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Syntax and Directionality in Bilingual Codeswitching: Sentence Repetition with Typically Developing and Language Impaired English-Hebrew Bilingual Children

תחביר וכיווניות בהחלפת קוד דו-לשונית: חיקוי משפטים בקרב ילדים דו-לשוניים דוברי אנגלית - עברית בעלי התפתחות שפתית תקינה וילדים לקויי שפה

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Table of Contents

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1. Introduction and research goals

Codeswitching (hereafter CS), the alternate use of two or more languages within the same discourse, is a phenomenon unique to bilingualism (Walters 2005) and has been studied extensively (Bullock & Toribio 2009). While CS is widespread in some communities and seemingly effortless, under certain circumstances a switch in languages may incur some difficulty in terms of processing speed and quality (Chauncey, Grainger & Holcomb 2011; Costa & Santesteban 2004; Macnamara & Kushnir 1971; Meuter & Allport 1999). Processing CS may be more difficult when the CS violates a linguistic constraint (Dussias 2003).

The present study aims to investigate several linguistic factors which either facilitate or impede CS. Specifically, it will examine the effects of part of speech (verb vs. noun), syntactic function (subject vs. object), and locus of the switch in prepositional phrases (PPs) on CS performance. It will also assess directionality effects (English to Hebrew vs. Hebrew to English CS). It explores these effects by means of sentence repetition tasks with preschool, English-Hebrew bilingual children. Another objective of this dissertation is to determine whether typically developing (TD) bilingual children and children with specific language impairment (SLI) exhibit different patterns of CS vis-a-vis the aforementioned effects. The study hopes to contribute to the relatively new field of bilingual SLI and the question of how bilingual language acquisition in children with SLI can be differentiated from that of bilingual children with TLD. While previous research has often examined this question by considering linguistic features that are typical of one or two particular languages, the added value of employing a specifically bilingual phenomenon such as CS lies in its potential as a clinical marker of SLI across multiple languages.

2. Background

2.1 Codeswitching: Overview

CS research varies greatly in its perspectives and purposes. Some approaches focus on its structural aspects, for instance the linguistic constraints of intra-sentential CS (Joshi 1985; MacSwan 2013; Myers-Scotton 2002). Others are concerned with sociolinguistics aspects, such as the speakers' identity and social settings (Myers-Scotton 1993; Zentella 1997). Experimental

psycholinguistic CS studies center on cognitive processes (Gollan & Ferreira 2009; Li 1996), while neurolinguistic research examines CS as it relates specifically to activity of the brain (Moreno, Federmeier & Kutas 2002). Still other work integrates different approaches, for example sociological, pragmatic, linguistic and psychological (Matras 2009; Walters 2005). Research can also be distinguished in terms of the unit of analysis, which ranges from single-word to intra-sentential-, inter-sentential- and longer segments of codeswitched (CSed) discourse.

2.2 CS: Functions and motivations

There are various functions and motives of CS. Lexical accounts include lack of word knowledge, difficulty retrieving a word, or the sense that meaning may be better conveyed in the alternate language (Heredia & Altarriba 2001). CS has also been linked to sociolinguistic factors, including changes in social setting or topic of conversation, and the role or identity of the interlocutors (Gumperz 1982; McClure 1981; Myers-Scotton 1993). Socio-pragmatic functions of CS include aiming for attention, emphasis or clarification (Grosjean 1982; Zentella 2007). Finally, CS has also been related to psycho-emotional factors, such as the need to distance or connect oneself (Santiago-Rivera, Poll, Altarriba, Gonzalez-Miller & Cragun 2009).

2.3 Processing CS and CS costs

Despite the fact that CS is a phenomenon which is widespread, of benefit to its user and seemingly effortless, under certain circumstances it may incur a cognitive cost in comprehension and/or production in terms of processing time and/or quality (Costa & Santesteban 2004; De Groot 2011; Thomas & Allport 2000). Kolers (1966) argued that time costs may be due to the unpredictability of the phonological system generated by two different language systems, the time needed to decide on how to switch appropriately without violating any linguistic rules, or the search in two "dictionaries" (373), which should slow down the user's memory search. The Bilingual Interactive Activation model (Dijkstra & van Heuven 1998; Grainger & Dijkstra 1992) predicts that when recognizing a word in one language, "nodes" and lexical representations for that particular language are activated, facilitating subsequent processing of that language. When switching languages, however, the need to activate an inhibited set of language nodes and lexical representations results in a less efficient processing and recognition mechanism. According to

Green's (1998) inhibitory control model, switch costs are linked to so called task "schemas," or, "mental devices or networks that individuals may construct or adapt on the spot in order to achieve a specific task" (69), which can be of a linguistic nature or not. In this view the switch cost of changing languages results from the time it takes to overcome inhibition of the previously active language task schema. It has also been suggested that longer processing times for CS might be due to a delayed decision regarding whether to search the lexicon of the base or CSed language, a process itself affected by a great number of factors, including whether or not a listener is in a bilingual language mode and expects a switch (Grosjean & Soares 1986).

Empirical research generally supports the existence of the so-called "switch cost" (Chauncey, Grainger and Holcomb 2011). In two early studies, Kolers (1966) found longer reading times for passages that contained intra-sentential codeswitches than for those with unilingual text, and Macnamara & Kushnir (1971) similarly showed in a true/false judgment task that response times took longer when the stimuli contained sentences with a CS. Psycholinguistic experiments typically involve "switch and non-switch trials" during which subjects perform a particular task, such as object naming (Gollan & Ferreira 2009; Meuter & Allport 1999) or lexical categorization (Von Studnitz & Green 2002). Such research often relates to single lexical units (but see for example Tarlowsky, Wodniecka & Marzecová 2013) with no language presented aurally, and their resemblance to more naturally-occurring CS has been questioned (Cheng & Howard 2008; Myers-Scotton 2006).

Experimental studies examining the linguistic factors affecting CS and its processing are scarce. Such research examines CS that either conforms to or violates a proposed linguistic constraint on CS and proposes that in the former cases the "costs" of CS are either smaller or non-existent. Thus for instance, Azuma & Meier (1997), in a sentence repetition task, found that sentences with switches involving single-word, closed-class items like determiners or prepositions were repeated more slowly and with more errors than open-class items such as adjectives or nouns. In an eye tracking experiment, Dussias (2003), noted that switches between an auxiliary and a participle were processed with more difficulty than those where the auxiliary and verb were in the same language. Similarly, Kootstra, van Hell & Dijkstra (2010) found support for Poplack's (1980) Equivalence Constraint in an experiment involving the production of CS in languages with conflicting word order.

The present research addresses the linguistic aspects of CS and their processing nature. The approach here focuses on the effects of syntactic function of the CSed constituent (subject vs. object) and part of speech (verb vs. noun), as well as CS within PPs. The proposed study also examines these factors in CS from L1 (the first acquired language) to L2 as well as from L2 to L1.

2.4 CS: Characteristics and constraints

CS has been found to operate under linguistic constraints. A classic example is Poplack's (1980) Free Morpheme Constraint, which precludes CS between a free and bound morpheme. Not surprisingly, it has also been suggested that CS demands a certain level of linguistic and communicative competence in the languages being switched (Bullock & Toribio 2010). Indeed less proficient bilinguals have been found to be less sensitive to the grammatical constraints of CS (Dussias & Courtney 1995; Toribio 2001); that intra-sentential or intra-clausal CS, where the rules of two languages need to be taken into account, is more characteristic of fluent bilinguals (Muysken, Kook & Vedder 1996; Poplack 1980); and that less fluent speakers engage in linguistically less demanding CS, for instance involving just single lexical items (McLure 1981; Muysken 2000). Pert & Letts (2006) found that CS was used in linguistically more complex utterances and propose that lack of its occurrence might be an indication of language impairment.

Regardless of linguistic constraints, CS frequencies based on data elicited naturally suggests that some switches may be more practical, more acceptable and less demanding than others. A consistent finding in this respect is the high rate of noun and noun phrase (NP) switching and the relatively low frequency of verb switching (Marian 2009). Myers-Scotton and Jake (1995) argue that verbs are less easily integrated into syntactic frames than nouns and thus less likely to be CSed. Deuchar (2005) maintains that since nouns are often more syntactically "congruent" (equivalent) across languages than verbs, they are more easily switched. Marian (2009) adds semantic accounts to the noun-verb CS asymmetry. She relates how verbs are more abstract than nouns and points to their role in establishing relations between elements in the sentence as opposed to just "depicting entities" (171). The relations verbs establish might vary across languages, thus making CS more difficult. Nouns, on the other hand, are less tied to a "specific linguistic context" and therefore more "portable" (172). Finally, Klavans (1985) and

Treffers- Dallers (1993) point to the unique status of verbs in CS and argue that the matrix (base) language of an utterance should be determined based on the inflection of its finite verb (cf. Myers-Scotton (2002) for criteria that establish the matrix vs. embedded language). Among the issues to be investigated here, the present study will test the notion that verb switching will be more challenging than noun switching.

Experimental studies on the syntactic function of the CSed element are also relatively rare. A few studies based on naturalistic data and narratives include frequency counts of subject and object switching. They reveal that object switching occurs more often (Bhatt 1997; Meisel 1994; Raichlin 2008; Zentella 1997). These data refute Di Sciullo, Muysken and Singh's (1986) Government Constraint, which predicts that there can be no CS between a verb and its object because the two are in a government relation (cf., MacSwan 2009). Still, this constraint might operate differently in Hebrew, which has more flexible word order than English and might therefore be more permissive of object CS than English. In clear contrast, Meisel (1994; personal communication) argues that the subject, governed by INFL, is more strongly related to the verb than the object, which is governed by V, a factor which should facilitate processing and produce more CS objects than subjects. An alternative explanation for the lower frequency of subject CS (e.g. Meisel 1994) might be related to a differential distribution of subject vis-à-vis object pronouns and subject pronouns vis-à-vis subject nouns. It has been pointed out that pronouns occur more frequently in subject than object position (Hasselgard, Johansson & Lysvag 1998), and analyses of (adult) speech reveal the majority of grammatical subjects to be pronouns (Biber, Johansson, Leech, Conrad & Finegan 1999; Chafe 1994), not nouns or NPs. Subject pronouns, however, are generally not CSed (Van Gelderen & MacSwan 2008; Matras 2009), and this, in turn, might account for the lower occurrence of CS in subject position. Finally, primacy effects may play a role in processing CS subjects as compared to objects, with the latter possibly proving more difficult if they occur mid-sentence. The present study will test the proposition that processing switched subjects is easier than objects.

2.5 Preliminary findings

Two pilot studies examined the effects of syntactic category of the codeswitch (subject vs. object) and part of speech (verb vs. noun) on sentence repetition in English-Hebrew bilingual preschoolers who were either TD balanced, TD Hebrew-dominant, or language impaired (LI).

CSed single lexical items were embedded in both English and Hebrew allowing for analysis of directionality effects – English to Hebrew vs. Hebrew to English switching. Sentence repetition was analyzed in terms of 1) correct repetition of the entire sentence, 2) correct repetition of the target item (subject/object and verb/noun), and 3) number of errors per sentence. The main findings for both studies were:

1. Overall better performance was documented for CS from English to Hebrew than from Hebrew to English;
2. Overall performance was better for children with TD than those with SLI;
3. In Hebrew sentences, a trend towards better performance by children with SLI on non-switched stimuli than on both verb and (bare) noun CS; TD children perform better on both non-switched items and noun CS than on verb CS;
4. No significant difference in performance on CS vs. non-CS sentences with the subject-object stimuli, both in English to Hebrew switching and in English to Hebrew;
5. In Hebrew sentences containing a switch into English, better performance was found for non-CS sentences in the verb-noun stimuli; in English sentences containing a switch into Hebrew better performance was found for CSed than for non-CSed sentences in the verb-noun stimuli; more non-elicited (spontaneous) CS was found in sentences containing a verb switch than those containing a noun switch in both English and Hebrew;
6. In the first pilot study: a trend towards somewhat better performance emerged for switched subjects in Hebrew stimuli, but better performance on switched objects in the English stimuli; in the second pilot study somewhat better performance was found on CSed subjects than objects, particularly with English sentence stimuli, including a greater tendency towards not switching CS objects than subjects;
7. Better performance was found for CSed nouns than verbs, but only in Hebrew stimuli.

Single CSed lexical items seem to pose difficulty when the switch occurs from the dominant (Hebrew) to the weaker language (English), in tasks involving verb switches, and possibly in the case of children with SLI, with bare English nouns. Hebrew verbs might also be switched with greater ease than those in English because of their morphological regularity and saliency, and their being less infrequent than English verbs for this population. Inserting an English verb into a Hebrew frame, on the other hand, might be more difficult in that Hebrew, which has a much more heavily inflected verb system than English, would call for an inflected verb, a feature

lacking in English verbs. The present study will investigate the verb-noun asymmetry further and examine whether the asymmetry in English stimuli also holds for English dominant children. Further, in contrast to data on spontaneous CS, there was no consistent evidence for any difficulty in processing CS subjects as opposed to objects. This finding may be explained in terms of a primacy effect for subjects, which (in the second pilot study) occurred sentence-initially (cf. Coady, Evans & Cluender 2010). In the first pilot study, however, where the switches occurred mid-sentence, an interaction was found, with performance better on subjects in Hebrew sentences and better on objects in English. This study will examine the subject-object asymmetry in more detail. Finally, it will also examine switches that go beyond single lexical items so as to investigate whether more complex types of code switches result in more pronounced CS difficulty. In this light, the present study will examine different loci of CS within PPs.

Prepositions differ from nouns and verbs in several ways which are relevant here. They are less frequent, they are minor constituents, and they frequently co-occur with a subsequent NP. They are considered a mixed category, exhibiting both lexical and functional properties (Muysken 2008). They are a source of difficulty for bilingual children, both TD and LI (Armon-Lotem 2014; Romaine 1989). Prepositions are claimed to be infrequently switched (Muysken 2008; Pfaff 1979; Treffers-Daller 1993). Joshi (1985) maintains that prepositions are sanctioned from being switched because they are closed class items. As for PPs, Di Sciullo, Muysken & Singh (1986), based on their 'Government Constraint,' bar switching between a P and its governed complement, for instance the determiner (DET) in the NP following the P. As for such NPs, the CS literature shows that the DET is generally not switched together with the noun (Dussias 2002). Myers-Scotton's Matrix Language Framework (1993) provides an explanation for this asymmetry suggesting that nouns (content morphemes) may be switched freely into the 'matrix' (main) language, but that DETs (system morphemes), setting the morpho-syntactic frame of the matrix language, should not. Nevertheless, the latter two constraints may operate differently in English and Hebrew: in English DETs are free-standing morphemes whereas in Hebrew they are bound. Following the Free Morpheme Constraint (Poplack 1980), which proscribes word-internal CS, switching DET together with the following noun may be more acceptable in Hebrew than in English. The present study's focus on PPs will allow for (1) an examination of CS of constituents that are linguistically more complex than single lexical items,

(2) an analysis of different CS loci within the PP, and thus (3) a testing ground for the proposed constraints on intra-sentential CS. The study may thereby shed light on children's linguistic representations believed to be at play when switching within PPs. Importantly, these representations may be different for bilingual children with TD and those with SLI thus making CSed PPs a potential marker for bilingual SLI.

2.6 Bilingual children and CS

The focus of the present study is on the CS behavior of bilingual children. It has been shown that their CS operates under the same grammatical constraints as that of adults (Cantone 2007; Gutiérrez-Clellen, Simon-Cereijido & Erickson Leone 2009), and that they, too, favor noun switches over all others (De Houwer 2005; Gutiérrez-Clellen et al. 2009; Meisel 1994).

Children, like adults, may switch because of lexical gaps or because the morphosyntactic system in one language is less developed than the other (Genesee & Nicoladis 2009; Greene, Peña & Bedore 2012; Lanza 1997; Petersen 1988). Indeed, with sequential bilingual children, where L1 may become the weaker language over time (Basnight-Brown & Altarriba 2007), the typical direction in CS seems to be from L1 into L2 (Iluz-Cohen & Walters 2012; Raichlin 2008). Gutiérrez-Clellen et al. (2009), however, found that regardless of what language was acquired first, bilingual children did not switch when using their dominant language (English or Spanish) and that while English dominant children tended to switch from Spanish to English, Spanish dominant children did not switch to Spanish. The authors provide a sociolinguistic account for these CS patterns and point to the children's awareness of the "language prescribed by the majority culture" (105). Greene et al. (2012), however, found a clear correlation between dominance and switching in a study involving 5 year-old preschoolers: the Spanish dominant subjects switched more from English to Spanish while the English dominant children switched more in the opposite direction. Balanced bilinguals tended to switch into both languages. The present study will further examine the issue of directionality in CS and whether or not CS patterns differ with respect to language dominance.

2.7 Bilingual children with specific language impairment

Specific language impairment (SLI) refers to a language disorder which is diagnosed in the absence of other apparent impairments, e.g. hearing loss, below average non-verbal intelligence,

and emotional, behavioral and neurological problems (Tallal & Stark 1981) which could otherwise explain the language deficit(s). Children with SLI are a heterogeneous group, whose language difficulties may present in areas like morphology, syntax and phonology (Leonard 1998) with some children affected in just one language module; others in several (Friedmann & Novogrodsky 2008). Children with SLI may also have lexical problems, manifested in a delay in vocabulary acquisition and difficulty with lexical naming and novel word learning (Lahey & Edwards 1999; Rice, Oetting, Marquis, Bode & Pae 1994). The linguistic limitations characteristic of SLI have been related to reduced processing abilities and speed, which are evident in linguistic as well as non-linguistic cognitive abilities (Im-Bolter, Johnsen & Pascual-Leone 2006; Miller, Kail, Leonard & Tomblin 2001), and impaired linguistic representation (Rice & Wexler 1996; van der Lely 1994).

Bilingual children with SLI, by definition, present with language difficulties in both of their languages (Iluz-Cohen & Armon-Lotem 2013; Kohnert 2010). Some of these difficulties are distinct from those found in TD bilingual children, who, like impaired populations might have language development that is unlike that of TD monolinguals (Bedore & Peña 2008). Armon-Lotem, Danon & Walters (2008), for example, suggest omission of prepositions as a marker for bilingual SLI. However, the difficulties may also be parallel (Paradis 2010), and this might result in misdiagnosis of both populations: children with SLI may be underdiagnosed while those with TD may be incorrectly labeled as LI (Bedore & Peña 2008; Rothweiler 2007). The present study investigates whether CS could be a diagnostic marker for bilingual SLI.

There are only a handful of studies that have looked at CS patterns in children with SLI. Pert (2007) observed Mirpuri-English bilingual children with SLI during Mirpuri language therapy sessions longitudinally. He notes that the children switched nouns freely, but that they seemed to have difficulty inserting English verbs into Mirpuri. Gutiérrez-Clellen et al. (2009), studying 6-year-old, Spanish-English bilingual children's narratives and conversations, concluded that the LI children did not differ from their TD peers in terms of CS frequencies and that both groups adhered to grammatical constraints on CS, for instance avoidance of switching between a pronoun and a verb. In contrast, Iluz-Cohen & Walters (2012), using a narrative elicitation and story retelling task with English-Hebrew bilingual 5 to 7-year-olds, report a higher rate of CS for children with SLI. Also, while TD children switched more from their L1 (weaker language) to L2 (dominant), children with SLI tended to switch in both directions. Greene et al.

(2012), using semantic expressive tasks with 5 year-old Spanish-English bilinguals, found that LI children mixed more in English (into Spanish) than their TD peers, while the TD children mixed more in Spanish. Similarly, Sheng, Peña, Bedore & Fiestas (2012) using a word association task with 7-9 year-olds, noted that the TD children switched more from Spanish to English, while the LI children switched more from English to Spanish.

The present study investigates CS in bilingual children with SLI. However, unlike previous research, which has focused on spontaneous production data, it will examine the extent to which CSed sentences result in a processing difference compared to non-switched sentences, and what linguistic factors contribute to this difference. In light of their circumscribed processing skills, one might suppose that children with SLI would have particular difficulty processing switched as opposed to non-switched sentences. Alternatively, since LI children might use CS as compensation for their impaired lexical skills and turn to CS more than TD children, they may have relatively little difficulty processing switched sentences. Furthermore, in terms of possibly impaired linguistic representation, children with SLI might not adhere to the linguistic constraints of CS like TD children. They may exhibit deficits in government, i.e. the specification of relationships between constituents in a sentence (van der Lely 1994). Consequently, children with SLI may have different patterns in their CS within PPs due to the way their linguistic system specifies government relations therein.

2.8 Sentence repetition

In order to assess whether CS involves processing and/or representation differences, the present research will use a sentence repetition task. Sentence repetition involves auditory, memory and production skills and taps into underlying linguistic representations (Riches 2012). It has been shown to accurately reflect language abilities (Vinther 2002). Sentence repetition can also get at the child's linguistic representation by targeting structures which are believed not to be intact, for instance among children with SLI (Armon Lotem 2014). Three basic premises underlie the use of this task: (1) cognitively more demanding language (e.g. CS) should leave fewer resources for processing the sentence and result in more repetition errors, (2) ungrammatical/less acceptable CS should result in more repetition errors than their more acceptable counterparts (Azuma & Meier 1997), and (3) structures not part of an individual's linguistic representations should lead to more errors than those that are.

3. Research Questions and Hypotheses

Overall processing difficulty of CSed vs. non-CSed sentences

Research question 1: Will bilingual children perform better (make fewer repetition errors) on unilingual sentences than on those containing a CSed version?

Hypothesis 1: Performance will be better on unilingual as compared to CSed sentences. This prediction follows from the literature on processing costs in CS.

Processing difficulty of CSed verbs vs. CSed nouns

Research question 2: Will bilingual children perform better on sentences containing a single CSed noun than on those with a single CSed verb?

Hypothesis 2a: Performance will be better on CSed nouns than on CSed verbs. This prediction stems from literature suggesting that verbs are switched with more difficulty than nouns.

Processing difficulty of CSed subjects vs. CSed objects

Research question 3: Will bilingual children perform better on sentences containing a CSed subject than on those with a CSed object?

Hypothesis 3a: Performance will be better on CSed subjects as compared to objects. This prediction is based on the Government Constraint as well as primacy effects, implying that items presented sentence-initially will be processed with greater ease.

Processing difficulty of CSed PPs

Research question 4: What will be the effect of CSed PPs on bilingual children's performance?

Hypothesis 4a: Performance on a single noun (N) switch within the PP (P+DET+N) will be better than on any other switch within the PP, i.e. a single P, P+DET, P+DET+N, and DET+N. This prediction follows from the high frequency of noun CS in naturally occurring CS data and preliminary/pilot research.

Hypothesis 4b: Performance on a P+DET switch will be better than on a single P or DET+N switch. This hypothesis is based on the Government Constraint, on the constraint on switching Ps and on the constraint on switching a DET+N.

Hypothesis 4c: Performance on a P+DET+N switch will be better than on a single P, P+DET or DET+N switch.

Directionality

Research question 5: Will bilingual children perform differently on English to Hebrew CS than Hebrew to English CS?

Hypothesis 5a: Children will perform better on English to Hebrew CS. Hebrew is assumed to be the language of higher proficiency among the bilingual participants.

Hypothesis 5b: Children with higher proficiency in English as compared to Hebrew will perform better on Hebrew to English CS.

Hypothesis 5c: Children will perform better on English to Hebrew verb CS, due to the inflections on Hebrew verbs.

Hypothesis 5d: Better performance is expected on CSed subjects than objects for English stimuli, since primacy effects might be more marked in the weaker language (English) and Hebrew word order is more flexible than English.

Hypothesis 5e: Effects 4b above will be more pronounced in Hebrew to English CS since English DETs are unbound, Hebrew are bound.

Children with TD and children with SLI

Research question 6: To what extent will performance of bilingual children with TD differ from performance of bilingual children with SLI?

Hypothesis 6a: Children with TD are predicted to perform better than children with SLI due to the supposed higher processing load involved in CS and circumscribed processing skills of children with SLI.

Hypothesis 6b: Based on previous research (Armon Lotem et al. 2008), children with TD are expected to make more substitution errors and children with SLI more omission errors.

Hypothesis 6c: TD children will display less non-elicited CS than children with SLI. This is based on the assumption that children with SLI would turn to CS to compensate for their language impairment.

Hypothesis 6d: Among CSed sentences with PPs, TD children's performance will be more consistent with the following constraints:

a. Government Constraint (Ps will be switched along with the following DET),

b. the constraint on switchability of Ps (single Ps will not be switched)

c. the constraint on switchability of DET with following N

This prediction follows from an assumption that children with SLI have a less elaborate system for specifying linguistic relations due to supposed impaired linguistic representations.

4. Method

Three sentence repetition experiments will be conducted. The first will investigate verb vs noun CS. The second will examine subject vs object CS. The third will study CS within PPs.

4.1 Participants

Participants will be 48 sequential English-Hebrew bilingual children equally divided between male and female, ages 5-6. The children will be screened for language proficiency by means of standardized tests in each of their languages: CELF-2 Preschool for English (Wiig, Secord & Semel 2004) and the Goralnik Diagnostic Test for Hebrew (Goralnik 1995). The results of the testing will render four groups of children: children with typical development in both languages (TD, balanced bilinguals who score within monolingual norms in both English and Hebrew), children with atypical development in both languages (SLI, bilinguals who score below the norm in both languages), children with TD in English (English dominant children who score below the norm in Hebrew), and children with TD in Hebrew (Hebrew dominant children who score below the norm in English). All the children will score within the norm on Raven's Progressive Matrices for cognitive abilities (Raven 1998) and will show no evidence of emotional, neurological, visual or auditory impairments (Tallal & Stark 1981).

4.2 Materials and Design

The study will use a sentence repetition task consisting of three experiments. The first experiment examines CS verbs vs. nouns. It will consist of 18 stimuli sentences in Hebrew and 18 in English. The 18 sets include an NP subject (animate agent), a transitive verb (past simple), a bare noun (all but one inanimate), and a temporal or locative phrase at the end. Each of these sets is arranged into three conditions containing either a CS verb, a CS noun or no switch (see Appendix A, Tables 1 and 2). The English and Hebrew sentences are matched for semantic content and syntax. They consist of early-acquired vocabulary taken primarily from Hart & Risley (1995) and adapted to the Israeli context based on teachers', parents' and children's feedback and pilot studies. No English-Hebrew cognates will be used. Mean number of words,

syllables and morphemes of the stimuli appear in Appendix A, Table 3. The dissimilarities between English and Hebrew reflect differences in the area of verbal and nominal morphosyntax, where Hebrew has a richer morphology, and English is more analytic. CS and non-CS words will be matched in terms of syllable length to the extent possible (Appendix A, Table 4) though Hebrew words are inherently longer. The same procedure will be followed for experiment 2, which examines subject-object CS. The 18 sets of stimuli will include an NP subject (animate agent), a transitive verb (past simple), an NP direct object (all but three inanimate), and a temporal or locative phrase (Appendix B, Tables 5 and 6; Appendix B, Tables 7 and 8 for data on length of stimuli).

Three experimental lists containing stimuli from both experiments will be created for each language. There will be six items for each condition in English, and six in Hebrew, with a total of 36 test items per list and 12 filler sentences. Each filler will be unilingual and syntactically different from the test sentences. No list will contain more than one version of a particular set. The lists will be counterbalanced for order of the six conditions and filler sentences. The order will be pseudorandom, with sentences from the same CS condition as well as recurrent lexical items not adjacent. Each list will begin with a filler and a non-switched test sentence. Regular and irregular English verb switches, Hebrew verb patterns ('binyanim'), and count and non-count noun switches will be balanced across the three lists. Each participant will be randomly assigned to one list in English and one in Hebrew.

The third experiment will examine CS in PPs. The design is similar to the other experiments. It consists of 36 stimuli sentences in Hebrew and 36 in English. Each sentence includes an NP subject, an intransitive verb, a PP consisting of P+DET+N, and a temporal. All Ps are bi-syllabic. The temporal does not contain a P. Six switch conditions are examined: a single P, a P+DET, a P+DET+N, a single N, a DET+N, and no switch (Appendix C, Tables 9-10). Mean number of words, syllables and morphemes of the stimuli appear in Appendix C, Table 11. Six experimental lists will be created for each language with six items for each condition in English and six in Hebrew, with a total of 36 test items per list and 24 filler items.

In addition, a language background questionnaire, BIPAQ (Abutbul-Oz, Armon- Lotem & Walters 2012) administered to the participants' parents will examine factors such as participants' L1 and L2 exposure (Appendix D).

4.3 Procedure

Approvals from the university IRB and Ministry of Education have been secured. Participants' parents will be informed about the purpose of the study and will be asked to sign consent forms. Stimuli will be read by a fluent bilingual female and recorded in a professional, sound-proof recording studio. Participants will be tested in a quiet room in the kindergarten, where the stimuli will be presented by audio-headphones. Children will be instructed to repeat the sentences verbatim. Half of the children will be tested first in English and then, in a separate session one week later, in Hebrew; the other half will be tested in Hebrew first. To familiarize the children with the task, each session begins with several practice sentences, with and without a CSed item.

4.4 Transcription, coding and data analyses

All sessions will be audio-recorded and transcribed. Responses will be analyzed in terms of 1) correct repetition of the entire sentence (correct/incorrect); 2) correct repetition of the target item (subject/object, verb/noun, PP); and 3) number of errors. Errors will be grouped into four types: omissions, substitutions, additions and word order. Substitutions will include grammatical and lexical errors. Lexical errors will include CSed elements that were not switched as well as non-elicited (spontaneous) CS. Errors will also be examined in light of the research questions, in particular for differences in directionality and between TD and SLI groups. In order to assess the effects of part of speech (N and V), syntactic category (Sub and Ob), CS in PPs (P, P+DET, P+DET+N, N and DET+N), directionality (Eng to Heb/Heb to Eng) and language proficiency (balanced, Eng dominant, Heb dominant, SLI), a series of ANOVAs and non-parametric tests will be conducted. Correlations will examine relationships among demographic variables (e.g., length of exposure) and performance on the CS task.

Table of Contents of Dissertation

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Appendices

Appendix A

Table 1 – English sentence stimuli for the verb-noun experiment with CSed items bolded

1	My little sister	picked	flowers	on Sunday
	My little sister	**katfa**	flowers	on Sunday
	My little sister	picked	**praxim**	on Sunday
2	The pretty baby	drank	juice	in the house
	The pretty baby	**shata**	juice	in the house
	The pretty baby	drank	**mic**	in the house
3	The new teacher	wrote	numbers	in the book
	The new teacher	**katav**	numbers	in the book
	The new teacher	wrote	**misparim**	in the book
4	The little girl	cut	paper	on the table
	The little girl	**gazra**	paper	on the table
	The little girl	cut	**niyar**	on the table
5	The big man	tasted	butter	before breakfast
	The big man	**ta'am**	butter	before breakfast
	The big man	tasted	**xema**	before breakfast
6	The dirty man	spilled	milk	on the floor
	The dirty man	**shafax**	milk	on the floor
	The dirty man	spilled	**xalav**	on the floor
7	The happy boy	played	football	after the show
	The happy boy	**sixeq**	football	after the show
	The happy boy	played	**kadur+regel**	after the show
8	The beautiful queen	cooked	food	before lunch
	The beautiful queen	**bishla**	food	before lunch
	The beautiful queen	cooked	**oxel**	before lunch
9	The old man	watched	movies	in the bedroom
	The old man	**raa**	movies	in the bedroom
	The old man	watched	**sratim**	in the bedroom

10	The nice father	washed	apples	in the bathroom
	The nice father	**shataf**	apples	in the bathroom
	The nice father	washed	**tapuxim**	in the bathroom
11	The hungry mouse	ate	cookies	in the evening
	The hungry mouse	**axal**	cookies	in the evening
	The hungry mouse	ate	**'uga**	in the evening
12	The pretty mother	carried	bottles	in the bag
	The pretty mother	**sama**	bottles	in the bag
	The pretty mother	carried	**baqbuqim**	in the bag
13	My best friend	painted	pictures	in the winter
	My best friend	**ciyer**	pictures	in the winter
	My best friend	painted	**tmunot**	in the winter
14	The nice doctor	brought	money	in the car
	The nice doctor	**hevi**	money	in the car
	The nice doctor	brought	**kesef**	in the car
15	The old woman	bought	candy	in the store
	The old woman	**qanta**	candy	in the store
	The old woman	bought	**mamtaqim**	in the store
16	The white cat	broke	glasses	in the morning
	The white cat	**shavar**	glasses	in the morning
	The white cat	broke	**kosot**	in the morning
17	The sick lady	opened	presents	after the birthday
	The sick lady	**patxa**	presents	after the birthday
	The sick lady	opened	**matanot**	after the birthday
18	My big brother	counted	children	before the game
	My big brother	**safar**	children	before the game
	My big brother	counted	**yeladim**	before the game

Table 2 – Hebrew sentence stimuli for the verb-noun experiment with CSed items bolded

1	Axoti ha- qtana	qatfa	praxim	be- yom- rishon
	Axoti ha- qtana	**picked**	praxim	be- yom- rishon
	Axoti ha-qtana	qatfa	**flowers**	be- yom- rishon
2	Ha- tinoq ha- xamud	shata	mic	betox ha- bayit
	Ha- tinoq ha- xamud	**drank**	mic	betox ha- bayit
	Ha- tinoq ha- xamud	shata	**juice**	betox ha- bayit
3	Ha- more ha- xadash	katav	misparim	ba- sefer
	Ha- more ha- xadash	**wrote**	misparim	ba- sefer
	Ha- more ha- xadash	katav	**numbers**	ba- sefer
4	Ha- yalda ha- qtana	gazra	niyar	‘al ha- shulxan
	Ha- yalda ha- qtana	**cut**	niyar	‘al ha- shulxan
	Ha- yalda ha- qtana	gazra	**paper**	‘al ha- shulxan
5	Ha- ish ha- gadol	ta’am	xema	lifney ha- xagiga
	Ha- ish ha- gadol	**tasted**	xema	lifney ha- xagiga
	Ha- ish ha- gadol	ta’am	**butter**	lifney ha- xagiga
6	Ha- ish ha- meluxlax	shafax	xalav	‘al ha- ricpa
	Ha- ish ha- meluxlax	**spilled**	xalav	‘al ha- ricpa
	Ha- ish ha- meluxlax	shafax	**milk**	‘al ha- ricpa
7	Ha- yeled ha- sameax	sixeq	kadur-regel	axarey ha- hacaga
	Ha- yeled ha- sameax	**played**	kadur-regel	axarey ha- hacaga
	Ha- yeled ha- sameax	sixeq	**football**	axarey ha- hacaga
8	Ha- malka ha- yafa	bishla	oxel	be- ‘emca ha- laila
	Ha- malka ha- yafa	**cooked**	oxel	be- ‘emca ha- laila
	Ha- malka ha- yafa	bishla	**food**	be- ‘emca ha- laila
9	Ha- ish ha- zaqen	raa	sratim	be- xadar+ha- shena
	Ha- ish ha- zaqen	**watched**	sratim	be- xadar+ha- shena
	Ha- ish ha- zaqen	raa	**movies**	be- xadar+ha- shena

10	Ha- aba ha- nexmad	shataf	tapuxim	ba- kiyor
	Ha- aba ha- nexmad	**washed**	tapuxim	ba- kiyor
	Ha- aba ha- nexmad	shataf	**apples**	ba- kiyor
11	Ha- axbar ha- ra' ev	axal	'uga	ba- 'erev
	Ha- axbar ha- ra' ev	**ate**	'uga	ba- 'erev
	Ha- axbar ha- ra' ev	axal	**cookies**	ba- 'erev
12	Ha- ima ha- yafa	sama	baqbuqim	betox ha- saqit
	Ha- ima ha- yafa	**carried**	baqbuqim	betox ha- saqit
	Ha- ima ha- yafa	sama	**bottles**	betox ha- saqit
13	Ha- xaver sheli	ciyer	tmunot	ba- xoref
	Ha- xaver sheli	**painted**	tmunot	ba- xoref
	Ha- xaver sheli	ciyer	**pictures**	ba- xoref
14	Ha- rofe ha- nexmad	hevi	kesef	ba- mxonit
	Ha- rofe ha- nexmad	**brought**	kesef	ba- mxonit
	Ha- rofe ha- nexmad	hevi	**money**	ba- mxonit
15	Ha- isha ha- zqena	qanta	mamtaqim	ba- xanut
	Ha- isha ha- zqena	**bought**	mamtaqim	ba- xanut
	Ha- isha ha- zqena	qanta	**candy**	ba- xanut
16	Ha- xatul ha- lavan	shavar	kosot	ba- boqer
	Ha- xatul ha- lavan	**broke**	kosot	ba- boqer
	Ha- xatul ha- lavan	shavar	**glasses**	ba- boqer
17	Ha- gveret ha- xola	patxa	matanot	ba- yom+holedet
	Ha- gveret ha- xola	**opened**	matanot	ba- yom+holedet
	Ha- gveret ha- xola	patxa	**presents**	ba- yom+holedet
18	Axi ha- gadol	safar	yeladim	lifney ha- misxak
	Axi ha- gadol	**counted**	yeladim	lifney ha- misxak
	Axi ha- gadol	safar	**children**	lifney ha- misxak

Table 3 - Mean number of words, syllables and morphemes of the verb-noun stimuli

Sentence Stimulus	Word Mean (SD)	Morpheme Mean (SD)	Syllable Mean (SD)
English	7.8 (0.38)	7.8 (0.38)	10.7 (0.96)
Hebrew	5.6 (0.50)	9.2 (0.38)	14.6 (1.62)

Table 4 – Mean number of syllables of CSed items for the verb-noun stimuli

English Verb	No. of Syllables	**Hebrew Verb**	No. of Syllables	**English Noun**	No. of Syllables	**Hebrew Noun**	No. of Syllables
cooked	1	bishla	2	bottles	2	baqbuqim	3
ate	1	axal	2	numbers	2	misparim	3
opened	2	patxa	2	children	2	yeladim	3
brought	1	hevi	2	water	2	mayim	2
tasted	2	ta'am	2	candy	2	mamtaqim	3
drank	1	shata	2	movies	2	sratim	2
picked	1	qataf	2	juice	1	mic	1
washed	1	shataf	2	presents	2	matanot	3
cut	1	gazar	2	food	1	oxel	2
painted	2	ciyer	2	ice-cream	2	glida	2
played	1	sixeq	2	butter	2	xema	2
broke	1	shavar	2	cookies	2	'uga	2
watched	1	raa	2	cups	1	kosot	2
counted	2	safra	2	flowers	2	praxim	2
wrote	1	katav	2	paper	2	niyar	2
threw	1	zaraq	2	football	2	kadur+regel	3
carried	2	sama	2	pictures	2	tmunot	2
bought	1	qanta	2	apples	2	tapuxim	3
MEAN	**1.28***		**2.00***		**1.83****		**2.33****
SD	**0.46**		**0.00**		**0.38**		**0.59**

*$p < 0.001$ **$p < 0.01$

Appendix B

Table 5 - English sentence stimuli for the subject-object experiment with CSed items bolded

1	The lady	sent	the letter	last year
	The **gveret**	sent	the letter	last year
	The lady	sent	the **mixtav**	last year
2	The teacher	read	the story	in the school
	The **more**	read	the story	in the school
	The teacher	read	the **sipur**	in the school
3	The clown	kissed	the baby	in the chair
	The **leycan**	kissed	the baby	in the chair
	The clown	kissed	the **tinok**	in the chair
4	The driver	closed	the window	in the truck
	The **nahag**	closed	the window	in the truck
	The driver	closed	the **xalon**	in the truck
5	The bear	broke	the door	at 5 o'clock
	The **dov**	broke	the door	at 5 o'clock
	The bear	broke	the **delet**	at 5 o'clock
6	The rabbit	ate	the carrot	in the garden
	The **shafan**	ate	the carrot	in the garden
	The rabbit	ate	the **gezer**	in the garden
7	The elephant	kicked	the bucket	on the grass
	The **pil**	kicked	the bucket	on the grass
	The elephant	kicked	the **dli**	on the grass
8	The king	opened	the umbrella	before the rain
	The **melex**	opened	the umbrella	before the rain
	The king	opened	the **mitriyah**	before the rain
9	The tiger	bit	the chicken	last night
	The **namer**	bit	the chicken	last night
	The tiger	bit	the **tarnegolet**	last night

10	The monster	pushed	the table	in the kitchen
	The **miflecet**	pushed	the table	in the kitchen
	The monster	pushed	the **shulxan**	in the kitchen
11	The monkey	tasted	the ice-cream	in the summer
	The **kof**	tasted	the ice-cream	in the summer
	The monkey	tasted	the **glida**	in the summer
12	The policeman	painted	the kitchen	after the party
	The **shoter**	painted	the kitchen	after the party
	The policeman	painted	the **mitbax**	after the party
13	The puppy	moved	the pillow	in the bed
	The **klavlav**	moved	the pillow	in the bed
	The puppy	moved	the **karit**	in the bed
14	The princess	made	the painting	in the park
	The **nasix**	made	the painting	in the park
	The princess	made	the **ciyur**	in the park
15	The lion	smelled	the orange	yesterday morning
	The **aryeh**	smelled	the orange	yesterday morning
	The lion	smelled	the **tapuz**	yesterday morning
16	The woman	cleaned	the bedroom	after dinner
	The **isha**	cleaned	the bedroom	after dinner
	The woman	cleaned	the **salon**	after dinner
17	The doggie	drank	the water	in the street
	The **kelev**	drank	the water	in the street
	The doggie	drank	the **mayim**	in the street
18	The child	watched	the horse	before the race
	The **yeled**	watched	the horse	before the race
	The child	watched	the **sus**	before the race

Table 6 - Hebrew sentence stimuli for the subject-object experiment with CSed items bolded

1	Ha- gveret	shalxa	et ha- mixtav	lifney shana
	Ha- **lady**	shalxa	et ha- mixtav	lifney shana
	Ha- gveret	shalxa	et ha- **letter**	lifney shana
2	Ha- moreh	kara	et ha- sipur	be- bet+ha- sefer
	Ha- **teacher**	kara	et ha- sipur	be- bet+ha- sefer
	Ha- moreh	kara	et ha- **story**	be- bet+ha- sefer
3	Ha- leican	nishek	et ha- tinok	ba- kise
	Ha- **clown**	nishek	et ha- tinok	ba- kise
	Ha- leican	nishek	et ha- **baby**	ba- kise
4	Ha- nahag	sagar	et ha- xalon	ba- masait
	Ha- **driver**	sagar	et ha- xalon	ba- masait
	Ha- nahag	sagar	et ha- **window**	ba- masait
5	Ha- dov	shavar	et ha- delet	be- sha'a shesh
	Ha- **bear**	shavar	et ha- delet	be- sha'a shesh
	Ha- dov	shavar	et ha- **door**	be- sha'a shesh
6	Ha- shafan	axal	et ha- gezer	ba- gina
	Ha- **rabbit**	axal	et ha- gezer	ba- gina
	Ha- shafan	axal	et ha- **carrot**	ba- gina
7	Ha- pil	zarak	et ha- dli	'al ha- deshe
	Ha- **elephant**	zarak	et ha- dli	'al ha- deshe
	Ha- pil	zarak	et ha- **bucket**	'al ha- deshe
8	Ha- melex	patax	et ha- mitriyah	lifney ha- geshem
	Ha- **king**	patax	et ha- mitriyah	lifney ha- geshem
	Ha- melex	patax	et ha- **umbrella**	lifney ha- geshem
9	Ha- namer	nashax	et ha- tarnegolet	etmol ba- laila
	Ha- **tiger**	nashax	et ha- tarnegolet	etmol ba- laila
	Ha- namer	nashax	et ha- **chicken**	etmol ba- laila

10	Ha- miflecet	daxfa	et ha- shulxan	ba- mitbax
	Ha- **monster**	daxfa	et ha- shulxan	ba- mitbax
	Ha- miflecet	daxfa	et ha- **table**	ba- mitbax
11	Ha- kof	ta'am	et ha- glida	ba- kayic
	Ha- **monkey**	ta'am	et ha- glida	ba- kayic
	Ha- kof	ta'am	et ha- **ice-cream**	ba- kayic
12	Ha- shoter	cava	et ha- mitbax	axarey ha- mesiba
	Ha- **policeman**	cava	et ha- mitbax	axarey ha- mesiba
	Ha- shoter	cava	et ha- **kitchen**	axarey ha- mesiba
13	Ha- klavlav	heziz	et ha- karit	'al ha- mita
	Ha- **puppy**	heziz	et ha- karit	'al ha- mita
	Ha- klavlav	heziz	et ha- **pillow**	'al ha- mita
14	Ha- nasix	asa	et ha- ciyur	leyad ha- park
	Ha- **princess**	asta	et ha- ciyur	leyad ha- park
	Ha- nasix	asa	et ha- **painting**	leyad ha- park
15	Ha- aryeh	heriax	et ha- tapuz	etmol ba- boqer
	Ha- **lion**	heriax	et ha- tapuz	etmol ba- boqer
	Ha- aryeh	heriax	et ha- **orange**	etmol ba- boqer
16	Ha- isha	nikta	et ha- salon	axarey ha- aruxa
	Ha- **woman**	nikta	et ha- salon	axarey ha- aruxa
	Ha- isha	nikta	et ha- **bedroom**	axarey ha- aruxa
17	Ha- kelev	shata	et ha- mayim	ba- rexov
	Ha- **doggie**	shata	et ha- mayim	ba- rexov
	Ha- kelev	shata	et ha- **water**	ba- rexov
18	Ha- yeled	ra'a	et ha- sus	lifney ha- taxarut
	Ha- **child**	ra'a	et ha- sus	lifney ha- taxarut
	Ha- yeled	ra'a	et ha- **horse**	lifney ha- taxarut

Table 7 - Mean number of words, syllables and morphemes of the subject-object stimuli

Sentence Stimulus	Word Mean (SD)	Morpheme Mean (SD)	Syllable Mean (SD)
English	7.8 (0.43)	7.8 (0.43)	10.5 (1.38)
Hebrew	5.7 (0.49)	9.0 (0.34)	13.3 (1.49)

Table 8 – Mean number of syllables of CSed items for the subject-object stimuli

English Subject	No. of Syllables	**Hebrew Subject**	No. of Syllables	**English Object**	No. of Syllables	**Hebrew Object**	No. of Syllables
bear	1	dov	1	flower	2	salon	2
lion	2	aryeh	2	table	2	shulxan	2
clown	1	leican	2	bucket	2	dli	1
children	2	yeled	2	bedroom	2	mitbax	2
rabbit	2	shafan	2	door	1	delet	2
tiger	2	namer	2	pillow	2	karit	2
monkey	2	kof	1	baby	2	tinok	2
teacher	2	moreh	2	chicken	2	tarnegolet	4
policeman	3	shoter	2	carrot	2	gezer	2
people	2	melex	2	orange	2	tapuz	2
doggie	2	kelev	2	cage	1	mixtav	2
princess	2	nasix	2	candy	2	ciyur	2
woman	2	isha	2	water	2	mayim	2
monster	2	miflecet	3	picture	2	sus	1
puppy	2	klavlav	2	umbrella	3	mitriya	3
elephant	3	pil	1	story	2	sipur	2
lady	2	gveret	2	icecream	2	glida	2
mother	2	nahag	2	window	2	xalon	2
MEAN	**2**		**1.89**		**1.94**		**2.06**
SD	**0.49**		**0.47**		**0.42**		**0.64**

Appendix C

Table 9 – English sentence stimuli for the PP experiment with CSed items bolded

1	The train	rides	around the tower	every day
	The train	rides	**saviv** the tower	every day
	The train	rides	**saviv ha-** tower	every day
	The train	rides	**saviv ha- migdal**	every day
	The train	rides	around the **migdal**	every day
	The train	rides	around **ha- migdal**	every day
2	The teacher	walks	around the classroom	every day
	The teacher	walks	**saviv** the classroom	every day
	The teacher	walks	**saviv ha-** classroom	every day
	The teacher	walks	**saviv ha- kita**	every day
	The teacher	walks	around the **kita**	every day
	The teacher	walks	around **ha- kita**	every day
3	The doggie	ran	around the flower	one evening
	The doggie	ran	**saviv** the flower	one evening
	The doggie	ran	**saviv ha-** flower	one evening
	The doggie	ran	**saviv ha- perax**	one evening
	The doggie	ran	around the **perax**	one evening
	The doggie	ran	around **ha- perax**	one evening
4	The tiger	went	around the tree	one evening
	The tiger	went	**saviv** the tree	one evening
	The tiger	went	**saviv ha-** tree	one evening
	The tiger	went	**saviv ha- 'ec**	one evening
	The tiger	went	around the **'ec**	one evening
	The tiger	went	around **ha- 'ec**	one evening
5	The duck	swam	around the boat	this morning
	The duck	swam	**saviv** the boat	this morning
	The duck	swam	**saviv ha-** boat	this morning
	The duck	swam	**saviv ha- sira**	this morning
	The duck	swam	around the **sira**	this morning
	The duck	swam	around **ha- sira**	this morning

6	The mouse	ran	around the table	today
	The mouse	ran	**saviv** the table	today
	The mouse	ran	**saviv ha-** table	today
	The mouse	ran	**saviv ha- shulxan**	today
	The mouse	ran	around the **shulxan**	today
	The mouse	ran	around **ha- shulxan**	today
7	The turtle	walks	inside the box	every day
	The turtle	walks	**betox** the box	every day
	The turtle	walks	**betox ha-** box	every day
	The turtle	walks	**betox ha- qufsa**	every day
	The turtle	walks	inside the **qufsa**	every day
	The turtle	walks	inside **ha- qufsa**	every day
8	The builder	works	inside the house	every morning
	The builder	works	**betox** the house	every morning
	The builder	works	**betox ha-** house	every morning
	The builder	works	**betox ha- bayit**	every morning
	The builder	works	inside the **bayit**	every morning
	The builder	works	inside **ha- bayit**	every morning
9	The girl	played	inside the bedroom	all day
	The girl	played	**betox** the bedroom	all day
	The girl	played	**betox ha-** bedroom	all day
	The girl	played	**betox ha- xeder**	all day
	The girl	played	inside the **xeder**	all day
	The girl	played	inside **ha- xeder**	all day
10	The doctor	looked	inside the bag	one day
	The doctor	looked	**betox** the bag	one day
	The doctor	looked	**betox ha-** bag	one day
	The doctor	looked	**betox ha- tiq**	one day
	The doctor	looked	inside the **tiq**	one day
	The doctor	looked	inside **ha- tiq**	one day
11	The policeman	stayed	inside the shop	a long time
	The policeman	stayed	**betox** the shop	a long time
	The policeman	stayed	**betox ha-** shop	a long time
	The policeman	stayed	**betox ha- xanut**	a long time
	The policeman	stayed	inside the **xanut**	a long time
	The policeman	stayed	inside **ha- xanut**	a long time

12	The milk	was	inside the bottle	a long time
	The milk	was	**betox** the bottle	a long time
	The milk	was	**betox ha-** bottle	a long time
	The milk	was	**betox ha- baqbuq**	a long time
	The milk	was	inside the **baqbuq**	a long time
	The milk	was	inside **ha- baqbuq**	a long time
13	The airplane	flies	over the river	every night
	The airplane	flies	**me'al** the river	every night
	The airplane	flies	**me'al ha-** river	every night
	The airplane	flies	**me'al ha- nahar**	every night
	The airplane	flies	over the **nahar**	every night
	The airplane	flies	over **ha- nahar**	every night
14	The dolphin	jumps	over the water	every night
	The dolphin	jumps	**me'al** the water	every night
	The dolphin	jumps	**me'al ha-** water	every night
	The dolphin	jumps	**me'al ha-mayim**	every night
	The dolphin	jumps	over the **mayim**	every night
	The dolphin	jumps	over **ha- mayim**	every night
15	The cat	jumped	over the chair	again and again
	The cat	jumped	**me'al** the chair	again and again
	The cat	jumped	**me'al ha-** chair	again and again
	The cat	jumped	**me'al ha- kise**	again and again
	The cat	jumped	over the **kise**	again and again
	The cat	jumped	over **ha- kise**	again and again
16	The bird	flew	over the garden	again and again
	The bird	flew	**me'al** the garden	again and again
	The bird	flew	**me'al ha-** garden	again and again
	The bird	flew	**me'al ha- gina**	again and again
	The bird	flew	over the **gina**	again and again
	The bird	flew	over **ha- gina**	again and again
17	The balloon	went	over the bridge	this morning
	The balloon	went	**me'al** the bridge	this morning
	The balloon	went	**me'al ha-** bridge	this morning
	The balloon	went	**me'al ha- gesher**	this morning
	The balloon	went	over the **gesher**	this morning
	The balloon	went	over **ha- gesher**	this morning

18	The cloud	moved	over the building	this morning
	The cloud	moved	**me'al** the building	this morning
	The cloud	moved	**me'al ha-** building	this morning
	The cloud	moved	**me'al ha- binyan**	this morning
	The cloud	moved	over the **binyan**	this morning
	The cloud	moved	over **ha- binyan**	this morning
19	The lion	stands	next to the tiger	every morning
	The lion	stands	**leyad** the tiger	every morning
	The lion	stands	**leyad ha-** tiger	every morning
	The lion	stands	**leyad ha- namer**	every morning
	The lion	stands	next to the **namer**	every morning
	The lion	stands	next to **ha- namer**	every morning
20	The driver	sits	next to the window	every morning
	The driver	sits	**leyad** the window	every morning
	The driver	sits	**leyad ha-** window	every morning
	The driver	sits	**leyad ha- xalon**	every morning
	The driver	sits	next to the **xalon**	every morning
	The driver	sits	next to **ha- xalon**	every morning
21	The monkey	sat	next to the doggie	all day
	The monkey	sat	**leyad** the doggie	all day
	The monkey	sat	**leyad ha-** doggie	all day
	The monkey	sat	**leyad ha- kelev**	all day
	The monkey	sat	next to the **kelev**	all day
	The monkey	sat	next to **ha- kelev**	all day
22	The father	stayed	next to the baby	all night
	The father	stayed	**leyad** the baby	all night
	The father	stayed	**leyad ha-** baby	all night
	The father	stayed	**leyad ha- tinoq**	all night
	The father	stayed	next to the **tinoq**	all night
	The father	stayed	next to **ha- tinoq**	all night
23	The clown	ate	next to the kitchen	last week
	The clown	ate	**leyad** the kitchen	last week
	The clown	ate	**leyad ha-** kitchen	last week
	The clown	ate	**leyad ha- mitbax**	last week
	The clown	ate	next to the **mitbax**	last week
	The clown	ate	next to **ha- mitbax**	last week

24	The king	danced	next to the princess	all night
	The king	danced	**leyad** the princess	all night
	The king	danced	**leyad ha-** princess	all night
	The king	danced	**leyad ha- nasix**	all night
	The king	danced	next to the **nasix**	all night
	The king	danced	next to **ha- nasix**	all night
25	The man	smiles	after the story	every time
	The man	smiles	**axrey** the story	every time
	The man	smiles	**axrey ha-** story	every time
	The man	smiles	**axrey ha- sipur**	every time
	The man	smiles	after the **sipur**	every time
	The man	smiles	after **ha- sipur**	every time
26	The horse	falls	after the jump	every time
	The horse	falls	**axrey** the jump	every time
	The horse	falls	**axrey ha-** jump	every time
	The horse	falls	**axrey ha- qfica**	every time
	The horse	falls	after the **qfica**	every time
	The horse	falls	after **ha- qfica**	every time
27	The baby	slept	after the bath	yesterday
	The baby	slept	**axrey** the bath	yesterday
	The baby	slept	**axrey ha-** bath	yesterday
	The baby	slept	**axrey ha- tiyul**	yesterday
	The baby	slept	after the **tiyul**	yesterday
	The baby	slept	after **ha- tiyul**	yesterday
28	My brother	cried	after the dream	last week
	My brother	cried	**axrey** the dream	last week
	My brother	cried	**axrey ha-** dream	last week
	My brother	cried	**axrey ha- xalom**	last week
	My brother	cried	after the **xalom**	last week
	My brother	cried	after **ha- xalom**	last week
29	My sister	laughed	after the joke	last night
	My sister	laughed	**axrey** the joke	last night
	My sister	laughed	**axrey ha-** joke	last night
	My sister	laughed	**axrey ha- bdixa**	last night
	My sister	laughed	after the **bdixa**	last night
	My sister	laughed	after **ha- bdixa**	last night

30	My friend	drank	after the movie	today
	My friend	drank	**axrey** the movie	today
	My friend	drank	**axrey ha-** movie	today
	My friend	drank	**axrey ha- seret**	today
	My friend	drank	after the **seret**	today
	My friend	drank	after **ha- seret**	today
31	The rain	stops	before the summer	every year
	The rain	stops	**lifney** the summer	every year
	The rain	stops	**lifney ha-** summer	every year
	The rain	stops	**lifney ha- qayic**	every year
	The rain	stops	before the **qayic**	every year
	The rain	stops	before **ha- qayic**	every year
32	The lady	sings	before the show	tonight
	The lady	sings	**lifney** the show	tonight
	The lady	sings	**lifney ha-** show	tonight
	The lady	sings	**lifney ha- riqud**	tonight
	The lady	sings	before the **riqud**	tonight
	The lady	sings	before **ha- riqud**	tonight
33	The boy	slept	before the party	last night
	The boy	slept	**lifney** the party	last night
	The boy	slept	**lifney ha-** party	last night
	The boy	slept	**lifney ha- tisa**	last night
	The boy	slept	before the **tisa**	last night
	The boy	slept	before **ha- tisa**	last night
34	The woman	left	before the winter	last year
	The woman	left	**lifney** the winter	last year
	The woman	left	**lifney ha-** winter	last year
	The woman	left	**lifney ha- xoref**	last year
	The woman	left	before the **xoref**	last year
	The woman	left	before **ha- xoref**	last year
35	My daddy	came	before the birthday	today
	My daddy	came	**lifney** the birthday	today
	My daddy	came	**lifney ha-** birthday	today
	My daddy	came	**lifney ha- geshem**	today
	My daddy	came	before the **geshem**	today
	My daddy	came	before **ha- geshem**	today

36	My mommy	worked	before the game	last night
	My mommy	worked	**lifney** the game	last night
	My mommy	worked	**lifney ha-** game	last night
	My mommy	worked	**lifney ha- misxaq**	last night
	My mommy	worked	before the **misxaq**	last night
	My mommy	worked	before **ha- misxaq**	last night

Table 10 – Hebrew sentence stimuli for the PP experiment with CSed items bolded

1	Ha- rakevet	nosa'at	saviv ha- migdal	kol yom
	Ha- rakevet	nosa'at	**around** ha- migdal	kol yom
	Ha- rakevet	nosa'at	**around the** migdal	kol yom
	Ha- rakevet	nosa'at	**around the tower**	kol yom
	Ha- rakevet	nosa'at	saviv ha- **tower**	kol yom
	Ha- rakevet	nosa'at	saviv **the tower**	kol yom
2	Ha- more	holex	saviv ha- kita	kol yom
	Ha- more	holex	**around** ha- kita	kol yom
	Ha- more	holex	**around the** kita	kol yom
	Ha- more	holex	**around the classroom**	kol yom
	Ha- more	holex	saviv ha- **classroom**	kol yom
	Ha- more	holex	saviv **the classroom**	kol yom
3	Ha- kelev	rac	saviv ha- perax	erev exad
	Ha- kelev	rac	**around** ha- perax	erev exad
	Ha- kelev	rac	**around the** perax	erev exad
	Ha- kelev	rac	**around the flower**	erev exad
	Ha- kelev	rac	saviv ha- **flower**	erev exad
	Ha- kelev	rac	saviv **the flower**	erev exad
	Ha- namer	halax	saviv ha- 'ec	erev exad
	Ha- namer	halax	**around** ha- 'ec	erev exad
	Ha- namer	halax	**around the** 'ec	erev exad
	Ha- namer	halax	**around the tree**	erev exad
	Ha- namer	halax	saviv ha- **tree**	erev exad
	Ha- namer	halax	saviv **the tree**	erev exad
5	Ha- barvaz	saxa	saviv ha- sira	haboqer
	Ha- barvaz	saxa	**around** ha- sira	haboqer
	Ha- barvaz	saxa	**around the** sira	haboqer
	Ha- barvaz	saxa	**around the boat**	haboqer
	Ha- barvaz	saxa	saviv ha- **boat**	haboqer
	Ha- barvaz	saxa	saviv **the boat**	haboqer

6	Ha- axbar	rac	saviv ha- shulxan	hayom
	Ha- axbar	rac	**around** ha- shulxan	hayom
	Ha- axbar	rac	**around the** shulxan	hayom
	Ha- axbar	rac	**around the table**	hayom
	Ha- axbar	rac	saviv ha- **table**	hayom
	Ha- axbar	rac	saviv **the table**	hayom
7	Ha- cav	mistovev	betox ha- qufsa	kol yom
	Ha- cav	mistovev	**inside** ha- qufsa	kol yom
	Ha- cav	mistovev	**inside the** qufsa	kol yom
	Ha- cav	mistovev	**inside the box**	kol yom
	Ha- cav	mistovev	betox ha- **box**	kol yom
	Ha- cav	mistovev	betox **the box**	kol yom
8	Ha- banay	oved	betox ha- bayit	kol boqer
	Ha- banay	oved	**inside** ha- bayit	kol boqer
	Ha- banay	oved	**inside the** bayit	kol boqer
	Ha- banay	oved	**inside the house**	kol boqer
	Ha- banay	oved	betox ha- **house**	kol boqer
	Ha- banay	oved	betox **the house**	kol boqer
9	Ha- yalda	sixqa	betox ha- xeder	kol ha- yom
	Ha- yalda	sixqa	**inside** ha- xeder	kol ha- yom
	Ha- yalda	sixqa	**inside the** xeder	kol ha- yom
	Ha- yalda	sixqa	**inside the bedroom**	kol ha- yom
	Ha- yalda	sixqa	betox ha- **bedroom**	kol ha- yom
	Ha- yalda	sixqa	betox **the bedroom**	kol ha- yom
10	Ha- rofe	histakel	betox ha- tiq	yom exad
	Ha- rofe	histakel	**inside** ha- tiq	yom exad
	Ha- rofe	histakel	**inside the** tiq	yom exad
	Ha- rofe	histakel	**inside the bag**	yom exad
	Ha- rofe	histakel	betox ha- **bag**	yom exad
	Ha- rofe	histakel	betox **the bag**	yom exad
11	Ha- shoter	nishar	betox ha- xanut	harbe zman
	Ha- shoter	nishar	**inside** ha- xanut	harbe zman
	Ha- shoter	nishar	**inside the** xanut	harbe zman
	Ha- shoter	nishar	**inside the shop**	harbe zman
	Ha- shoter	nishar	betox ha- **shop**	harbe zman
	Ha- shoter	nishar	betox **the shop**	harbe zman

12	Ha- xalav	haya	betox ha- baqbuq	harbe zman
	Ha- xalav	haya	**inside** ha- baqbuq	harbe zman
	Ha- xalav	haya	**inside the** baqbuq	harbe zman
	Ha- xalav	haya	**inside the bottle**	harbe zman
	Ha- xalav	haya	betox ha- **bottle**	harbe zman
	Ha- xalav	haya	betox **the bottle**	harbe zman
13	Ha- matos	tas	me'al ha- nahar	kol laila
	Ha- matos	tas	**over** ha- nahar	kol laila
	Ha- matos	tas	**over the** nahar	kol laila
	Ha- matos	tas	**over the river**	kol laila
	Ha- matos	tas	me'al ha- **river**	kol laila
	Ha- matos	tas	me'al **the river**	kol laila
14	Ha- dolfin	qofec	me'al ha- mayim	kol laila
	Ha- dolfin	qofec	**over** ha- mayim	kol laila
	Ha- dolfin	qofec	**over the** mayim	kol laila
	Ha- dolfin	qofec	**over the water**	kol laila
	Ha- dolfin	qofec	me'al ha- **water**	kol laila
	Ha- dolfin	qofec	me'al **the water**	kol laila
15	Ha- xatul	qafac	me'al ha- kise	shuv ve- shuv
	Ha- xatul	qafac	**over** ha- kise	shuv ve- shuv
	Ha- xatul	qafac	**over the** kise	shuv ve- shuv
	Ha- xatul	qafac	**over the chair**	shuv ve- shuv
	Ha- xatul	qafac	me'al ha- **chair**	shuv ve- shuv
	Ha- xatul	qafac	me'al **the chair**	shuv ve- shuv
16	Ha- cipor	afa	me'al ha- gina	shuv ve- shuv
	Ha- cipor	afa	**over** ha- gina	shuv ve- shuv
	Ha- cipor	afa	**over the** gina	shuv ve- shuv
	Ha- cipor	afa	**over the garden**	shuv ve- shuv
	Ha- cipor	afa	me'al ha- **garden**	shuv ve- shuv
	Ha- cipor	afa	me'al **the garden**	shuv ve- shuv
17	Ha- balon	af	me'al ha- gesher	haboqer
	Ha- balon	af	**over** ha- gesher	haboqer
	Ha- balon	af	**over the** gesher	haboqer
	Ha- balon	af	**over the bridge**	haboqer
	Ha- balon	af	me'al ha- **bridge**	haboqer
	Ha- balon	af	me'al **the bridge**	haboqer

18	Ha- 'anan	avar	me'al ha- binyan	haboqer
	Ha- 'anan	avar	**over** ha- binyan	haboqer
	Ha- 'anan	avar	**over the** binyan	haboqer
	Ha- 'anan	avar	**over the building**	haboqer
	Ha- 'anan	avar	me'al ha- **building**	haboqer
	Ha- 'anan	avar	me'al **the building**	haboqer
19	Ha- aryeh	omed	leyad ha- namer	kol boqer
	Ha- aryeh	omed	**next to** ha- namer	kol boqer
	Ha- aryeh	omed	**next to the** namer	kol boqer
	Ha- aryeh	omed	**next to the tiger**	kol boqer
	Ha- aryeh	omed	leyad ha- **tiger**	kol boqer
	Ha- aryeh	omed	leyad **the tiger**	kol boqer
20	Ha- nahag	yoshev	leyad ha- xalon	kol boqer
	Ha- nahag	yoshev	**next to** ha- xalon	kol boqer
	Ha- nahag	yoshev	**next to the** xalon	kol boqer
	Ha- nahag	yoshev	**next to the window**	kol boqer
	Ha- nahag	yoshev	leyad ha- **window**	kol boqer
	Ha- nahag	yoshev	leyad **the window**	kol boqer
21	Ha- qof	yashav	leyad ha- kelev	kol ha- yom
	Ha- qof	yashav	**next to** ha- kelev	kol ha- yom
	Ha- qof	yashav	**next to the** kelev	kol ha- yom
	Ha- qof	yashav	**next to the doggie**	kol ha- yom
	Ha- qof	yashav	leyad ha- **doggie**	kol ha- yom
	Ha- qof	yashav	leyad **the doggie**	kol ha- yom
22	Ha- saba	nishar	leyad ha- tinoq	kol ha- laila
	Ha- saba	nishar	**next to** ha- tinoq	kol ha- laila
	Ha- saba	nishar	**next to the** tinoq	kol ha- laila
	Ha- saba	nishar	**next to the baby**	kol ha- laila
	Ha- saba	nishar	leyad ha- **baby**	kol ha- laila
	Ha- saba	nishar	leyad **the baby**	kol ha- laila
23	Ha- leycan	axal	leyad ha- mitbax	hashavu'a
	Ha- leycan	axal	**next to** ha- mitbax	hashavu'a
	Ha- leycan	axal	**next to the** mitbax	hashavu'a
	Ha- leycan	axal	**next to the kitchen**	hashavu'a
	Ha- leycan	axal	leyad ha- **kitchen**	hashavu'a
	Ha- leycan	axal	leyad **the kitchen**	hashavu'a

24	Ha- melex	rakad	leyad ha- nasix	kol ha- laila
	Ha- melex	rakad	**next to** ha- nasix	kol ha- laila
	Ha- melex	rakad	**next to the** nasix	kol ha- laila
	Ha- melex	rakad	**next to the princess**	kol ha- laila
	Ha- melex	rakad	leyad ha- **princess**	kol ha- laila
	Ha- melex	rakad	leyad **the princess**	kol ha- laila
25	Ha- ish	mexayex	axrey ha- sipur	kol pa'am
	Ha- ish	mexayex	**after** ha- sipur	kol pa'am
	Ha- ish	mexayex	**after the** sipur	kol pa'am
	Ha- ish	mexayex	**after the story**	kol pa'am
	Ha- ish	mexayex	axrey ha- **story**	kol pa'am
	Ha- ish	mexayex	axrey **the story**	kol pa'am
26	Ha- sus	nofel	axrey ha- qfica	kol pa'am
	Ha- sus	nofel	**after** ha- qfica	kol pa'am
	Ha- sus	nofel	**after the** qfica	kol pa'am
	Ha- sus	nofel	**after the jump**	kol pa'am
	Ha- sus	nofel	axrey ha- **jump**	kol pa'am
	Ha- sus	nofel	axrey **the jump**	kol pa'am
27	Ha- tinoq	yashan	axrey ha- tiyul	etmol
	Ha- tinoq	yashan	**after** ha- tiyul	etmol
	Ha- tinoq	yashan	**after the** tiyul	etmol
	Ha- tinoq	yashan	**after the bath**	etmol
	Ha- tinoq	yashan	axrey ha- **bath**	etmol
	Ha- tinoq	yashan	axrey **the bath**	etmol
28	Ax sheli	baxa	axrey ha- xalom	hashavu'a
	Ax sheli	baxa	**after** ha- xalom	hashavu'a
	Ax sheli	baxa	**after the** xalom	hashavu'a
	Ax sheli	baxa	**after the dream**	hashavu'a
	Ax sheli	baxa	axrey ha- **dream**	hashavu'a
	Ax sheli	baxa	axrey **the dream**	hashavu'a
29	Axoti	caxaqa	axrey ha- bdixa	ha'erev
	Axoti	caxaqa	**after** ha- bdixa	ha'erev
	Axoti	caxaqa	**after the** bdixa	ha'erev
	Axoti	caxaqa	**after the joke**	ha'erev
	Axoti	caxaqa	axrey ha- **joke**	ha'erev
	Axoti	caxaqa	axrey **the joke**	ha'erev

30	Xaver sheli	shata	axrey ha- seret	hayom
	Xaver sheli	shata	**after** ha- seret	hayom
	Xaver sheli	shata	**after the** seret	hayom
	Xaver sheli	shata	**after the movie**	hayom
	Xaver sheli	shata	axrey ha- **movie**	hayom
	Xaver sheli	shata	axrey **the movie**	hayom
31	Ha- geshem	mafsiq	lifney ha- qayic	kol shana
	Ha- geshem	mafsiq	**before** ha- qayic	kol shana
	Ha- geshem	mafsiq	**before the** qayic	kol shana
	Ha- geshem	mafsiq	**before the summer**	kol shana
	Ha- geshem	mafsiq	lifney ha- **summer**	kol shana
	Ha- geshem	mafsiq	lifney **the summer**	kol shana
32	Ha- gveret	shara	lifney ha- riqud	ha'erev
	Ha- gveret	shara	**before** ha- riqud	ha'erev
	Ha- gveret	shara	**before the** riqud	ha'erev
	Ha- gveret	shara	**before the show**	ha'erev
	Ha- gveret	shara	lifney ha- **show**	ha'erev
	Ha- gveret	shara	lifney **the show**	ha'erev
33	Ha- yeled	yashan	lifney ha- tisa	halaila
	Ha- yeled	yashan	**before** ha- tisa	halaila
	Ha- yeled	yashan	**before the** tisa	halaila
	Ha- yeled	yashan	**before the party**	halaila
	Ha- yeled	yashan	lifney ha- **party**	halaila
	Ha- yeled	yashan	lifney **the party**	halaila
34	Ha- isha	azva	lifney ha- xoref	hashana
	Ha- isha	azva	**before** ha- xoref	hashana
	Ha- isha	azva	**before the** xoref	hashana
	Ha- isha	azva	**before the winter**	hashana
	Ha- isha	azva	lifney ha- **winter**	hashana
	Ha- isha	azva	lifney **the winter**	hashana
35	Aba sheli	ba	lifney ha- geshem	hayom
	Aba sheli	ba	**before** ha- geshem	hayom
	Aba sheli	ba	**before the** geshem	hayom
	Aba sheli	ba	**before the birthday**	hayom
	Aba sheli	ba	lifney ha- **birthday**	hayom
	Aba sheli	ba	lifney **the birthday**	hayom