.5   Fast mapping task

Fast mapping is associated with word learning, in which exposure to a novel word requires rapid learning of new lexical information (Carey & Bartlett 1978). Children are learning new words by recognizing the phonological string of the word (lexical label) and associating it with the specific semantic characteristics (semantic features) of the object. Effective word learning is required for lexical, semantic and phonological processing (Alt & Plante, 2006). While fast mapping is crucial in early acquisition of vocabulary in L1 and becomes valuable again in building the vocabulary in L2 (Kan & Sadagopan, 2014), children with SLI who often have more limited vocabulary (Leonard, 1998) might show difficulties with word learning (Alt & Plante, 2006) that could help identifying them. In order to evaluate the "fast mapping" ability, a task containing 12 novel words, each word constructed from 2 syllable (CVCVC) that are mapped onto to 12 invented objects was developed and piloted (Appendix A – table 5). The task contains three phases : 1. The training phase: in which the child is presented with a picture of a new object together with the novel name assigned to it, for example, "this is a gubin", then the child is asked to repeat the name of the object and when succeeding, the object is named once again for a total exposer of three times in order to allow the child to "map" lexical label onto the object. Afterwards, the child is asked to identify the novel object out of 4 pictures containing three distractors with familiar objects (e.g: where is the gubin?). A total of 4 novel objects with labels are presented in this phase. 2. The learning phase: This phase measures receptive knowledge of the target words. The child is presented with 4 pictures and is asked to identify the novel objects that were presented to him on the first phase (e,g: where is the gubin?) only that this time another novel object is presented among the 3 distractors. 3. The memory phase: This phase measures memory and expressive knowledge as well as lexical access skills. The child is presented

with a picture containing all 4 novel objects and the child is asked to name the novel objects each at the time (can you remember what this is?).

The task is divided into three conditions, each containing 4 novel words: in the first condition, each of the four novel objects is presented among familiar distractors from the same semantic category that is ascribed to each novel object. For example: the novel word " ponal" which has visual aspects similar to a fruit, is presented with three other fruits – a banana, an apple and an orange. In the second condition, the novel objects are presented among unfamiliar objects so they are not ascribed to a specific semantic category. The third condition is different from the first two conditions since it skips the training phase and relays on mutual exclusivity and contain only the learning phase and the memory phase. In this condition the child is presented with 4 pictures containing 3 **familiar distractors** from a specific semantic category and with a novel object, and the child is asked to identify the novel object (e.g : "where is the pamig?" among pictures of kitchenware – knife, ladle, frying pan), later, the child is presented with 4 more pictures containing the same novel object only in a different color and with 3 **unfamiliar distractors** and the child is asked to generalize and identify "another novel object" (e.g: " where is another pamig?"). This condition ends with the same memory phase described above.

5. **Data Analysis**

    5.1 **Linguistic tasks**

Sentence repetition. For each child, each language and each sentence the score will be given according to LITMUS-SRep (Marinis & Armon-Lotem, 2015) both for verbatim repetition and for sentence structure:

1. Sentence verbatim repetition score (correct/incorrect): if the sentence is repeated entirely correct the score is 1 and if there are one or more errors the score is 0.
2. Sentence Structure score (correct/incorrect): repeating the sentence structure correctly receives the score of 1 while errors in the sentence structure leads to a score of 0.

Non-word repetition task. Each word will be scored 1 for repeating all segments in the word and 0 for not repeating all segments. (Segments are correct if they fall within target segmental category, even if they are phonetically distorted). Items are correct if they contain *all* and *only* the segments in the target in the correct order. Using these scores:

    1. Total number of correct items will also be calculated.
    2. Further analysis will take into account length in syllable and segmental complexity.

Story telling. The stories will be analyzed for microstructure features that were found to be informative for teasing apart children with TLD from children with SLI (Altman et al, 2016): 1. Total number of utterances 2. Total number of words. 3. Mean length of utterance (MLU) 4. Analysis of morphological errors.

5.2 Cognitive tasks

Tower of Hanoi task (TOH). Two measures are taken during the tasks: 1. Number of moves 2. Duration of the task. Scoring will include: 1. Number of total moves 2. Duration of the task in seconds 3. Number of returns to the starting point

"Fast mapping " task. Each response will be scored as correct or incorrect. A total score of 12 correct responses for each condition and 36 correct responses for all task. The percentage of correct responses will be calculated for each condition and for all task. Further analysis will address the different subskills explored by this task

5.3 Comparisons at ages 8-9

Data from the different tasks will be used to generate individual and group profiles comparing between the two languages within each individual (as case studies) and each group and then comparing for each language across groups. Within group within language comparisons will compare performance on the different tasks, while comparisons between languages or between groups will be done for the same task. General linear models will be used to verify statistical significance.

5.4 Longitudinal comparison

The data from the present study will be compared to the results from ages 5-6 for sentence repetition and non-word repetition as well as to the narratives told at that age. These comparisons will make it possible to track changes in dominance, since parallel tasks were administered in both languages.

6. The contribution of this study

The current study joins a series of studies that attempt to find and characterize the bilingual population in order to enable more effective assessment and prevent misdiagnosis in this population. It is the first longitudinal study of bilingual children that makes use of the tools that were developed as part of the COST action IS0804 (Armon-Lotem, De Jong, & Meir, 2015) in order to facilitate the identification of SLI. Moreover, this longitudinal study will enable the verification of the linguistic profile compare to preschool age, thus validating the tasks used in the first testing and in the current study. In addition to the linguistic tasks, this study will examine executive function abilities, and will help in understanding whether executive function tasks are valuable in identifying children with SLI in school years. In sum, the results of this study are expected to increase our knowledge of potential markers of language delay in bilingual children and improve the assessment of children with SLI among bilingual children.

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Appendix A

Table 1 – English SR

- **Scoring sheet - Multilingual Sentence Imitation Task (Multi-SIT) –English 30**

ITEM	TARGET	Whole Sentence Score (0-1)	Score 0-3	Syntactic structure score	Lexical errors
ITEM	TARGET				
1	They are eating the bananas in the park.				
2	What did the princess buy last month?				
3	He was kicked by the donkey at the farm.				
4	He will feed the cow before he waters the plants.				
5	The children enjoyed the cake that they tasted.				
6	The mom cooked the meal that the children are eating.				
7	Which picture did he paint at home yesterday?				
8	The policeman has been looking at us.				
9	The books were taken to the office.				
10	The people will get a present if they clean the house.				
11	The boy that the teacher helped has lost his way.				
Total 1-11					

ITEM	TARGET	Whole Sentence Score (0-1)	Score 0-3	Syntactic structure score	Lexical errors
12	The kitten could have pushed the rattle down the stairs.				
13	Which drink did the neighbor spill in the house?				
14	He was pushed hard against the ground.				
15	She went to the nurse because she was sick.				
16	He should wash the baby that the child is patting.				
17	What did they find yesterday in the snow?				
18	The boy should sweep the floor in the kitchen.				
19	If the kids behave we will go to the playground.				
20	She was stopped at the big red lights.				
21	The mother was followed by the girl.				
22	They have been riding the horse around the garden.				
23	Who have they seen near the steps?				
24	The bee that the man swallowed had hurt him.				
25	Who did the monkey splash near the water?				
26	He wouldn't have brought his friend if she was nasty.				
27	She was seen by the doctor in the morning.				
Total 12-27					

ITEM	TARGET	Whole Sentence Score (0-1)	Scoring in a Score 0-3	Syntactic structure score	Lexical errors
28	The horse that the farmer pushed kicked him in the back.				
29	She can bring the glass to the table.				
30	The child ate breakfast after he washed his face.				
Total 28-30					

-**Scores by sentence type**

Sentence types	Whole Sentence Score (0-1)	Score 0-3	Syntactic structure score	Lexical errors
1. SVO with auxiliaries/modals				
SVO with 1 auxiliary/modal: Total 1+18+29				
SVO with 2 auxiliaries/aux+modal: Total 8+12+22				
2. Passives				
Short actional passives: Total 9+14+20				
Long passives: Total: 3+21+27				
3. who, what, which object questions				
Who questions: Total 23+25				
what questions: Total 2+17				
which questions: Total 7+13				
4. Sentential adjuncts				
before/after/because: Total 4, 15, 30				
Conditionals: Total 10, 19, 26				
5. Object Relative Clauses				
right branching: Total 5, 6, 16				
centre embedded: Total 11, 24, 28				

Table 2 – Hebrew SR

Scoring sheet - Multilingual Sentence Imitation Task (Multi-SIT) –English 30

Child name/ID number: _____

Tester: _____

	Year	Month	Day
Date:	____	____	____
Child date of birth:	____	____	____
Child Age:	____	____	____

Practice items:
Ha- yeladot mesaxakot be- maxshev ba- veit ha- sefer.
He matxila lesaxek.

ITEM	TARGET	Whole Sentence Score (0-1)	Score 0-3	Syntactic structure score	Lexical errors
ITEM	TARGET				
1	ha-ganenet mistakelet al ha-yeldim				
2	ba-layla navax ha-kelev shel ha-shxenim				
3	carix lemaher kedey she nagia la-hacaga				
4	im eyze xaver ha-yeled rav				
5	ha-kelev maca et ha-ecem mitaxat la-mita				
6	ha-banot qonot matanot ve ha-banim mesaxaqim be-kadur				
7	ha-shxenim asu ra'ash lamrot she bikashnu sheqet				
8	hu ka'as al ha-yeladim				
9	ha-tinoq yeqabel xalav im hu yivke				
10	hi mesaxeqet maxavo'im leyad ha-bayit				
11	le-eyzo mora ha-yalda hevi'a perax				
Total 1-11					

ITEM	TARGET	Whole Sentence Score (0-1)	Score 0-3	Syntactic structure score	Lexical errors
12	hu axal tapuax axarey ha-shi'ur				
13	ha-ciporim hayu afot im hen hayu be-saqana				
14	qasharta et ha-kelev ve ha-shaxen ka'as				
15	eyze talmid ha-menahel hizmin la-misrad				
16	ba-boqer qafca ha-yalda ba-xevel				
17	ha-xatulot yoc'ot lesaxeq lamrot she yesh geshem				
18	ra'inu et ha-yeled she ha-sus ba'at bo				
19	hi paxada me-ha-kelev shel ha-shaxen				
20	ha-rakavot nos'ot maher ve ha-mexoniyot ocrot ba-ramzor				
21	eyzo cipor ha-yalda ra'ata ba-gina				
22	ba-erev baxa ha-tinoq ha-ra'ev				
23	ha-shaxen haya qosher et ha-kelev im hu haya nexmad				
24	pagashnu et ha-yalda she ha-shaxen hifxid				
25	zot ha-mora she ha-yalda ka'asa aleha				
26	me-eyze kelev ha-xatul barax				
27	ra'iti et ha-kelev she ha-sus daxaf				
Total 12-27					

ITEM	TARGET	Whole Sentence Score (0-1)	Scoring in a Score 0-3	Syntactic structure score	Lexical errors
28	eyze **yeled** ha-**more hifxid** etmol				
29	**litafti** et ha-**xatul** she ha-**yeled mefaxed** mimeno				
30	zot ha-**yalda** she ha-**isha** nishqa				
Total: 28-30					

Scores by sentence type

Sentence types	Whole Sentence Score (0-1)	Score 0-3	Syntactic structure score	Lexical errors
1. SVO				
SVO with free prepositions: 5,10,12				
SVO with obligatory prepositions: 1, 8,19				
2. VSO				
2, 16, 22				
3. Questions				
Object questions: 15, 21, 28				
Oblique questions: 4, 11, 26				
4. Biclausal				
Coordination: 6,14,20				
With Advanced Conjunctions: 3,7, 17				
5. Relative Clauses				
Subject Relatives: 24,27,30				
Object Relatives: 18, 25, 29				
6. Conditionals				
9, 13, 23				

Table 3 – Non Word Repetition list in English

Non word repetition – English

Participant name :_____

Order:_____

First language: _____

Age:_____

Gender:_____

הוגו ונינה הכינו שרשרת לאמא שלהם והם השתמשו בחרוזים צבעוניים

אבל השרשרת נקרעה וכל החרוזים נפלו על הרצפה, הוגו ונינה היו מאוד עצובים אבל אנחנו יכולים לעזור להם.

אנחנו נוכל לעזור להם עם מילות קסם. כשאת/ה תחזור על מילת קסם חרוז יופיע בשרשרת בוא ננסה.

	set 1			set 2	
1	bamedi		1	toskelina	
2	lidapimudi		2	lasnak	
3	lumega		3	skimukaida	
4	nagi		4	frashek	
5	zepalida		5	vasnorauda	
6	dulegasumu		6	flanamuza	
7	sipamakila		7	reniseda	
8	dula		8	zumela	
9	ledesoku		9	lavuga	
10	malaziguba		10	maspedau	
11	zibu		11	refep	
12	maletu		12	saneri	
13	sipala		13	kafemoipa	
14	lumi		14	smeshetau	
15	kasalumi		15	revaik	
16	mukitala		16	zispegoi	
			17	zedogena	
			18	nasket	
			19	dalen	
			20	spodol	
			21	pezeina	
			22	stofeli	
			23	ponoveika	
			24	nalosh	

Table 4 – Non Word Repetition list in Hebrew

NWR Quasi Answer sheet Session 2/3

Name_____ Last Name_____ Gan_____

Age_____ Date_____ Experimenter_____

2nd hearing	online		
			תרגול
	qapan		
	maqpena		
			ניסוי
	rafi		1
	kafib		2
	frabru		3
	bufaki		4
	bukri		5
	kifabu		6
	brakru		7
	kufrabi		8
	faku		9
	kabufik		10
	frukif		11
	brufa		12
	kubafri		13
	bikrafu		14
	fabru		15
	bukif		16
	friku		17
	fikubra		18
	krifak		19
	biru		20
	fribuka		21
	kabi		22
	bifakub		23
	kribafu		24

Table 5- Fast mapping - scoring sheet

מטלת מיפוי מהיר (fast mapping) : דף תשובות

	קוד הילד
תאריך המבדק	זמן התחלה
זמן סיום:	

זה תמי/תום התמנון.
תום גר במעמקי הים ויש שם כל מיני חפצים שאין בעולם שלנו.
הוא ילמד אותנו איך קוראים לכל הדברים האלה בשפה שלו.
בסדר ?
בואי נראה מה הוא הביא לנו.

- למשל זה _____ את/ה יכול/ה לומר _____ יופי. אז אמרנו שזה _____ (מחליפים שקופית)
- ואיפה ה _____ מצויין!
- **מחלק 5 :** בוא/י נראה אם אנחנו זוכרות את המילים שתום /תמי לימד אותנו, אז איפה ה _____
- **חלק 9 שיום :** עכשיו נשחק במשחק הזכרון. בוא/י נראה אם אנחנו זוכרות איך קוראים ל _____

חלק ראשון

מספר	מילת טרגט	שאלה	תשובה נכונה	תשובת <u>הילד</u> (מס' תמונה)	הערות
01	ponal	איפה ה- ponal ?	3		training
02	gubin	איפה ה- gubin ?	4		
03	monir	איפה ה- monir ?	1		
04	sharud	איפה ה- sharud ?	3		
05	ponal	איפה ה- ponal ?	1		
06	gubin	איפה ה- gubin ?	4		
07	monir	איפה ה- monir ?	2		
08	sharud	איפה ה- sharud ?	3		
09	ponal	איך קוראים ל-1?	ponal		
	sharud	איך קוראים ל-2?	sharud		
	monir	איך קוראים ל-3?	monir		
	gubin	איך קוראים ל-4?	gubin		

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ועכשיו אני רוצה להציג לך את כוכי הכוכב, הוא חבר של תמי והוא גם רוצה להוציא כמה דברים מהים.

בוא/י נראה מה הוא הביא לנו.

- למשל זה _____ את יכולה לומר _____ יופי. אז אמרם שזה _____ (מחליפים שקופית)
- ואיפה ה _____ מצויין!
- מחלק 14: בוא/י נראה אם אנחנו זוכרות את המילים שכוכי לימד אותנו, אז איפה ה _____
- חלק 18 שיום: עכשיו נשחק במשחק הזכרון. בוא/י נראה אם אנחנו זוכרות איך קוראים ל _____

מספר	מילת טרגט	שאלה	תשובה נכונה	תשובת <u>הילד</u> (מס' תמונה)	הערות
					חלק שני
10	sholeb	איפה ה-sholeb ?	1		training
11	lamor	איפה ה-lamor ?	3		
12	dekesh	איפה ה-dekesh?	4		
13	Xinak	איפה ה-xinak ?	2		
14	sholeb	איפה ה-sholeb ?	1		
15	lamor	איפה ה-lamor ?	4		
16	dekesh	איפה ה-dekesh?	2		
17	Xinak	איפה ה-xinak ?	3		
18	Xinak	איך קוראים ל-1?	Xinak		
	sholeb	איך קוראים ל-2?	sholeb		
	Lamor	איך קוראים ל-3?	lamor		
	dekesh	איך קוראים ל-4?	dekesh		

ועכשיו אני רוצה להכיר לך את צבי הצב, גם הוא חבר של תום וכוכי והוא גם רוצה להוציא כמה דברים מהים.

בוא/י נראה מה הוא הביא לנו.

- צבי הביא לנו _____ איפה ה _____ מצויין! ואיפה עוד _____ . נהדר!

מספר	מילת טרגט	שאלה	תשובה נכונה	תשובת <u>הילד</u> (מס' תמונה)	הערות
					חלק שלישי
19	pamig	איפה ה-pamig?	1		training
20	pamig	איפה עוד -pamig?	3		training
21	renil	איפה ה-renil?	2		
22	renil	איפה עוד-renil?	4		
23	Xemog	איפה ה-xemog?	3		
24	Xemog	איפה עוד -xemog?	4		
25	tumof	איפה ה- tumof?	2		
26	tumof	איפה עוד - tumof?	1		
27	renil	איך קוראים ל-1?	renil		
	tumof	איך קוראים ל-2?	tumof		
	pamig	איך קוראים ל-3?	pamig		
	Xemog	איך קוראים ל-4?	Xemog		

- מחלק 27: עכשיו נשחק במשחק הזכרון. בוא/י נראה אם אנחנו זוכרות איך קוראים ל _____

Appendix B

story telling - developed by *(Armon‑Lotem, De Jong, & Meir, 2015)*

The sequence of story telling: " The cat and the boy"

The sequence of story telling: " The dog and the boy"