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The Acquisition of the Lexicon-Syntax Parameter  
A Developmental Study of Reflexivization

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## ABSTRACT

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The operation of reflexivization is argued to be subject to the recently proposed Lexicon-Syntax (Lex-Syn) parameter (Reinhart & Siloni, 2005), according to which UG arity operations (e.g. the operation of reflexivization) can apply either (i) in the lexicon (Hebrew, English, Russian, Hungarian, and Dutch) or (ii) in the syntax (Romance, Serbo-Croatian, Czech, Greek, and German).

I conducted experiments to examine the validity of the Lex-Syn parameter using data from the acquisition of French and Hebrew, which are set differently for this parameter: to syntax in French, and to lexicon in Hebrew.

The study's aim was to compare the acquisition of early reflexives in Hebrew and French in order to detect possible differences, and then determine whether these differences (or the lack thereof) are predicted by the Lex-Syn parameter, or in fact support a different approach.

Two groups of children with typical language development were tested: monolingual native speakers of Hebrew in one group, and of French in the other. They were at the one-word stage of acquisition, and in the initial stages of inflectional verbal morphology paradigm acquisition.

It was found that the results of the experiments partially support the predictions that were based on the Lex-Syn parameter hypothesis: while they support the predictions made for French regarding syntactic reflexives, they do not support the predictions made for French regarding the so-called 'grooming' class of reflexives. Namely, the results regarding the reflexives derived by syntactic reflexivization show that they do not appear among the first early verbal productions or during the one-word stage of acquisition. However, the results also show that 'grooming' reflexives appear at this early stage of acquisition in French, just like in lexical languages (Hebrew). This result was not predicted by the Lex-Syn parameter hypothesis, but it does not conflict with it either, because it can be assumed that the default setting of the Lex-Syn parameter as 'lexicon' is manifested at the early stage of acquisition crosslinguistically.

However, the proposed interpretation of the results as "default setting of the Lex-Syn parameter as 'lexicon'" is not the only possibility. Another possible explanation for the dissociation found in French between syntactic reflexives and reflexive verbs that belong to the set typical of languages with a lexical set might be as follows: the 'grooming' reflexives are formed in the lexicon—even in French, and this is why they appear among the early verbal productions or during the one-word stage of acquisition in French, just like in Hebrew. This further hypothesis was examined in this thesis. Closer inspection revealed that certain reflexive verbs in French (a 'syntax' language) exhibit the properties of the lexical reflexives,

namely, certain French reflexives are found in idioms, event nominals and undergo semantic drift. These verbs seem to belong to the core set typical of languages with a lexical setting of the parameter. In addition, the interpretation of these reflexive verbs in French was found to differ in one particular respect from the interpretation of the rest of the French reflexives (i.e. reflexives formed in syntax), and this interpretive property was exhibited by reflexives in 'lexicon' languages. It was assumed that in order to derive this particular interpretation, the verb has to be formed in the lexicon.

Based on the findings of both the experiments and the theoretical examination, I propose that the formation of the French reflexive verbs, which belong to the core set typical of languages with a lexical setting of the parameter, takes place in the lexicon. Consequently, French has a set of lexical reflexives, just like the lexical languages.

An important conclusion emerging from this study is that the Lex-Syn parameter should, in fact, determine whether or not an operation can apply in syntax, whereas lexical application is always possible.

## Between the Lexicon and Syntax

### 1. Introduction

The issue of division of labor between mental lexicon and syntax is still under debate. Following Reinhart (2002), Reinhart and Siloni (2005) and Horvath and Siloni (2006), the various operations deriving the different verbal voices split into three types according to the locus of application: (a) universally in the lexicon (e.g., decausativization), (b) universally in the syntax (e.g., verbal passive formation), (c) parametric choice (e.g., reflexivization). The latter operations are argued to be subject to the recently proposed Lexicon-Syntax (Lex-Syn) parameter (Reinhart & Siloni, 2005), according to which each language specifies whether arity (i.e. valence-changing operations) apply in the syntax or in the lexicon in that language. Importantly, the parameter is applicable only if the grammar includes an active lexicon (Siloni, 2002) as a computational component.

Contrary to this view of the division of labor, at least two different approaches emerge, both arguing against the Lex-Syn parameter. The first is the nonlexicalist approach, which eliminates the operative role of the lexicon by transferring all derivational operations to syntax (Marantz, 1997, 2000; Borer, 2004, among others). The second one, the lexicalist approach, suggested for example, by Doron and Rappaport-Hovav (2007), assumes an active lexicon approach but challenges the idea that the same valence changing operation may apply in different components of the grammar in different languages (i.e. in certain languages in lexicon and in others in syntax). In particular, Doron and Rappaport-Hovav (2007) argue that reflexivization as a valence changing operation applies uniformly in the lexicon.

The present study sets out to examine the validity of the Lex-Syn parameter. First, the hypothesis is tested from the angle of acquisition, namely in light of data from L1 reflexive verb acquisition in Hebrew and French, two languages which are set differently for this parameter: to syntax in French, and to lexicon in Hebrew. Second, I perform a closer theoretical inspection of French reflexive verbs that belong to the core set typical of languages with a lexical set. The study determines the lexical-semantic properties of these reflexive verbs in comparison with their lexical counterparts in Russian (a 'lexicon' language).

The thesis consists of three parts. The first is dedicated to defining the Lex-Syn parameter and to describing the relevant theories about arity operations. The second is dedicated to the

experiments in L1 acquisition. In the final part of the thesis, a theoretical analysis of reflexive verbs is presented, as well as possible direction for future research.

## **2. Theoretical Framework**

In this section, I provide some background for the present study. Specifically, I outline the Lex-Syn parameter (Reinhart & Siloni, 2005) and the Active Lexicon approach (Siloni, 2002). The present study is conducted within the grammatical Principles and Parameters framework set out in Chomsky (1981, 1986). I do not undertake a review of the fundamental postulates of the theories; I will outline only the theoretical apparatus relevant to the present study.

### **2.1 The Lexicon-Syntax Parameter**

Reinhart and Siloni (2005) suggest that although reflexive verbs share certain basic properties across languages, they split into two types according to a cluster of distinctions. They argue that UG arity (valency changing) operations, which affect the  $\theta$ -grid of a predicate (e.g. the operation of reflexivization) are universal, but that the level at which they are applied is a parametric choice: they can apply either (i) in the lexicon (Hebrew, English, Russian, Hungarian, and Dutch) or (ii) in the syntax (French, Italian, Spanish, Serbo-Croatian, Czech, Greek, and German), as formulated in the following parameter.

#### **(1) The Lex-Syn Parameter (Reinhart & Siloni, 2005)**

UG allows thematic arity operations to apply in the lexicon or in the syntax.

Accepting this proposal entails including an active lexicon in the grammar—which is not a mere list of items: it is also a computational component, which can perform arity changing operations (Siloni, 2002).

#### **2.1.1 *The reflexivization operation***

Reflexivity can be expressed via syntactic constructions, involving a reflexive anaphor serving as an argument of a predicate, or via a reflexivization operation on verbal entries. The former option is not relevant to the Lex-Syn parameter. The present study deals only with the second option.

Reflexivization is the operation generating a reflexive verb from a transitive verb entry. The term reflexive verb refers to verbs denoting an action that the Agent argument applies to itself (2c) or in certain languages (e.g. in French), a state of mind the Experiencer argument has with regard to itself (Reinhart & Siloni, 2005).

Although syntactically, the reflexive verb is a one-place unergative (Reinhart & Siloni, 2005), its semantics retains the original roles of the transitive base entry (compare the transitive entry in (2a) and its interpretation in (2b) to the reflexive alternate in (2c) and its interpretation in (2d)).

- (2)
- a. Dan roxec et ha-yeled. (Hebrew)/Dan washes the child. /Dan lave l'enfant. (French)
  - b.  $\exists e$  [wash (e) & Agent (e, Dan) & Theme (e, the child)]
  - c. Dan mitraxec. (Hebrew)/Dan washes. / Dan se lave. (French)
  - d.  $\exists e$  [wash (e) & Agent (e, Dan) & Theme (e, Dan)]

Reinhart and Siloni (2005) call the operation of reflexivization bundling, an operation that necessarily applies to an external  $\theta$ -role. This operation bundles any  $\theta$ -role with the external  $\theta$ -role, as defined in (3), so that both  $\theta$ -roles end up associated with the external argument of the verb.

### (3) Reflexivization Bundling

$[\theta_i] [\theta_j] \rightarrow [\theta_i - \theta_j]$ , where  $\theta_i$  is an external  $\theta$ -role.

When the Lex-Syn parameter is set to the lexicon value, the bundling operation (3) applies directly to the verb's  $\theta$ -grid.<sup>1</sup> Applying bundling reduces the Accusative Case feature; such reduction is an effect shared by all valence reducing operations that apply in the lexicon (Reinhart, 2002; Reinhart & Siloni, 2005).

In syntax languages, what is to become a reflexive verb leaves the lexicon with the same number of  $\theta$ -roles as the basic verbal entry and carries the Accusative Case feature. Reinhart and Siloni (2005) (among others) assume that in syntax languages, the clitic (or its equivalent) reduces Case. Reflexivization bundling in syntax cannot apply to the  $\theta$ -grid of the verb as it does in the lexicon. The syntax is the engine that builds structure from elements selected from the lexicon and cannot change the lexical-semantic information of the elements it operates on (Siloni, 2002). Thus the syntax cannot change the  $\theta$ -grid of a predicate. Such manipulation of  $\theta$ -grids is only possible in the lexicon. This is stated in the following guideline:

### (4) The Lexicon Interface Guideline

The syntactic component cannot manipulate  $\theta$ -grids: elimination, modification and addition of a  $\theta$ -role are illicit in the syntax.

---

<sup>1</sup> This analysis assumes that the external  $\theta$ -role is part of the thematic information of the predicate in the lexicon (see Horvath & Siloni, 2002 for details).



Once a  $\theta$ -role is part of the  $\theta$ -grid of a predicate in the structure, it must either be merged as an argument or have a residue in the syntax or at the level of interpretation. Thus, bundling in syntax does not apply to the  $\theta$ -grid of the verb, but to unassigned  $\theta$ -roles. An internal  $\theta$ -role is not mapped onto its canonical position due to the lack of Case. The unassigned role is retained by the verbal projection until the external  $\theta$ -role is merged. Upon merging of the external  $\theta$ -role, the unassigned role is bundled with the external role, resulting in the assignment of two roles to the same syntactic argument, which is an instance of non-canonical  $\theta$  assignment.<sup>2</sup>

Siloni (2008) introduced a modification of this mechanism, according to which the syntactic operation does not form a complex bundled  $\theta$ -role. Specifically, Siloni makes the proposal presented in (5) regarding the way reciprocalization applies in the syntax, and argues that the same operation extends to the formation of reflexives.

(5) Reciprocalization in the syntax

- a. Case reduction (enabled by the appropriate morphology (*se*)).
- b. Parasitic assignment: a retained  $\theta$ -role is assigned upon merger of another argument (a last resort operation).

Then, following Siloni (2008), the syntactic mechanism can proceed as follows. The choice of morphology (*se*) reduces case. An internal  $\theta$ -role is not mapped onto its canonical position owing to lack of case. The unassigned role is retained on the verbal projection until the merger of another argument. It is then assigned to that same argument, resulting in the association of two roles with the same argument. The assignment of the retained role is parasitic on the assignment of another  $\theta$ -role. It is not the standard procedure of  $\theta$ -assignment, but rather a last resort mechanism, consequently applicable only at the edge of the thematic phase, namely, only upon assignment of the external role.

Reflexive verbs appear in a certain morphological form: a particular verbal template in Semitic languages, the fifth verbal template, namely the so-called *hitpa'el* template in Hebrew; a clitic (*se* or *si*) in Romance (e.g., French), both illustrated in (2c).

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<sup>2</sup> The original  $\theta$ -Criterion includes a biuniqueness condition requiring that each argument receive only one  $\theta$ -role and that each  $\theta$ -role be assigned to only one argument. Reinhart and Siloni (2005) proposed that the  $\theta$ -Criterion only requires that every  $\theta$ -role be assigned, and that the former part of the biuniqueness condition can be discarded.

Importantly, cross-linguistically the same morphology can also appear with other types of predicates, derived by other arity operations. For example, unaccusative verbs can appear in *hitpa'el* template in Hebrew or with the clitic *se* in French.

In the following subsection, I briefly outline the formation of unaccusative verbs used in the present study due to their shared morphology with the reflexive verbs (the specific purpose of their use will be explained in sections 3 and 4); I will then turn to the cluster of distinctions that follows from the setting of the Lex-Syn parameter.

### 2.1.2 *The formation of the unaccusative verb—a lexical operation*

As mentioned in section 1, in addition to the arity operations that have a parametric choice, namely the operations related to the Lex-Syn parameter (e.g., reflexivization), there are two other types of arity operations, differing in their locus of application: universally syntactic arity operations (e.g., verbal passive formation), and universally lexical ones (e.g., decausativization). Following Reinhart (2002) and Reinhart & Siloni (2005), unaccusative verbs are derived from their transitive alternate by fully eliminating an external  $\theta$ -role, namely via the operation of Decausativization. This arity operation is restricted to predicates whose external argument is a Cause, i.e. the verbs whose external  $\theta$ -role is underspecified with regard to ‘mental state’ and therefore can be realized either as an Agent or as an inanimate cause. The operation reduces the valency (i.e. the Cause role) of the predicate and the verb loses its ability to check Accusative Case. Decausativization leaves no residue of the reduced role in either syntactic structure or interpretation.

#### (6) Decausativization: Reduction of an external [+c] role<sup>3</sup>

$$V_{acc}(\theta_{1 [+c]}, \theta_2) \rightarrow V(\theta_2)$$

Since Decausativization eliminates a  $\theta$ -role of the source predicate (the input), the lexicon interface guideline (4) predicts that the operation ought to be illicit in the syntax. Indeed, according to Reinhart and Siloni (2005), unaccusative verbs are formed in the lexicon even in

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<sup>3</sup> Following Reinhart (2000, 2002), the widely accepted thematic roles ("Agent", "Theme", "Experiencer", etc.) are not primary entities of the grammar, but rather interpretations of feature clusters: [+/-c] = **Cause change** and [+/-m] = **Mental state relevant**. In each cluster, a feature may be specified for a certain value, or left unspecified, giving eight possible combinations: [+c+m] – agent; [+c-m] – instrument; [-c+m] – experiencer; [-c-m] – theme; [+c] – cause; [+m] – ?sentient {Reinhart proposes that candidates for this cluster are the subjects of the verbs *love*, *know*, *believe*, etc.}; [-m] – subject matter/locative source; [-c] – goal/benefactor.

Romance, German and Serbo-Croatian, languages which form reflexives, middles and reciprocals in the syntax.<sup>4</sup>

### 2.1.3 *A cluster of distinctions*

Cross-linguistic differences among reflexives determine a cluster of distinctions between lexical and syntactic reflexivization. Reinhart & Siloni (2005) argued that this cluster of distinctions follows from the setting of the Lex-Syn parameter. I will now discuss some of these distinctions, in particular those I will be exploring in the proposed study. I will illustrate the distinctions, by contrasting Hebrew with French.

First, in syntax languages, reflexivization is a productive operation: any transitive verb whose external argument can be interpreted as bearing a [+m] feature (mental state relevant) can reflexivize as in French.<sup>5</sup> That is, any transitive verb whose external argument is an Agent (7a), an Experiencer (7b), or even a Cause [+c] ('cause change', unspecified with regard to the feature /m but compatible with a [+c +m] interpretation) can reflexivize.

- (7)
- |    |                                                           |          |
|----|-----------------------------------------------------------|----------|
| a. | Jean se dessine.<br>Jean SE draws<br>'Jean draws himself' | (French) |
| b. | Jean s'aime.<br>Jean SE loves<br>'Jean loves himself'     |          |

In contrast, in lexicon languages such as Hebrew, reflexivization is limited. In Hebrew, reflexivization cannot apply to the verb *draw* (8a) or *love* (8b) ((8b) is grammatical only when the verb is used in a non reflexive meaning). The set of lexical reflexives is approximately the same across languages. The set of verbal entries (transitives) that undergo reflexivization is a restricted subset of the set of Agent-Theme verbs: reflexivization targets, mostly the so-called grooming verbs, like in (8c). However, the precise definition of the subset of Agent-Theme verbs that allow reflexivization in the lexicon is not yet clear.

- (8)
- |    |                                            |          |
|----|--------------------------------------------|----------|
| a. | *Dani mictayer.<br><i>Dani draws-refl.</i> | (Hebrew) |
| b. | *Dani mit'ahev.<br><i>Dani loves-refl.</i> |          |

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<sup>4</sup> French nominalizations provide evidence pointing in this direction (see Reinhart & Siloni, 2005 for details).

<sup>5</sup> On the face of it, Greek (Papangeli, 2004) and Serbo-Croatian (Marelj, 2004) might seem to be exceptions to this generalization (see Reinhart & Siloni, 2005 for details).

- c. Dani mitraxec.  
*Dani washes-refl.*  
 ‘Dani washes’

Second, in lexicon languages, but not in syntax languages, the operation of reflexivization always absorbs the Accusative Case of the verbs: compare Hebrew (9) and French (10).

- (9) \*Dani mitraxec yadaim. (Hebrew)  
*Dani washes-refl the hands-ACC*

- (10) Jean se lave les mains. (French)  
*Jean washes-refl the hands-ACC*  
 ‘Jean washes his hands’

There are some other distinctions attested between lexicon- and syntax-type languages (Reinhart & Siloni, 2005; Siloni, 2008). For example, lexicon languages do not allow ECM reflexives while syntax languages do;<sup>6</sup> reflexive event nominals are possible only in lexicon languages; reflexivization involving a dative argument is possible when the parameter is set onto syntax, but seems to be impossible when the setting is lexicon; only lexicon languages allow reflexive verbs to have meanings (resulting from semantic drift) not shared by their transitive alternates; only lexicon languages allow reflexive verbs to appear in idioms not shared by their transitive alternates. Some of these additional distinctions will be discussed in part 3.

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<sup>6</sup> This distinction is very important, but it is not relevant to the present study and therefore will not be discussed here.

### The Lex-Syn parameter and the L1 acquisition

#### **3. The Lex-Syn parameter setting and objectives of the L1 study**

##### 3.1 A note on acquisition

Following Reinhart and Siloni (2005) the above distinctions between lexicon- and syntax-type languages *"provide the triggers for parameter setting at the acquisition stage. The setting onto syntax will be triggered by encountering reflexive ECM predicates, reflexives that do not belong to the universal lexical set, such as se dessiner ('draw'(refl)) or s'aimer ('love'(refl)), as well as reflexivizations involving datives, all of which characterize syntactic languages. By contrast, the existence of reflexive nominalizations is typical of languages forming reflexives in the lexicon and could set the right parameter value."*

##### 3.2 The present study

The present study aimed to examine the validity of the Lex-Syn parameter using data from the acquisition of L1 French and L1 Hebrew. These two languages are set differently for the parameter: to syntax in French, and to lexicon in Hebrew.

More specifically, the domain of the present study is the acquisition of the system of reflexive verbal formation in L1, because the operation of reflexivization is claimed to be associated with the Lex-Syn parameter (see sections 2.1.1 and 2.1.3).

The research aimed to compare the acquisition of early reflexives in Hebrew and French to detect possible differences, and then determine whether those differences (or lack thereof) are predicted by the Lex-Syn parameter, or rather support a different approach.

The present study tested both production and comprehension of early reflexive verbs (and in addition, for particular purposes, unaccusative and transitive verbs). Each study (i.e. production and comprehension) included two parallel sets of experiments, one with Hebrew-speaking children and the other with French-speaking children, thereby permitting a comparison of the acquisition of reflexives in these languages. This comparison was based on the measures specified below.

##### *3.2.1 The measures*

In order to begin analyzing syntactic development, it is important to be able to measure a child's stage of development using a meter that is comparable across children and independent of particular syntactic constructions. In this section, I discuss two properties:

*inflectional verbal morphology acquisition (IVMA)* and *the predominant length of utterance (PLU)*, which were chosen as measures for the presently described study. In the following subsections, I provide some background for these measures.

### *3.2.1.1 Inflectional verbal morphology paradigm acquisition*

Armon-Lotem's (1997) study use longitudinal data from eight Hebrew-speaking children at ages 1;04 to 6;11 years, containing the data on the early verbs from the one-word stage. Armon-Lotem (1997) has shown the order in which verbal inflectional paradigm is acquired by Hebrew-speaking children: children seem to start with verbs specified for participial agreement (number and gender), then morphemes of past and future tenses appear, and finally 1<sup>st</sup> and 2<sup>nd</sup> person agreement morphemes are manifested. Legendre, Hagstrom, Vainikka, and Todorova (2002) showed the same order of verbal inflectional morphology acquisition in French (also in English, Swahili and German).

Thus, cross-linguistic data regarding the order of acquisition of inflectional elements converge to provide remarkable confirmation of the existence of a universal order established for the acquisition of verbal inflection. This fact allows use of the *stages in inflectional verbal morphology acquisition (IVMA)* as a measure by which to assess/compare participants in the present study.

### *3.2.1.2 Predominant length of utterance (PLU) stages in early syntax*

The PLU measure developed by Vainikka et al. (1999, as cited in Legendre et al., 2002) has been very effective in isolating qualitative shifts in development. Following Legendre et al. (2002), PLU stages are defined over two dimensions, the primary stage reflecting the number of words in the majority of a child's utterances (one-word, two-word or multiword utterances are predominant) and the secondary stage reflecting the proportion of utterances containing a verb<sup>7</sup> (e.g. 11-60% of all utterances contain verbs, see Appendix A1 for details). These definitions

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<sup>7</sup> This PLU-based approach to identifying stages of syntactic development has its conceptual grounding in the traditional observation that children progress through one-word, two-word, and multiword stages; the PLU measure reveals these stages directly. Previous research has shown that the proportion of verbs in the data is indicative of the child's developmental stage. Given the crucial status of verbs in adult syntax, this measure perhaps most reliably gets to the status of syntactic development in the child's mental grammar (Legendre et al., 2002).

were formulated by considering data from several languages, with the intent of creating a meter that would have cross-linguistic applicability.<sup>8</sup>

### 3.2.2 *Predictions for Acquisition*

This section states the objectives of the present child-language study. It presents the study questions, preliminary evidence from previous studies in the acquisition field, and expected results in light of the Lex-Syn parameter hypothesis.

The present study deals with the following questions:

(I) *Do unaccusative and reflexive verbs emerge at the same period of acquisition, i.e. during the time of early verbal production, in both French and Hebrew?*<sup>9</sup>

By exploring the emergence of unaccusative and reflexive verbs, I tested two types of derived predicates—unaccusatives and reflexives. However, while the former are argued to be derived in the lexicon crosslinguistically, the derivation of the latter is parameterized (by Lex-Syn parameter hypothesis) across languages; it is lexical in Hebrew but syntactic in French.

I expected both types of verbs to emerge at the same period of acquisition in Hebrew-speaking toddlers, i.e. during the early stage of verb production, since both are formed in the lexicon.

I based my assumption concerning "early" stage of verb production on crosslinguistic evidence that children's first verbal productions consist of the unaccusative, transitive and unergative verbs (see, for example, Guasti, 2002), namely verbs derived in the lexicon (unaccusatives), and underived verbs (transitive and unergatives). I take this to mean that lexical arity operations are manifested in the same acquisition period as underived verbs and, crucially, earlier than syntactic operations.

The claim concerning "the same period of acquisition" for emergence of unaccusatives and reflexives may not seem so obvious, since reflexive verbs have different and potentially more difficult semantics for acquisition than unaccusative verbs. So we can, in principle, expect that the operation of reflexivization in the lexicon will be manifested later in acquisition than the operation of decausativization, though, crucially, still earlier than syntactic operations. I based my assumption concerning the emergence of unaccusatives and reflexives at the same period of acquisition on preliminary evidence stemming from Armon-Lotem's study (1997): that

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<sup>8</sup> This measure was created as an alternative to age and MLU (mean length of utterance), in an attempt to better characterize the types and proportions of utterances found in child speech that is independent of specific syntactic phenomena.

<sup>9</sup> The predicates were chosen such that they would have the same morphological form (i.e. *hitpa'el* template in Hebrew and the clitic *se* in French), thereby excluding any alternative explanations for the data pertaining to difficulties in morphological acquisition.

study contains data featuring all the verbs produced by a specific child, Yuval. The first twenty verbs produced by Yuval included both reflexives and unaccusatives. (For instance, the reflexive verb *hitlabesh* 'dress' – [be] was produced among the first 20 verbs by Yuval (1;4-1;9); three of these first 20 verbs were unaccusative: [mima]-*nigmar* 'finished', [ba]-*nishbar* 'break', [ba]-*nishpax* 'spilt'.)<sup>10</sup>

In French, however, based on the Lex-Syn parameter hypothesis, we expect to find a period during which the children produce unaccusative verbs but not the reflexive ones, because the latter, by hypothesis, are not formed in the lexicon. While analyzing the data, I bore in mind the division between the "grooming verbs" set and the rest of the reflexive verbs.

(II) *Which steps of lexical, morphological and syntactic development correlate with emergence of the reflexive verbs in each language, i.e. Hebrew and French?*

The measures described in the section 3.2.1 will help us to determine a stage of acquisition at which reflexive verbs will appear.

The prediction with respect to reflexivization in the lexicon was as follows: in Hebrew, reflexive verbs will appear from the one-word (PLU) stage of acquisition. This is a stage when the child seems not yet to have demonstrated overt command of syntax. In addition, in Hebrew, reflexive verbs will appear during the initial steps of the verbal inflectional paradigm acquisition (IVMA). Concerning IVMA, the evidence may come from a lack of tense, and/or person features in most of the child's verbs, including reflexive ones. Preliminary evidence supporting the above hypothesis is presented in the data from Yuval, the child mentioned above from Armon-Lotem's (1997) study. Yuval produced his first reflexive verb at the one-word stage of acquisition, prior to the emergence of word combinations and during the initial steps of IVMA.

Additional evidence comes from the study of Friedmann (2004, 2007), who conducted a story-retelling task experiment consisting of two-word utterances with an intransitive verb and a full NP subject: 8 SV unaccusatives, 8 VS unaccusatives, 11 SV unergatives, and 10 SV reflexives. The participants were 17 children aged 1;9-2;0. In repetition of sentences including reflexives, children omitted the subject about 60% of the time; and they had no-responses about 35% of the time. These data show that reflexive verbs appear in Hebrew at the one-word (PLU) stage.

With respect to reflexivization in syntax, I expected that reflexive verbs in French would appear when the child had already demonstrated an overt command of syntax. I assumed that non-canonical assignment of a  $\theta$ -role or parasitic assignment of  $\theta$ -role demands a certain level

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<sup>10</sup> Later however, when the experiments had already been conducted, Armon-Lotem (p.c.) suggested not drawing any conclusions from Yuval's data.



of syntactic development. Therefore based on the Lex-Syn parameter hypothesis, I expected that reflexive verbs in French would not appear among the first early verbal productions, or during the one-word stage of acquisition.

(Again, while analyzing the data I bore in mind the division between the "grooming verbs" set and the rest of the reflexive verbs.)

## **4. Experiments**

### **4.1 Production study**

To elicit children's production of reflexive, transitive and unaccusative verbs, I followed Ruigendijk, Baauw, Avrutin, and Vasić (2004) and Friedmann (2004, 2007), and constructed a story-elicitation task in which the child is asked to retell a story or repeat it sentence-by-sentence. When a child repeats a sentence, she is not just passively copying it, but actively reconstructing it (Lust, Flynn & Foley, 1996). Children can only repeat structures they have already acquired, and therefore the comparison of sentences that are repeated correctly and sentences with errors can indicate the stage of syntax acquisition. If we compare two sentences that are equal in length and constituents, and the child has difficulty with only one of them, it will be possible to conclude that the problematic structure is unavailable at this point (Friedmann, 2007).

#### *4.1.1 Method*

##### *Procedure*

The children looked at an illustrated story, and the experimenter or kindergarten teacher read or told it to them. The child was then asked to retell the story, by repeating it sentence by sentence to the experimenter.

##### *Materials*

The task included short stories based on picture sequences: 6 stories for the Hebrew test and 7 for the French test. Each story consisted of 3-5 sentences. The sentences were two-word and three-word utterances with intransitive (unergative, unaccusative, reflexive) and transitive verbs and a full NP subject.

#### **(11) An example story:**

1. ha-nesixa ve-ha-namer hit'ayfu. (Hebrew) (Unaccusative verb)

La princesse et le tigre se sont fatigués. (French)

2. hem holxim lishon. (Hebrew) (Unergative, Experiencer verb)  
Ils vont dormir. (French)
3. (kodem) ha-nesixa mexasa et ha-namer. (Hebrew) (Transitive verb)  
(D'abord) La princesse couvre le tigre. (French)
4. (axar-kax) ha-nesixa mitkasa. (Hebrew) (Reflexive 'grooming' verb)  
(Ensuite) La princesse se couvre. (French)

The experiment in Hebrew included 28 sentences, from them 7 sentences with reflexive verbs, 10 with unaccusative verbs and 6 with transitive verbs. The full list of sentences can be found in Appendix B1.

The test materials consisted of six reflexive actions (washing, combing, wiping, covering, dressing, making up), based on verbs whose reflexive form is very commonly used: mitraxec "(SELF) wash", mistarek "(SELF) comb", mitnagev "(SELF) wipe", mitkase "(SELF) cover", mitlabesh "(SELF) dress", mitaper "(SELF) make up".

Materials for the French test were similar to those for the Hebrew test with two additions, but administered separately:

1) In order to test children's ability for productive reflexivization, the test consisted of two verbs that do not refer to the so-called grooming verbs, such as: *se dessiner* "SELF draw", *se mordre* "SELF bite".

(12) An example story:

1. Le tigre n'est pas content.  
Tiger is not happy.
2. Le tigre ne se comporte pas bien.  
Tiger is not conducting himself well.
3. (D'abord) Le tigre a mordu le lapin.  
(First) Tiger bit the hare.
4. (Ensuite) le tigre s'est mordu.  
(Then) Tiger bit himself.

Note that the group of grooming verbs consisted of four verbs analogous to those in the Hebrew test: *se laver* "SELF wash", *s'essuyer* "SELF wipe", *s'habiller* "SELF dress", *se couvrir* "SELF cover".

2) Availability of Accusative objects with reflexive verbs was tested using the three following sentences:

(13)

- a. Le tigre se lave le visage/les mains.  
*tiger SE washes (refl.) the face/hands (ACC)*  
Tiger washes its face/hands.
- b. La Princesse s'essuie les cheveux.  
*princess SE wipes (refl.) the hair (ACC)*  
Princess wipes her hair.
- c. Le tigre se touche la tête.  
*tiger SE touch (refl.) the head (ACC)*  
Tiger touches its head.

The experiment in French included 30 sentences from them 10 sentences with reflexive verbs, 8 with unaccusatives and 7 with transitive verbs. The full list of sentences can be found in Appendix B2.

### *Participants*

Two groups of three children each, with typical language development, were tested: monolingual native speakers of Hebrew in one group<sup>11</sup>, French in the other<sup>12</sup>.

The children were at the one-word (PLU) stage of acquisition, and in the initial steps of the IVMA. The precise stage of PLU and IVMA for each participant was determined based on data from the production study (see section 4.1.2).

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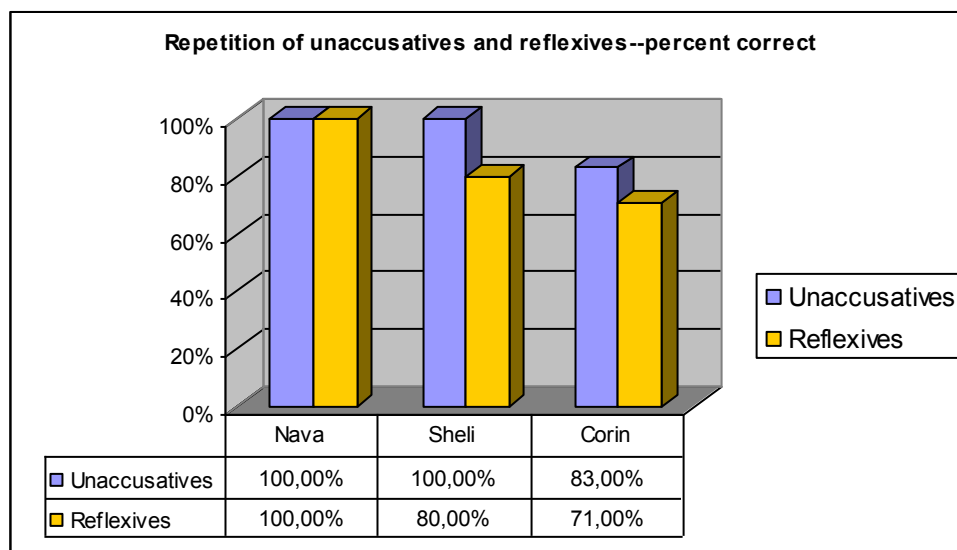
<sup>11</sup> The experiments took place in Oren, a preschool situated in kibbutz Netser Sireni.

<sup>12</sup> The experiments took place in Tova, a preschool in an ultra-orthodox district of Jerusalem named Bayit VeGan. This district is inhabited mostly by a French-speaking population. There is a network of private French schools and preschools, established and managed by rabbi Ariel Bejaoui, and the Tova preschool belongs to this network. I confirmed that the children had not been exposed to Hebrew: the rules of this program state that children up to the age of 4 years will hear only French; the preschool teachers and the preschoolers' parents always speak only French (indeed, they do not even know Hebrew). In addition, TVs are not permitted in their environment. In the street and in the markets we hear French. One of the subjects (Lucette) was born in Geneva and came to Israel at the age of 1 year, i.e. 6 months before participating in the experiments. The second subject (Odette) was born in Nice and came to Israel at the age of 7 months; the third subject (Ninette) was born in Jerusalem. All three subjects were second children in their families. These three subjects were chosen as the most suitable for the study's purposes from the preschool group, consisting of 15 children. The names of all subjects were changed.

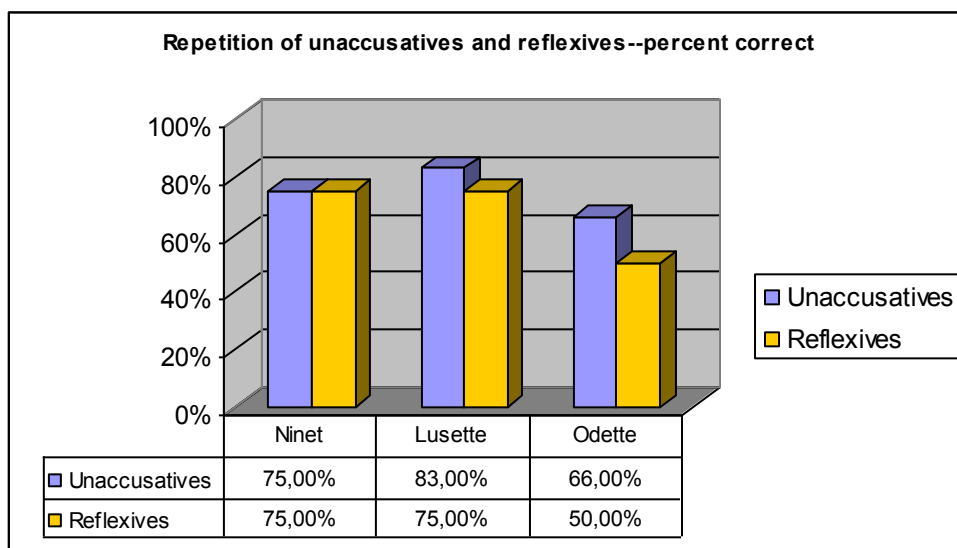
Initially, the children were chosen for the experiments based on information provided by their parents and preschool teachers concerning their speech, namely, they were asked whether the majority of the child's utterances were one-word utterances, and whether the child was already producing some verbs. Later, only the data of those children who remained in this early PLU and IVMA stage of acquisition until the end of the experiments, and were able to participate in the experiments to the end, were included and analyzed (see Appendix A2 for details).

#### 4.1.2 Results

First, we will consider the retelling of sentences with 'grooming' verbs (i.e. reflexive verbs that belong to the set typical of languages with a lexical set). The results, seen in Figures 1 and 2, show that all children were able to produce one-word utterances with unaccusative and 'grooming' verbs in both Hebrew and French.



**Figure 1 –Hebrew data**



**Figure 2- French data**

Preliminary analysis (see Fig.1 and 2) revealed no significant difference in the production of unaccusative versus grooming reflexive verbs in each of six participants.

However inspection of Figures 1 and 2 indicates that overall, the Hebrew-speaking children's performance with both unaccusatives and reflexives was slightly better than that of their French-speaking counterparts.

The main responses in this experiment were omission of the subject, omission of the verb, or no response at all. In the retelling of sentences including 'grooming' reflexives, children gave either no response or omitted the verb 16% of the time (3 out of 19) for Hebrew speakers and 33% of the time (4 out of 12) for French speakers, while the rest of the utterances consisted of a target verb in both languages. In the retelling of sentences including unaccusatives, children had either no response or omitted the verb 15% of the time (4 out of 27) for Hebrew speakers and 29% of the time (7 out of 24) for French speakers, while the rest of the utterances consisted of a target verb in both languages.

However, the French-speaking subjects were unable to produce 'productive' reflexives and reflexives with a direct object (both derived by syntactic reflexivization), which means that 100% of the time the children had either no response or omitted the verb.

The repetition task was informative with respect to the children's ability to represent syntactic structure. Every utterance the child produced as a repetition response to the target sentence was noted. A total of 114 sentences were produced in Hebrew; of these, 75 utterances contained the verb. A total of 100 sentences were produced in French, and 61 of them contained the verb. Table 1 summarizes the stage of syntactic development of the participants according to PLU and IVMA measures. 50%-72% of the repeated utterances contained the verb; the rest contained

only the subject or the object of the target sentence while the verb was omitted. All of the subjects repeated the unaccusative and reflexive verbs at the one-word stage of syntactic development, but the produced verbs lacked the relevant inflectional marking, i.e. clitic *se* in French and *hitpa'el* in Hebrew (for example, children's retelling of the sentence '*ha-nesixa mitkasa*' was repeated as *sa* or *a.'sa*, respectively). In French, the sentence '*La princesse se couvre*' was repeated as *uv/uv(?r)* or *cuv(?r)*. Hebrew-speaking children produced the verbs specified for participial agreement (gender and number), a finding that we could not check in French. Past tense morphemes were already appearing (in at least one utterance per subject); however 1<sup>st</sup> and 2<sup>nd</sup> person agreement morphemes were not yet manifested.

**Table 1. The stage of syntactic development**

Stage Name		<i>se / hitpa'el</i>	PLU		IVMA	
			One-word utterances	Utterances containing verbs	Past	1 <sup>st</sup> , 2 <sup>nd</sup> AGR
Hebrew	Nava	–	98%	72%	√	–
	Shelly	–	95%	65%	√	–
	Keren	–	93%	61%	√	–
French	Ninette	–	96%	65%	√	–
	Lucette	–	93%	65%	√	–
	Odette	–	97%	50%	√	–

"–" means that this particular feature was not found in the child's data

"√" means that this particular feature was found in at least one utterance produced by the child

### 4.1.3 Discussion

This study began with the question: Do unaccusative and reflexive verbs emerge at the same period of acquisition, i.e. during the time of early verbal production (which was determined by one-word PLU stage as well as initial stages of IVMA), in both French and Hebrew? In the analysis of the results, special attention was paid to the French children's production of 'grooming' vs. 'productive' reflexives, as well as to their production of reflexives with a direct object. Specifically, the analysis of French data had to show whether the production of the 'grooming' reflexives precedes the production of the 'productive' ones, and if so, whether this correlates with the production of reflexives with direct objects.

Several conclusions emerged from the production study experiment:

First, the finding that subjects at the one-word stage repeated both unaccusative and grooming reflexive verbs implies that the lexical operation of reflexive verb formation is innate, expressing itself fully right from the start, i.e. from early verbal acquisition.

Second, the results analysis showed that the French-speaking subjects were capable of producing reflexive verbs that belong to the set typical of languages with a lexical set, despite the fact that the parameter in this language is set to syntax.

Third, French-speaking subjects were unable to produce 'productive' reflexives, or reflexives with a direct object (both derived by syntactic reflexivization). Importantly, the difficulty with 'productive' reflexives cannot be attributed to an effect of frequency, because these children were quite familiar with the actions of *drawing* and *biting* and in addition, they produced both verbs in the retelling of sentences with transitive verbs, but not with reflexive ones.

Although I cannot claim that the subjects encountered these actions in reflexive form as often as 'grooming' reflexives, it is important to note that:

- i. We 'worked' on the sentences in the repetition tasks, which means that the children listened several times (on different days) to the stories which were told enthusiastically and later on, we proposed no less than four times (different attempts on different days) to repeat the sentences. Thus, even if the subjects had not had enough input in their previous experience, we 'created' this input for them in the most natural way possible. In addition, since different attempts were made on different days, our results cannot be accidental, and cannot be attributed to the subjects' subconscious, not feeling well, tiredness, etc.
- ii. Based on UG postulates, I strongly believe in the generativists' claim that "speakers are constantly confronted with expressions that they never encountered in their previous linguistic experience, and that they can nevertheless produce and understand with no effort...This remarkable capacity...has been regarded as a crucial component of human nature" (Chomsky, 2002:2). However, as mentioned earlier, this production and understanding can be performed only if the structure is already available in this period of acquisition.
- iii. It is important to note that the children correctly understood the pictures, but not the target sentence containing productive reflexives. They demonstrated how the tiger bites itself by copying the action depicted in the picture: they bit their hands with great enjoyment, despite teacher's warnings against bad behavior in the school. However, they were not capable of repeating the sentence containing this productive reflexive.
- iv. One subject (Lucette), whose language development was more rapid than the others, had several two-word utterances (*veux mettre*—'want put-inf.', *il touche*—'he touches') after a month, and in this period she began to repeat the sentences with 'productive' reflexives and reflexives with direct object.<sup>13</sup> I took this to mean that the repetition of productive

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<sup>13</sup> In this period Lucette repeated only one sentence containing a reflexive with direct object. It was the sentence "Le tigre se touche la tete" that was repeated as ' *il touche* ' or ' *il ~se touche* '. (It was not exactly an adult *se*, but as the

reflexives becomes possible at a certain stage of syntactic development. In the case of Lucette, it was the stage at which the child produces a sentence consisting of a pronoun (rather than full NP) and a verb.

The failure to repeat reflexives with a direct object is not a trivial finding. Remember that the subjects were capable of repeating the predicate *se lave* ('washes'-refl.) when presented as a 'grooming' verb, but they were incapable of repeating it when the same predicate was presented as a reflexive with the direct object *se lave le visage/les mains* ('SE washes (refl.) the face/hands-ACC'). I took this to mean that the latter structure had not yet been acquired. Importantly, the subjects had already acquired the feature of the relevant verbs being equipped with the Accusative case *when transitive*, because they were capable of repeating the sentences with transitive verbs. For example, the sentence *La princesse couvre le tigre* ('The princess covers the tiger') was repeated by Lucette as *uv/uvr*. But we will return to this point in the discussion of the comprehension study, in which we tested whether the subjects could distinguish between reflexive and transitive predicates.

Note that the most important result of these experiments was the dissociation in the production of 'grooming' vs. 'non-grooming' verbs in the French group. In view of this finding, we can conclude that at the very early stage of verbal acquisition, subjects can differentiate between different kinds of reflexive verbs (i.e. reflexives formed in syntax vs. reflexives that belong to the set typical of languages with a lexical set) and acquire them differently, presumably at different stages of syntax acquisition. Moreover, this finding shows that subjects at this early stage of acquisition know which entries can undergo reflexivization in the lexicon: we did not find any overgeneralizations. Namely, our results showed that French-speaking children do not reflexivize the verbs of the productive set, such as 'bite', indicating that French-speaking children 'know' which concepts can give rise to reflexive verbs in the lexicon.

A comparison of the Hebrew- and French-speakers' data shows that French-speaking subjects made more errors or failed more often in the repetition task than the Hebrew-speaking subjects, but that these failures were equally spread over the unaccusative (29% in French vs. 15% in Hebrew) and reflexive (33% vs. 16%, respectively) sentences, indicating that the errors were unrelated to knowledge of reflexive 'grooming' verbs. A closer look shows that none of the three French-speaking subjects repeated the reflexive 'grooming' verb *s'essuyer* ('wipe'-refl.). However, the subjects did not repeat this verb in the transitive form either. In view of the fact that the native speakers found this reflexive verb used as frequently as the

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preschool teacher said: "Elle rajoute quelque chose" i.e. "she adds something".) The sentence 'Le tigre s'est mordu' was repeated as 'mordu'. The sentence 'Le tigre se dessine' was repeated as 'se dessine'.



other three proposed 'grooming' reflexives, I find it difficult to explain this result. It may be that this verb is simply more difficult phonetically. Considering that French-speaking subjects failed equally in the production of both the reflexive and transitive forms of this entry, and that their overall performance pattern showed that they produced the (other) 'grooming' reflexive verbs, I suggest that this finding has nothing to do with reflexive verbal formation.

Importantly, in the Hebrew-speaking group, each subject failed on a different verb than the other subjects and was generally capable of repeating the transitive form of the same entry. Only one child (Keren) in the Hebrew-speaking group failed equally on the reflexive and transitive forms of the verb 'wash' which was presented twice, i.e. in two different stories, in the reflexive form (once in the masculine *mitraxec* and in the other in the feminine *mitraxecet*).<sup>14</sup> This issue will be further addressed in the discussion of the comprehension study.

With respect to the stage of acquisition, Table 1 shows that all of the subjects were at the one-word stage of development and 50%- 72% of their utterances contained the verb. Based on the PLU measure (see Appendix A), we can conclude that five subjects were at stage *1c* of development (i.e. "predominantly one-word stage: almost all utterances (90%) are of the one-word sentence type and more than 60% of all utterances contain a verb") and only one subject, Odette, whose verb-containing utterances amounted to only 50%, was at stage *1b* of development (i.e. the stage at which "11%-60% of all utterances contain a verb").

The subjects' data were very similar in that they repeated at least one verb with past tense-marking morphology in Hebrew and French; no one produced the verb marked by *hitpa'el/se* morphology; 1<sup>st</sup> and 2<sup>nd</sup> person agreement morphemes did not appear in any subject. Based on the summary in Table 1, as well as its interpretation in PLU and IVMA measures, we can conclude that both groups of participants on the one hand and all six subjects on the other were comparable with respect to stage of syntactic development.

To summarize, the production study showed that even at the one-word stage of acquisition and in the initial steps of IVMA, French-speaking subjects were able to produce the reflexive verbs that belong to the set typical of languages with a lexical set, just like Hebrew-speaking subjects, and without overgeneralizations. However, they were unable to produce 'productive' reflexives, and reflexives with a direct object.

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<sup>14</sup> When Keren did not retell the sentences with the verb *mitraxec*, she produced words like *sabon*, *cahov*, validly depicting the objects and their characteristics presented on the picture. Interestingly, this was a common response in the other subjects as well; when they did not manage to repeat the target verb, they named the objects or subjects presented in the picture.

The most important question emerging from the results of the production study was: Do children understand reflexivity when marked through the verb's morphology despite the lack of morphology (clitic *se* in French and *hitpa'el* in Hebrew) shown in the production study? That is, can we claim that the produced verbs were indeed reflexive? A comprehension study was conducted to answer this question.

## 4.2 Comprehension study

### 4.2.1 Method

The study was designed to investigate children's comprehension of reflexive verbs, using the **preferential-looking paradigm** developed by Golinkoff, Hirsh-Pasek, Cauley and Gordon (1987).

*Description:*<sup>15</sup> A child observes two different scenes presented simultaneously on two opposite sides of the computer screen (see Appendix C). The computer's audio speaker plays a linguistic stimulus that is consonant with or "matches" only one of the scenes shown on the screen. The child's task is to **look** at one of the two simultaneously presented scenes. The child's visual fixation is recorded by a video camera connected to the computer program.

Based on the previous studies, it could be argued that the child will choose to allocate more attention to the acted scene that matches what she is hearing (i.e. linguistic stimulus) than to the acted scene that does not match. If the utterance is not understood, the child would presumably look randomly at either scene (assuming neither is particularly salient).

*Rationale:* In order to compute the match and mismatch conditions correctly, children need to invoke their knowledge of reflexive verb formation.

#### *Linguistic stimuli and video events*

(14) Sentence:

ha-namer mitraxec. (Hebrew) /Le tigre se lave. (French)

*The tiger washes (refl)*

(15) Action scenes presented as pictures:<sup>16</sup>

- a. The tiger washes (refl); the princess is standing next to it.
- b. The tiger washes the princess.
- c. The princess washes (refl); the tiger is standing next to her.

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<sup>15</sup> To better understand the Preferential Looking Paradigm, see video at: [www.cll.uconn.edu/documents/NounBiasPIffenClip.mov](http://www.cll.uconn.edu/documents/NounBiasPIffenClip.mov)

<sup>16</sup> I adapted the technique of presenting the characters in a pair from Grodzinsky and Kave (1993/1994).

The sentence always denotes a reflexive action performed by its subject (e.g. (14)). The picture, however, is one of the following: it shows either the subject (*'the tiger'*) performing the action reflexively, while a second character (*'the princess'*) is present at the scene but is uninvolved (the Match) (15a); or it shows the same subject (*'the tiger'*) performing a transitive action on the second character (*'the princess'*) (the Transitive Mismatch) (15b); or it shows the second character (*'the princess'*) performing the action reflexively (the Reflexive Mismatch) (15c). Transitive verbs were included in the test to check whether the participants have knowledge of reflexive verbs despite the lack of morphology (clitic *se* in French and *hitpa'el* in Hebrew) shown in the production study, namely whether the participants differentiate between reflexive and transitive verbs. In addition, transitive verbs were included in the test to check whether the participants have acquired the feature of the relevant verbs being equipped with Accusative case when transitive. This was especially important when testing 'Availability of Accusative objects with reflexive verbs' in French.

### *Design*<sup>17</sup>

A schematic depiction of the acting scenes and audio match is presented in Table 2 and 3. The left and right columns indicate acting scenes, while the center column indicates the audio. There are three kinds of trials, all 6 seconds in length, called "sequential trials", "simultaneous trials" and "test trials", and one type of 3-second intertrial interval. The whole block of trials lasts 45 seconds.

*Intertrial intervals:* each trial is preceded and followed by a 3-second intertrial interval. During this period the screen is blank (i.e. black) and a red circle is blinking in the center of the screen. The intertrial interval serves an important function: it draws the child's attention back to the center area between the two sides of the computer screen, allowing the child to make a "clean", independent choice for each trial.

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<sup>17</sup> Following Naigless (1992) and Hirsh-Pasek and Golinkoff (1996).

**Table 2**

**Comprehension study: The action scenes and linguistic stimuli for one block of trials**  
**"Match vs. Reflexive Mismatch"**

	<b>Left side of screen</b>	<b>Linguistic stimuli</b> <i>Sequential trials</i>	<b>Right side of screen</b>
1	Blank	{ red circle is blinking in the center of the screen } "Look now!"	Blank
2	The tiger washes (refl); the princess is standing next to it	"Oh, what is the tiger doing?"	Blank
3	Blank	{ red circle is blinking } "Look now!"	Blank
4	Blank	"Look! What is the princess doing?"	The princess washes (refl); the tiger is standing next to her
<i>Simultaneous trials</i>			
5	Blank	{ red circle is blinking } "Wow, what's happening?!"	Blank
6	The princess washes (refl); the tiger is standing next to her	"What are they doing?"	The tiger washes (refl); the princess is standing next to it
<i>Test trials</i>			
7	Blank	{ red circle is blinking } "Look now! The tiger washes!"	Blank
8	The princess washes (refl); the tiger is standing next to her	"Look, the tiger washes!"	The tiger washes (refl); the princess is standing next to it
9	Blank	{ red circle is blinking } "Where is the tiger washes?"	Blank
10	The princess washes (refl); the tiger is standing next to her	"Look! The tiger washes!"	The tiger washes (refl); the princess is standing next to it

**Table 3**

**Comprehension study: The action scenes and linguistic stimuli for one block of trials**  
**"Match vs. Transitive Mismatch"**

	<b>Left side of screen</b>	<b>Linguistic stimuli</b>	<b>Right side of screen</b>
<i>Sequential trials</i>			
1	Blank	{ red circle is blinking in the center of the screen } "Look now!"	Blank
2	Blank	"Oh, what is the tiger doing?"	The tiger washes (refl); the princess is standing next to it
3	Blank	{ red circle is blinking } "Look now!"	Blank
4	The tiger washes the princess.	"Look! What's happening?"	Blank
<i>Simultaneous trials</i>			
5	Blank	{ red circle is blinking } "Wow, what's happening?!"	Blank
6	The tiger washes the princess.	"What are they doing?"	The tiger washes (refl); the princess is standing next to it
<i>Test trials</i>			
7	Blank	{ red circle is blinking } "Look now! The tiger washes!"	Blank
8	The tiger washes the princess.	"Look, the tiger washes!"	The tiger washes (refl); the princess is standing next to it
9	Blank	{ red circle is blinking } "Where is the tiger washes?"	Blank
10	The tiger washes the princess.	"Look! The tiger washes!"	The tiger washes (refl); the princess is standing next to it

*Sequential trials:* This is an introductory passage which familiarizes the subjects with the situation and the characters. As Table 2 shows, in the sequential trials the child first sees an event on only the one side (for example the left side) of the screen while the other (right) side remains blank. The scene is always presented for 6 seconds each. This is followed by a 3-second intertrial interval. Then the child sees the event on the right side of the screen while the left side remains blank. These trials serve to (1) introduce the acting scenes before the child has to find the match for the linguistic stimulus, and (2) create the expectation that something will appear in each screen. The audio presented during sequential trials, as well as the audio presented during the intertrial interval that precedes each sequential trial, is "neutral" in the

sense that it "matches" or is equally consistent with both events, like, for example, "Look! What is the princess doing?"

*Simultaneous trials:* A simultaneous trial, during which the acted scenes are presented simultaneously (performed by the same two actors) on both sides of the screen, follows the sequential trials. The linguistic stimulus is still neutral, like, for example, "Look! What are they doing?" One side of the screen shows the Match (the subject performing the action reflexively, while a second character is present at the scene but is uninvolved), while the other side of the screen shows either the Transitive Mismatch (the same subject performing a transitive action on the second character; see Table 3), or the Reflexive Mismatch (the second character performing the action reflexively; see Table 2).

As already explained, there were two main tasks in this experiment: first, to test the comprehension of Match vs. Reflexive Mismatch; and second, to test the comprehension of Match vs. Transitive Mismatch. Therefore, each linguistic stimulus (as in (14)) was tested twice, once for each mismatch condition (Reflexive Mismatch and Transitive Mismatch); thus, two types of blocks of trials were constructed:

- (I) Match (15a) vs. Reflexive Mismatch (15c) (see Table 2)
- (II) Match (15a) vs. Transitive Mismatch (15b) (see Table 3)

Simultaneous trials show the child that events will appear concurrently on both screens. They also provide a check of stimulus salience. That is, if the visual stimuli have been well balanced for perceptual factors, and while the linguistic stimulus is still neutral (see above), it is predicted that attention should be distributed equally to each member of the simultaneous pair across children.

*Test trials:* The following test trials (trials 8, 10) differ from the simultaneous trial in the single way: the linguistic stimulus, which describes one of the scenes, is first heard during the 3-second intertrial interval that precedes the test trials and again during the test trials themselves; thus the language, not merely the action scenes, drives the looking response.

This pattern of testing was repeated across six verbs in Hebrew and seven verbs in French (see Table 4). The tested sentences were the same as the sentences containing reflexive verbs in the production study.

**Table 4: Materials for the comprehension study**

Linguistic stimuli		
Hebrew	French	
1. ha-namer mistarek. 2. ha-nesixa mitraxecet. 3. ha-nesixa mitkasa. 4. ha-namer mitlabesh. 5. ha-nesixa mitpashetet. 6. ha-namer mitnagev.	1. Le tigre se coiffe. 2. La princesse se lave. 3. La princesse se couvre. 4. Le tigre s'habille.	'grooming' reflexives
	5. La princesse se dessine. 6. Le tigre se mord.	'productive' reflexives
	7. La princesse s'essuie la tête. 8. Le tigre se lave les pieds.	reflexives with direct object

In the Hebrew experiment, 12 blocks of trials were presented for each of the Hebrew-speaking toddlers (6 Match  $\times$  Reflexive Mismatch plus 6 Match  $\times$  Transitive Mismatch).

In the French experiment, 16 blocks of trials were presented for each of the French-speaking toddlers (to test four 'grooming' reflexives: 4 Match  $\times$  Reflexive Mismatch plus 4 Match  $\times$  Transitive Mismatch; to test two 'productive' reflexives: 2 Match  $\times$  Reflexive Mismatch plus 2 Match  $\times$  Transitive Mismatch; and to test two dative reflexives with direct object: 2 Match  $\times$  Reflexive Mismatch plus 2 Match  $\times$  Transitive Mismatch).

The side of the matching screen was balanced within trial blocks such that the Match occurred equally on the left and right sides.

Children were tested individually in two to four sessions, depending on their level of alertness.

### *Dependent variable*

Visual fixation time or the total amount of time in seconds (measured to the hundredths of a second) the child spends watching the matching versus the non- matching scene is the depended variable.

Note that the hypothesis is that significantly more visual fixation time will be allocated to the matching than to the non-matching event. However it is never hypothesized that the child will look *exclusively* at the matching screen.

### *Coding of the depended variable*

Subject's visual fixation responses were recorded on-line by a camera focused on the child's face and connected to the computer. The computer program was especially designed to record the data. Subject's visual fixation responses were coded after the child's visit. The experimenter, blind to the sequence of matches the child had seen, played the child's record back without sound. The data was calculated in two ways: the *direction* (left, right, center or away—i.e., not at the screen) of a child's gaze and the *duration* of each look.

### *Procedural notes*

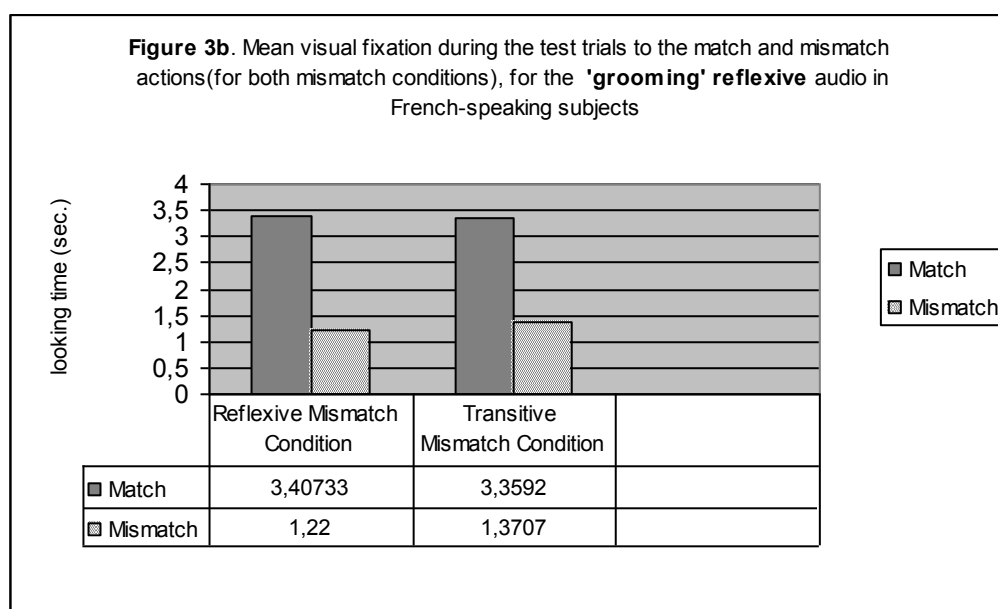
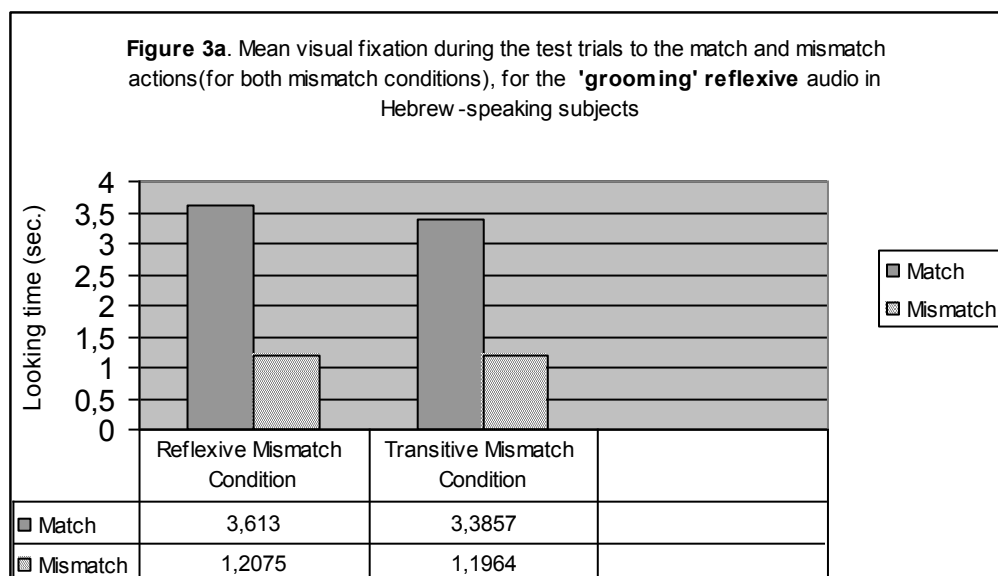
Note that although this procedure has an advantage in that it always utilizes movement in its visual displays, young children are notoriously difficult subjects! Below I give several notes on the procedure:

- Each test consisted of four to six blocks of trials, but testing was discontinued at any point if the child became fussy or upset.
- I (i.e. the experimenter) lost more data in the earlier testing runs (in Hebrew), because of experimenter error and equipment failure, than in later testing (in French) when the computer program had been improved, as had my experience 'working' with both the children and the equipment.
- Data were discarded from any child who showed a preference for one screen side that exceeded 75% of the total looking time or who watched the scenes less than 35% of the time; from any child who failed to return to the central fixation point on more than 33% of the trials in a given block. These measures were adopted from the previous studies (see for example, Naigless (1992) and Hirsh-Pasek & Golinkoff (1996)).

### *4.2.2 Results*

The main questions concerned the within-subject factor of the picture (acted scene): did the subjects fix their gaze longer on the picture that matched what they heard? That is, the initial questions were: did the subjects gaze longer at the picture that matched the sentence with 'grooming' reflexives than at the Reflexive Mismatch picture? Similarly, did the subjects gaze longer at the picture that matched the sentence with 'grooming' reflexives than at the Transitive Mismatch picture? Preliminary analysis (see Figs.3a and 3b) suggested that they did. Inspection of Figures 3a and 3b indicates that the matching picture received more visual fixation than the non-matching one in both Hebrew and French.

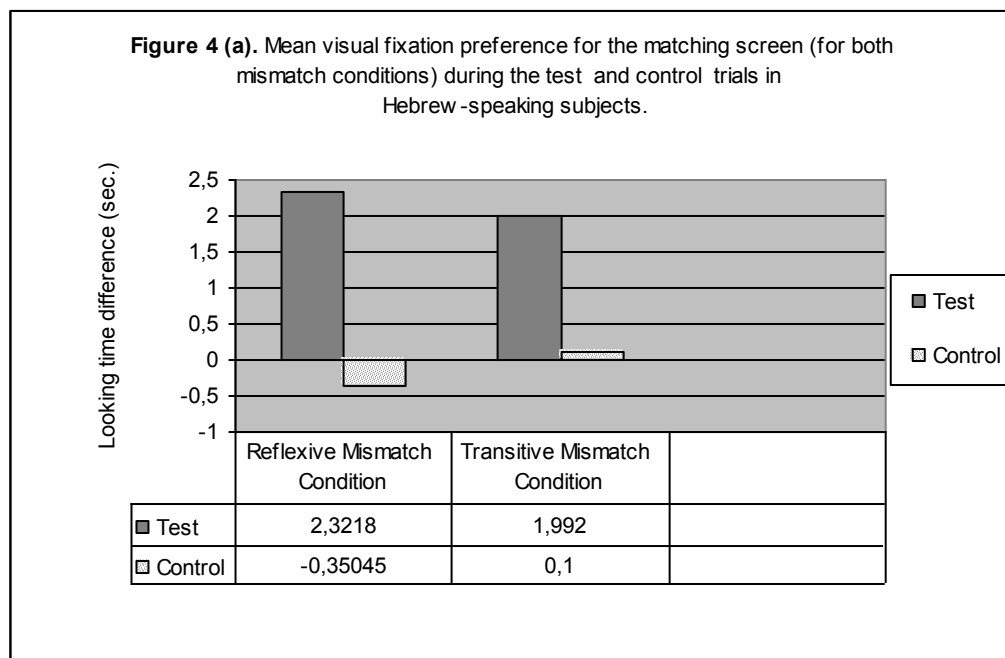


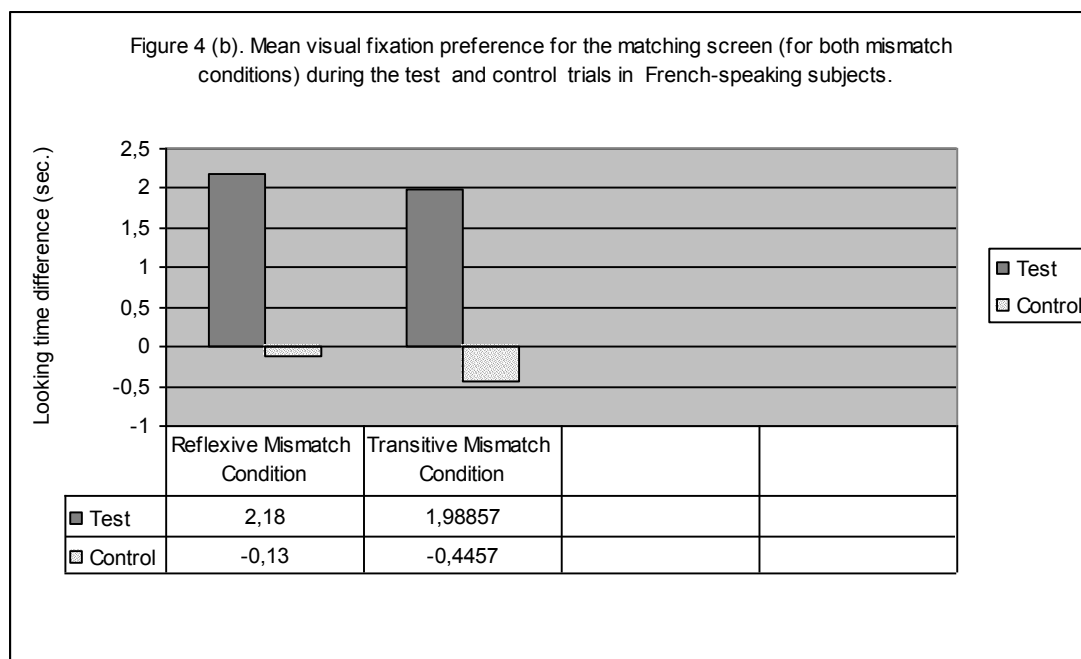


This analysis indicated that across both mismatch conditions (Reflexive Mismatch and Transitive Mismatch), the matching picture (side of screen) received significantly more visual fixation than the non-matching picture (side of screen). Thus, the subjects hearing linguistic stimuli (sentence with 'grooming' reflexive) while watching the Match and Reflexive Mismatch pictures simultaneously in the test trials looked significantly longer at the Match picture; and the subjects exhibited this pattern with the Transitive Mismatch condition as well. Data from the individual subjects indicated that 6 out of 6 subjects exhibited this pattern.

The preliminary analysis took into account the children's visual fixation preferences during both the simultaneous trials and test trials. This is because the children may have had an initial bias to label one of the acted scenes regardless of the linguistic stimuli. Thus, the

subjects' acted scene preferences during the test trials (when they were told to find the subject performing the action reflexively) were compared with their own preferences during the simultaneous trial (when their initial side-of-screen preference would presumably be dominant), and difference scores were computed for each subject by subtracting time of looking at the non-matching side of the screen from time of looking at the matching side for both the simultaneous and test trials. The results, presented in Figures 4a and 4b, show that the children's preference for the matching screen side is greater for the test trials than for the simultaneous trials, for both mismatch conditions. Note that the difference between simultaneous and test trials is found in both the reflexive and transitive mismatch conditions, and in addition the preference for the matching screen was obtained for all 'grooming' verbs in both Hebrew and French.





The next question was: Did the French-speaking children gaze longer at the picture that matched the sentence with 'productive' reflexives and reflexives with direct objects than at the Reflexive Mismatch picture? Likewise, did the French-speaking children gaze longer at the picture that matched the sentence with 'productive reflexives' and reflexives with direct objects than at the Transitive Mismatch picture? Preliminary analysis (see Figs. 5 and 6) suggests that they did not.

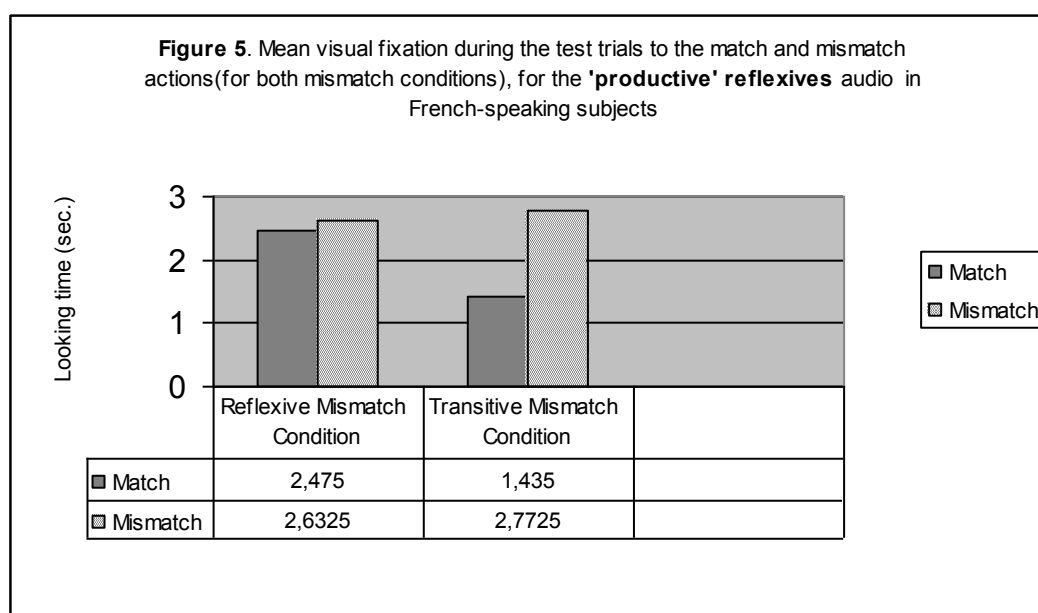


Figure 5 shows that the matching picture did not receive more visual fixation than the non-matching one in the case of 'productive' reflexives.

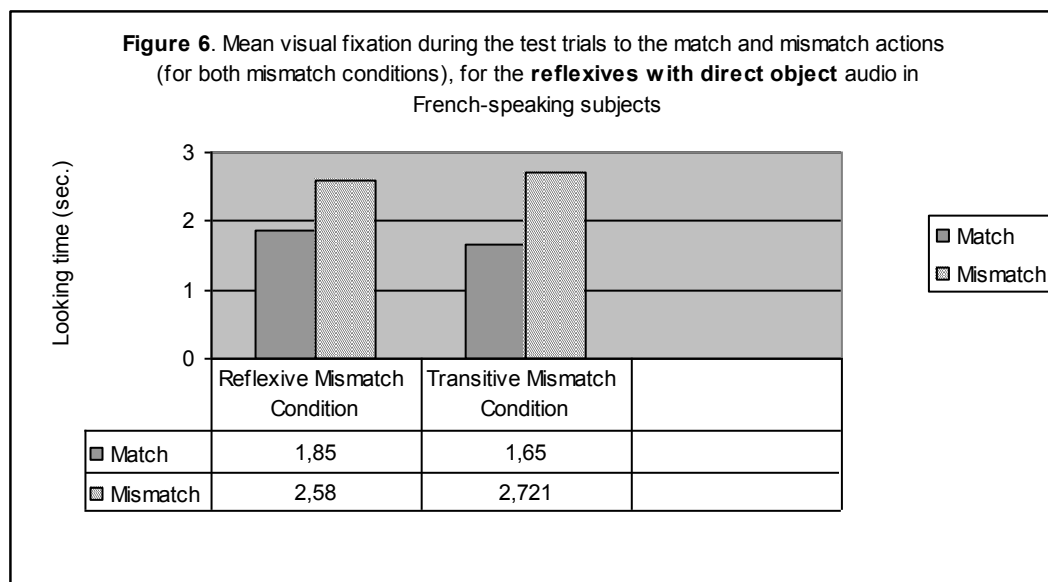
This analysis indicated that in the case of the Reflexive Mismatch condition, the subjects hearing linguistic stimuli (sentences with a 'productive' reflexive, for example, "*Le tigre se mord*" (*The tiger bites-refl.*) while watching the Match and Reflexive Mismatch pictures simultaneously in the test trials did not look longer at the Match picture. Thus, mean visual fixation during the test trials to the Match and Reflexive Mismatch pictures ended up being approximately the same.

When the child did not fix her gaze longer on the picture that matched the sentence, she either looked at the mismatch picture or looked randomly at either scene (Match or Mismatch).

In the case of the Transitive Mismatch condition, the subjects exhibited another pattern (Fig.5): the non-matching picture (side of screen) received more visual fixation than the matching picture (side of screen).

Data from individual subjects indicated that all three subjects exhibited these patterns across both mismatch conditions.

Consider now mean visual fixation for the reflexives with a direct object audio condition, presented below.



Inspection of Figure 6 indicates that across both mismatch conditions (Reflexive Mismatch and Transitive Mismatch), the non-matching picture (side of screen) received more visual fixation than the matching picture (side of screen).

## 5. Discussion

The comprehension study was designed to examine, first, whether the subjects have knowledge of the reflexive 'grooming' verbs they produced in the production study, and second, whether there is a difference in comprehension of 'grooming' versus 'productive' reflexives, as well as reflexives with a direct object in the French group (since such a difference was found in the production of these predicates). Specifically, the analysis of the French data was expected to show whether comprehension of the 'grooming' reflexives precedes that of the 'productive' ones, and if so, whether this correlates with comprehension of the reflexives with direct object.

Moreover, this study was designed to help determine whether the subjects indeed produced *reflexive* verbs (as opposed to transitive ones) in the retelling task, despite the lack of morphology (clitic *se* in French and *hitpa'el* in Hebrew) shown in the production study. Specifically, if the comprehension study's results showed that the child has knowledge of those reflexive verbs which she produced without relevant inflectional marking in the repetition/retelling task, and in addition she differentiates between the reflexive and transitive predicates, this would constitute support for the hypothesis that the child indeed produced *reflexive* verbs in the production study.

We found that the French- and Hebrew-speaking subjects showed a marked difference between the 'grooming' reflexive match and both mismatch conditions in every instance of the 'grooming' reflexives. Thus, the subjects in both groups (Hebrew and French) showed knowledge of the so-called 'grooming' verbs (i.e. reflexive verbs that belong to the set typical of languages with a lexical set). Importantly, the results of the comprehension study showed that the French-speaking subjects understood grooming reflexives as well as the Hebrew-speaking children (see Figs. 3a and 3b).

Moreover, results showed that the lexical operation of reflexive verb formation is innate, expressed fully right from the start, i.e. from early verbal acquisition, namely, at the one-word (PLU) stage of syntactic development and in the initial steps of the IVMA in both Hebrew and French.<sup>18</sup>

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<sup>18</sup> In fact, the finding that such young subjects performed successfully with the reflexive grooming verbs, and did so across languages, provides (autonomous to study purposes) partial empirical support for the innateness of Condition A of the Binding Conditions of Reflexivity, proposed by Reinhart and Reuland (1993):

(i) A reflexive-marked predicate is reflexive.

A predicate (formed of P) is reflexive-marked if either P is lexically reflexive or one of P's arguments is a SELF anaphor.

The support is partial because in this study we deal with only one of the two types of reflexively marked predicates, namely inherent reflexive predicates; the second type was not tested as this was beyond the scope of the present study.

The data culled from Keren remains a mystery. This child, who never produced the reflexive verb *mitraxec* 'wash' in the production study, also did not show knowledge of it in the comprehension study. However, taking into account that (1) she erred equally on both the Reflexive and Transitive mismatches, as well as on the production of this entry, and (2) her overall performance pattern showed that she had knowledge of the (other) reflexive verbs, I suggest that the finding regarding the verb *mitraxec* has nothing to do with reflexive verbal formation.

However, analysis of the results suggested that the French-speaking subjects were unable to understand 'productive' reflexives, and reflexives with a direct object (both derived by syntactic reflexivization). Similar to the production study, the results (presented in Figs. 5 and 6) cannot be attributed to an effect of frequency (see subsection 4.1.3).

Consider first the 'productive' reflexives data. Analysis revealed that the children, when presented with Match versus Reflexive Mismatch pictures, spent about half the time gazing at the picture that did not match the linguistic stimuli. For these children, then, it appears that the level of performance for the Reflexive Mismatch cases represents pure chance. What does this result mean? Note that in these particular blocks of trials, both visual stimuli (pictures) presented to the child simultaneously contained a reflexive action (i.e. Match vs. Reflexive Mismatch). When the child could not reach a definite conclusion, namely, find the match between the sentence and the picture, her performance was left to chance. The question is whether this finding shows that the children did not have knowledge of 'productive' reflexives. Can we assume that in fact they had knowledge of 'productive' reflexives, but when both visual stimuli contained reflexive actions, the child was more inclined to check for congruence between the internal structure/nature of the predicate and the semantic representation of the picture than to check for the identity of the subject? It is worth reiterating a previous finding of this study, that the children showed an overwhelming preference for Match pictures in the case of 'grooming' reflexives. Taking this into account, I suggest that the random level of performance on 'productive' reflexives for the Reflexive Mismatch condition indicates a lack of knowledge of these reflexives.

Analysis of the results of the 'productive reflexives' data for Transitive Mismatch condition shows that the subjects gazed longer at the picture that did not match the linguistic stimuli. What might explain this finding? I suggest that at the period at which the operation of reflexivization in syntax is not yet acquired, the child will try to match the linguistic stimuli

containing these predicates (for example, *se mordre* (bite-refl.) or *se dessiner* (draw-refl.)) with the form that is accessible in her grammar, namely the transitive meaning of the concept.<sup>19</sup>

Note, however, that the results of mismatch preference (mean 2.7725 seconds) differed from those of the 'grooming' reflexives match preference (mean 3.3592 seconds) (compare Fig. 4b and Fig.6). This difference occurred mainly because of the subjects' lack of attentiveness, such that part of the time they did not look at the screen at all. This lack of attentiveness was not observed while testing the 'grooming' reflexives.<sup>20</sup>

In sum, the analysis results indicate that across both mismatch conditions (Reflexive Mismatch and Transitive Mismatch), the subjects did not show a preference for the Match. The error patterns of all three French-speaking subjects showed a lack of knowledge of 'productive' reflexives. In addition, these results seem to indicate that children (i.e. their lexicon) at this early stage of acquisition know which entries can undergo reflexivization in the lexicon: similar to the production study, we did not find any overgeneralizations.

Consider now comprehension of reflexives with a direct object. The analysis results show that across both mismatch conditions (Reflexive Mismatch and Transitive Mismatch), the subjects gazed longer at the non-matching actions. Consider first the Reflexive Mismatch condition analysis. Based on the previous findings (i.e. test results on comprehension of 'productive' and 'grooming' reflexives), one might expect that even when the child does not understand the linguistic stimuli containing a reflexive predicate with a direct object (for example, "*La princesse se lave les pieds*" (*The princess washes-refl. the feet*)) while watching the Match and Mismatch pictures simultaneously in the test trials, her level of performance for the Reflexive

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<sup>19</sup> Remember that the results of the production study showed that these children were quite familiar with the actions of drawing and biting and produced both verbs in the retelling of sentences with transitive verbs, but not with reflexive ones. It should also be remembered that the children understood the pictures correctly, but not the linguistic stimuli. At the time of the production study they demonstrated how the tiger bites itself while copying the action depicted in the picture: biting their hand with great zeal. However in test trials of the comprehension study they preferred the Transitive Mismatch.

Note, that it is possible that pragmatically the children prefer the meaning of the concept/action of *biting* where somebody bites someone other (transitive) rather than oneself (reflexive). Regarding the *drawing* action, we will not expect the preference of the transitive form, because children very often draw themselves.

<sup>20</sup> It can always be assumed that when children fail to engage in a task, it is because they do not understand the linguistic stimuli. In fact, the observation of French-speaking children's visual fixation in the testing of reflexives derived in the syntax support this assumption. Namely, the French-speaking children were generally attentive during the initial trials where linguistic stimuli were neutral, but in the test trials, when the linguistic stimulus describing one of the acted scenes was first heard, they very often became inattentive, no longer looking at the screen or wanting to leave the adult's lap. Hence, we had to return to these 'problematic' trial blocks two or three more times. Importantly, such behavior was not observed in the testing of grooming reflexives.

Mismatch condition will be either dictated by chance (as in the case of 'productive' reflexives) or by a preference for the matching picture. The latter is expected since the subjects showed knowledge of the predicate *se lave* (washes-refl.) when presented as a 'grooming' verb and therefore they could process the verb solely while omitting a direct object. However, the subjects preferred the non-matching picture. I have some difficulty explaining this. Note, however, that the level of preference of the non-matching picture was significantly lower than the preference for the matching picture in the case of 'grooming' reflexives (2.58 seconds for the former and 3.40733 seconds for the latter), and the mean level of visual fixation on the matching picture was higher than in the case of fixation on the non-matching picture with the 'grooming' reflexives (1.85 seconds for the former and 1.22 seconds for the latter). Thus, when we compare the obtained results with the results of the 'grooming' reflexives comprehension, we can assume that the children were rather indecisive in the case of the Reflexive Mismatch condition for reflexives with a direct object. I take this result to mean that the subjects did not understand these reflexives.

Consider now the Transitive Mismatch condition. From the results of the Reflexive Mismatch condition, we already know that the subjects did not understand the reflexives with a direct object construction. Thus, I suggest that when the child did not understand the linguistic stimuli containing a reflexive predicate with a direct object (for example, "*La princesse se lave les pieds*" (*The princess washes-refl. the feet*)) while watching the Match and Transitive Mismatch pictures simultaneously in the test trials, she tried to match the sentence with the transitive form (i.e. that form which is available in her grammar) such as "*La princesse lave les pieds*" (*The princess washes the feet*). But why did the children not match the linguistic stimuli with the Match picture in which the princess washes her feet and the tiger is standing next to her? Why did they prefer the Transitive Mismatch picture in which the princess washes the tiger's feet? Can we assume that the preferred meaning is closer, pragmatically, to children's knowledge, because they know that others take care of them, they don't take care of themselves? I think not, because this did not play a role in the test of 'grooming' reflexives. The explanation might be as follows: The child has knowledge of reflexive verb formation in the lexicon only. The reflexive with a direct object construction is not yet acquired at this early stage of acquisition. Therefore linguistic stimuli containing this construction cannot be understood as reflexives by the child. As a consequence, the child prefers the picture in which the subject (of the sentence) does not perform an action on oneself (i.e. reflexive action), but rather on somebody else. Note that the comprehension results for the 'productive' reflexives for the Transitive Mismatch condition can also be explained in this way. Note also that very similar to the error patterns in the case of 'productive' reflexives, the results of the mismatch preference in the case of reflexives with a direct object (mean 2.721 seconds) differ from those of the match preference for grooming reflexives (mean 3.3592 seconds) (compare Fig. 3b and Fig.6).



Importantly, the analysis results on reflexives with a direct object show that the subjects differentiate between 'grooming' reflexives such as '*se lave*' (*washes-refl.*) and reflexives with a direct object such as '*se lave les pieds*' (*wash –refl. the feet*): they understand the former correctly, but not the latter.

In sum, the analysis results indicate that across both mismatch conditions (Reflexive Mismatch and Transitive Mismatch), the subjects showed a lack of knowledge of reflexives with a direct object.

The results of the first part of the comprehension study (i.e. the part in which the 'grooming' verbs were tested) extends the findings of the production study in two important ways. First, based on the fact that the subjects differentiated between the reflexives (i.e. intransitives) and transitive predicates in the comprehension study, I suggest that children indeed produced *reflexive* verbs in the retelling task despite the lack of morphology (clitic *se* in French and *hitpa'el* in Hebrew) shown in the production study. Second, this differentiation between reflexives and transitives can be taken as evidence of the fact that the subjects have acquired the feature of the relevant verbs of being equipped with Accusative case/direct object when transitive. Therefore we cannot attribute the subjects' failure in the production and comprehension of reflexives with a direct object to a delay in the acquisition of this feature.

A comparison of the production and comprehension studies shows that the results of both are very similar: subjects in both groups (Hebrew and French) were able to produce and understand the so-called 'grooming' verbs (i.e. reflexive verbs that belong to the set typical of languages with a lexical set). However, the French-speaking subjects were unable to produce and understand 'productive' reflexives and reflexives with a direct object (both derived by syntactic reflexivization).

These results led to the suggestion that at the early stage of acquisition, children derive first reflexive verbs in the lexicon regardless of whether their language is a lexicon language or a syntax language with respect to parameter setting. In other words, the Lex-Syn parameter is set to lexicon (regarding reflexive verbal formation) in French (a syntax language) at the early stage of acquisition. Thus, the first possible interpretation of the results of the L1 study experiments is: *Default setting of the parameter as 'lexicon' manifested at the early stage of acquisition*. Namely, we can assume that at the early stage of acquisition, children do not "deeply distinguish" between their language being a lexicon language or a syntax language with respect to parameter setting. This leads children to produce lexical reflexives in the period of acquisition, preceding the appearance of syntactic operation. Later, following syntactic development, the parameter will be met correctly, i.e. reset. The (re)setting onto syntax may be

mostly triggered by encountering reflexive ECM predicates that do not belong to the universal lexical set.

## **6. A note on the methodology of the experiments**

This section details the assumption that was made in designing the experiments,<sup>21</sup> and its consequences on the objectives of the study, as well as on the meaning of the obtained results.

The present study aimed to test the predictions of the Lex-Syn parameter hypothesis for L1 acquisition. The first problem that arose in designing the experiments was how to test the division of labor between the lexicon and syntax in the early period of acquisition. The second problem was how to determine the period of 'lexicon acquisition' and to measure a child's stage of language development in order to compare the subjects.

Regarding the first problem, studies in language acquisition have suggested that initial verbs appear at the stage termed 'acquisition of the lexicon' (see for example Guasti, 2002). However, this does not mean that children do not use syntax during this period. I believe that access to the syntactic structure of a sentence is innate, present right from the initial steps of language acquisition. Importantly, Landau and Gleitman (1985) have proposed that children exploit certain regularities between verb meaning and sentence structure ('syntax bootstrapping hypothesis') to acquire the meanings of specific verbs. This theory depends on three factors: that regularities between syntax and verb semantics exist,<sup>22</sup> that children are aware (implicitly) of those regularities, and that children can use them to make conjectures about meaning. There is evidence for each of these factors (see Landau & Gleitman, 1985; Gleitman, 1987). In addition, following Naigles (1990), children may use syntactic information to learn new verbs. Namely, the children acquire the new verb as a function of the syntactic structure in which the verb can appear. For example, Naigles's (1990) study showed that 2-year-old children conjecture

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<sup>21</sup> This section was written in response to comments I received regarding the methodology of the experiments. The comments concerned the division between lexicon and syntax at early acquisition. It was incorrectly concluded that I proposed some stage in acquisition at which the children acquire the lexicon solely or separately from syntax. I therefore wanted to clarify this issue. I chose to add the clarification at this particular junction, when the reader is already familiar with the experiments and their results.

<sup>22</sup> The theory of Landau and Gleitman (1985) rests on extensive investigations of, among others, Jackendoff (1983), Grimshaw (1983) and Levin (1985). These studies in lexical semantics have suggested that many semantic components (e.g. causation, direction or location of action, manner of action, etc.) contribute to the meaning of a verb. Some of these components are marked in the surface structure (i.e. number and arrangement of NP arguments, inflections, and adjuncts) in which the verb appears, but others are incorporated into the actual verb.

different meanings for novel verbs depending on whether they are presented in transitive frames or in intransitive ones.<sup>23</sup>

An additional issue is A-chains.<sup>24</sup> Friedmann (2004, 2007), who performed a study with Hebrew-speaking children (1; 6-4; 0) and Lorusso, Caprin and Guasti (2005), who tested 18- to 36-month-old Italian-speaking children showed that the children in their studies could already distinguish unaccusative and unergative verbs, and that they could move the argument of unaccusatives from object to subject position, namely, they already produced sentences that include A-chains. Note, however, that most subjects were at the two-word and multiple-word stages.

The above studies suggested that verb appearance is a sign that children have access to some new source of information for learning new word meaning, that is, syntactic information. In view of this, the question arises: if both the lexicon and the syntax exist right from the beginning of acquisition, and in addition both are involved and interrelated in verbal acquisition, then how can we detect a division between them in our experiments?

Here I made what is perhaps a questionable assumption, that at the early period of verbal acquisition children can produce and understand only those verbs which are formed in the lexicon. I assumed that the ability to perform syntactic operations such as reflexivization in syntax have to be acquired with time, i.e., later than the one-word acquisition stage,<sup>25</sup> due to the difficulty of the process (see section 3.2.2). Consider, for example, A-chains and the operation of reflexivization in syntax. Note that the latter but not the former involves a parasitic assignment of  $\theta$ -role, which I believe cannot be acquired at the early period of acquisition tested in the present study.

The period of 'lexicon acquisition' was determined based on previous studies in the acquisition field and depicted by the two measures, PLU and IVMA (see section 3.2.1); namely, the period of 'lexicon acquisition' was determined by the one-word period of acquisition as well as the

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<sup>23</sup> All of these studies were based on children's age rather than their stage of language development. It is therefore difficult to compare their findings with the findings described here.

<sup>24</sup> A-chains (argumental chains) are a type of chain that enables an argument to receive its thematic role in a position other than the initial one, i.e. it connects two argumental positions: the new one and the original one. Incorporating the VP internal subject hypothesis (Koopman & Sportiche, 1991), according to which all subjects that originate within VP move to spec IP, A-chains include, in fact, both the movement from object to subject position (to spec VP) in the case of, for example, unaccusatives, and the consequent movement from spec VP to spec IP.

<sup>25</sup> Based on the reports on L1 acquisition, I have come to the conclusion that the majority of syntactic operations are acquired some time after the one-word acquisition stage. For example, syntactic phenomenon such as binding is acquired at the multiple-word acquisition stage (Chien & Wexler, 1990; McKee, 1992; Grodzinsky & Reinhart, 1993; Grodzinsky & Kave, 1993; Bloom et al, 1994; Jakubowicz, 1994; Guasti & Chierchia, 1999).

initial stages of morphological acquisition. Therefore, the subjects were chosen for experiments and compared based on these measures. In this way, the second problem was resolved.

Now consider the nature of the task in the comprehension study. In every case we tested, the child had to construct a semantic representation of a *sentence*, like the sentence in (2c) repeated in (16a).

(16)

- a. The tiger washes.
- b.  $\exists e$  [wash (e) & Agent (e, tiger) & Theme (e, tiger)]

The child had to match representation (16b) with the meaning of the acted scene (picture). There were three such scenes, represented in (17).

(17)

- a. Match:  $\exists e$  [wash (e) & Agent (e, Tiger) & Theme (e, Tiger)]
- b. Reflexive Mismatch:  $\exists e$  [wash (e) & Agent (e, Princess) & Theme (e, Princess)]
- c. Transitive Mismatch:  $\exists e$  [wash (e) & Agent (e, Tiger) & Theme (e, Princess)]

Based on the above, and given that the children performed successfully with both mismatch conditions in the case of 'grooming' reflexives, I suggest that the children not only acquired the operation of reflexivization in the lexicon, but they also had the ability to construct a semantic representation of a sentence. I take the latter to mean that they had access to the syntactic structure of the sentence.<sup>26</sup> Specifically, in the case of the Reflexive Mismatch, the subjects systematically detected the mismatch between the linguistic stimulus and the picture (and correctly 'preferred' the Match), although the failure to construct a semantic representation of a sentence should have led them to overwhelming acceptance of the Mismatch.

However, the subjects failed in the same task with 'productive reflexives' and reflexives with a direct object in French, which I take to mean that the children were indeed in the period of acquisition at which the syntactic operation of reflexivization is not yet manifested.

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<sup>26</sup> The sentences used in this experiment were quite simple; the syntactic form of the linguistic stimuli's intransitive frame was [NP V]. However, it is unclear just what structural representation the children were creating: at what level of syntax were the children really parsing these sentences? The linguistic stimuli could have been parsed as surface structures composed of hierarchically organized NPs and VPs, or as particular combinations of predicates and arguments, or perhaps as more pragmatically based topic-comment structures. Several studies (e.g. Pinker, 1984; Borer & Wexler, 1987; Gleitman et al. 1987) suggest that even children's initial sentential structures are abstract and hierarchical.

In conclusion, I suggest that my assumption did not clash with the findings of previous studies which have suggested that children are aware (implicitly) of the regularities between syntax and verb semantics and use them in the period of initial verbal formations. Importantly, the assumption that was made as well as the measures that were proposed allowed us to discover the dissociation between the 'grooming' reflexives on the one hand and the 'productive' reflexives and those with a direct object on the other.

To summarize this part of the research, the results of the experiments partially support the predictions that were based on the Lex-Syn parameter hypothesis: while they support the predictions made for French regarding syntactic reflexives, they do not support the predictions made for French regarding the 'grooming' reflexives. Namely, the results regarding the reflexives derived by syntactic reflexivization show that they do not appear among the early verbal productions or during the one-word stage of acquisition; there is a period during which the children produce and understand unaccusative verbs but not the syntactic reflexives. However, the results also show that the so-called 'grooming' reflexives appear among the early verbal productions or during the one-word stage of acquisition in French, just like in lexical languages (Hebrew). This result is not predicted by the Lex-Syn parameter hypothesis, but it does not conflict with it either, because it can be assumed that the default setting of the Lex-Syn parameter as 'lexicon' is manifested at the early stage of acquisition crosslinguistically.

However, the proposed interpretation of the results as "default setting of the Lex-Syn parameter as 'lexicon'" is not the only possibility. Another possible interpretation of the dissociation found in French between syntactic reflexives and reflexive verbs that belong to the set typical of languages with a lexical set might be as follows: the 'grooming' reflexives are formed in the lexicon—even in French, and this is why they appear among the early verbal productions or during the one-word stage of acquisition in French, just like in Hebrew. This hypothesis is further examined in part three of the research.

## PART THREE

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### Lexical reflexives in a syntax language: the case of French

This part of the study examines French reflexive verbs for differences between the so-called 'grooming' reflexives and the rest of the reflexives (since a difference was found in the acquisition of these predicates). Specifically, the aim was to examine the syntactic and semantic properties of the French reflexives that belong to the set typical of languages with a lexical set relative to their counterparts in a lexical language, in order to detect possible similarities. We then determine whether these similarities (or lack thereof) are predicted by the nature of the operation by which the particular verbs are formed. In addition, it was important to determine whether the rest of the French reflexives (i.e. reflexives formed in syntax) lack the syntactic and semantic properties of lexical reflexives.

As will be shown in sections 7 and 8, closer inspection revealed that certain reflexive verbs in French (a syntax language) pattern with lexical reflexives. These verbs appear to belong to the core set typical of languages with a lexical setting of the parameter. I demonstrate that these are instances of lexical reflexives. Based on this finding, I discuss the locus of derivation of these predicates, proposing that their formation in French takes place in the lexicon. Given this, the results of the acquisition study can also be subjected to another interpretation.

#### **7. Event nominals, idioms and semantic drift:**

##### **Comparative analysis of French and Russian reflexives**

In the first part of this work I discussed the distinctions between lexicon- and syntax-type languages (section 2.1.3). Some of these distinctions were explored in the acquisition study, namely, the particular distinctions referring to what syntactic reflexivization allows while lexical operation does not: (1) in syntax languages, reflexivization is a productive operation while in lexicon languages reflexivization is limited; (2) only syntax languages have reflexive verbs with a direct object.

In this part of the study, I explore the other distinctions, in particular those which refer to what lexical operation of reflexivization allows while syntactic operation does not. Namely, as already mentioned, based on the arguments of Reinhart and Siloni (2005), Horvath and Siloni (2008) and Siloni (2008), it can be concluded that reflexive event nominals are possible only in lexicon languages; only lexicon languages allow reflexive verbs to have meanings (resulting

from semantic drifts) not shared by their transitive alternates; only lexicon languages allow reflexive verbs to appear in idioms not shared by their transitive alternates.

Based on the above properties of the lexical reflexives I will determine whether reflexive verbs in French participate in idioms, can undergo semantic drift and can give rise to event nominals (i.e. pattern with lexical reflexives). If they can, I will examine whether this applies only to the reflexives that belong to the set typical of languages with a lexical set, i.e. whether the rest of the reflexives (syntactic reflexives) lack these properties of lexical reflexives.

I will compare the findings in French with those in Russian, a language in which the Lex-Syn parameter is set to lexicon, in order to detect possible similarities or distinctions.<sup>27</sup>

Turning first to idioms, note that Horvath and Sioni (2005), Horvath and Sioni (2008) and Sioni (2008) argued that a predicate has to be present in the lexicon to give rise to an idiom. Since lexical reflexives are formed in the lexicon, they can form their own idioms. In contrast, syntactic reflexives are completely unavailable in the lexicon. They are inserted as two place predicates and are reflexivized in the syntax. A syntactic reflexive thus can only participate in an idiom if its transitive alternate does, as the latter is present in the lexicon; hence, such idioms share their idiomatic meaning with their transitive alternates.<sup>28</sup>

Consider, for instance, the idiom in (18a) below. The lexical reflexive in (18a) exhibits an idiomatic meaning in Russian that is not found in its transitive verb counterpart (18b).

(18)

- a. obliivat'sja potom  
shower-refl sweat-Instr.  
'To shower oneself with sweat.'  
Idiomatic: 'To work very hard.'

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<sup>27</sup> Russian was chosen for comparison and exemplification because, as a native Russian speaker, I have more confidence in the findings in this language (which were, of course, verified by other native Russian speakers as well before drawing any conclusions). I am deeply indebted to Nina Bialik and Nina Bronshtein for their judgments in Russian and for providing me with the relevant materials.

<sup>28</sup> The method by which the idioms were found was created by Horvath and Sioni and it is as follows: For each reflexive predicate it was checked whether it appears in a unique idiom (or in more than one). Unique idiom containing reflexive verb is an idiom not shared by the transitive verb alternate (can be shared by other predicates formed in the lexicon, like, for example, adjectival passives).

Relevant idioms are only those that are VPs, not full clauses containing reflexive verb. As is well known sentential idioms may involve syntactic phenomena such as wh-fronting or passivization. These idioms are most probably listed separately (not as subentries of their matrix predicate) (Sioni, 2008).

- b. obliwat' kogo-to (ego) potom  
*shower-inf somebody-Acc sweat-Instr.*  
 'To shower somebody with sweat.'

Horvath and Siloni (2008) argue that phrasal idioms, such as (18a), are listed in the lexicon as subentries of their matrix predicate, that is, their lexical head (the reflexive in 18a). Diachronically, idioms start out as literal, and acquire a special meaning in some specialized contexts (by ad hoc inference). After consistent use of the expression with that contextually adapted interpretation, the innovative interpretation enters the lexicon, namely, gets lexicalized. A special meaning of a phrasal expression cannot be readily listed in the lexicon if its matrix predicate is not an entry in the lexicon, as is the case with syntactic reflexives. Given this constraint, we would expect to find unique idioms containing reflexives in Russian (indeed nine such idioms were found), but not in French.

In light of the above, the fact that French does have unique idioms with reflexives might seem surprising.<sup>29</sup> Consider, for instance, the idiom in (19) below. The French reflexive verb in (19a) exhibits an idiomatic meaning that is not attested with its transitive verb counterpart (19b).

- (19)
- a. s'habiller de sapin (French)  
**Literat:** *SELF dress in fir*  
**Idiomat:** die
  - b. habiller quelqu'un de sapin—very odd sentence  
*dress somebody in fir*

The same holds true for the idiomatic meaning exhibited by the French reflexive verbs in (20) (I omit the transitive alternates, which have literal meaning only).

- (20)
- a. s'habiller sur mesure  
*SELF dress on measure*  
 'order and buy clothes that are custom-made for oneself'
  - b. se coiffer de (quelque chose/quelqu'un)  
*SELF comb from something/somebody*  
 'get excited'
  - c. se couvrir d'un sac mouillé  
*SELF covered with a bag wet*  
 'apologize but very badly, extricate oneself'

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<sup>29</sup> The search in French was done by looking up the relevant verbs in idiom dictionaries. I am deeply indebted to Laurent and Simon Beniluz for their judgments in French.



- d. se couvrir d'une noble poussière  
SELF cover with a noble dust  
'be hardened in battle'
- e. se couvrir de gloire  
SELF cover with glory  
'be or become famous'
- f. se coller à quelqu'un<sup>30</sup>  
SELF stick/glue to somebody  
'attach oneself to someone'
- g. se retrancher derrière  
SELF entrench behind  
'hide behind'

It is important to note, however, that the French reflexive verbs in (19a) and (20a-g) -- *s'habiller* ('dress'-refl.), *se coiffer* ('comb'-refl.), *se couvrir* ('cover'-refl.), *se coller* ('glue'-refl.), *se retrancher* ('entrench'-refl.) — are reflexives that belong to the set typical of languages with a lexical set. Crucially, verbs such as *se mordre* ('bite'-refl.) or *se pincer* ('pinch'-refl.), which are not related to the reflexive set in lexical languages, were not found in the unique French idioms. Thus, the list of French idioms containing reflexive verbs (see (19) and (20)) comes to a total of nine, with five reflexive verbs participating in these idioms, all of which belong to the set typical of languages with a lexical set.

As already mentioned, the list of Russian idioms containing reflexive verbs (see Appendix D) comes to a total of nine. Only in these idioms does the reflexive verb exhibit an idiomatic meaning that is not found in its transitive counterpart. Note, the set of reflexive verbs in Russian consists of 61 verbs (see Appendix E for the whole list). Five of these 61 reflexive verbs participate in these idioms: *umyvat'sja* ('wash the face'-refl.), *oblivat'sja* ('shower'-refl.), *kupat'sja* ('bathe'-refl.), *sobirat'sja* ('gather'-refl.), *vytjagivat'sja* ('stretch'-refl.).

Thus, to summarize the findings in Russian and French, I did not find any differences in the number of reflexive verbs participating in unique idioms (five in Russian and five in French) or in the number of unique idioms (nine in Russian and nine in French) among these two languages.<sup>31</sup>

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<sup>30</sup> The verb *se coller* ('glue'-refl.) has a reflexive meaning when its external argument is Agent. This particular meaning can be the result of semantic drift or perhaps it is simply an additional meaning of the verb. Since its Hebrew equivalent *nidbak* is included in the list of reflexive verbs in Hebrew, we can accept it in French as well. In Hebrew this verb is found in the unique idiom *nidbak la kise* ('glue-refl. to+the-chair), the idiomatic meaning of which is 'refused to leave a position'.

<sup>31</sup> Note that we know that the set of reflexive verbs in Russian consists of 61 verbs. In French, however, we do not yet know the total number of lexical reflexives. Therefore, we cannot compare the number of reflexives participating in the idioms with the total number of reflexive verbs in French. What we can do, however, is compare the total numbers



Nominalization is a lexical operation (Siloni, 1997). Unaccusative nominalizations (23a), namely nominalization of unaccusative verbs (23b), are possible even in syntax languages, as the operation forming unaccusatives (decausativization) is lexical crosslinguistically (Reinhart and Siloni, 2005).

- (23)
- a. le rétrécissement du pantalon au lavage (French)  
*the shrinking of the pants in+the washing*
  - b. Le pantalon s'est rétréci au lavage.  
*The pants shrank in+the washing*  
 (from Reinhart and Siloni, 2005)

Reflexive verbs that are formed in the lexicon (as in Hebrew and Russian) are available as input for the operation of nominalization (24a and 24b).

- (24)
- a. hitraxcut ('self-washing') (Hebrew)  
 (from Reinhart and Siloni, 2005)
  - b. umyvanie ('self-washing of the face') (Russian)

When reflexivization applies in syntax, there is no reflexive input in the lexicon to nominalize (Reinhart and Siloni, 2005). Nevertheless, we find certain examples of event nominals in French (without the clitic *se*). Again, as in the case of idioms and semantic drift, these event nominals are formed from reflexive verbs that seem to belong to the set typical of languages with a lexical set. In (25)-(29) below, I demonstrate some parallel examples of event nominals found in French and Russian, two languages which are set differently for the Lex-Syn parameter: to syntax in French, and to lexicon in Russian.<sup>33</sup>

- (25)
- a. Le déguisement est une coutume du carnaval. (French)  
*The disguise is a tradition of carnivals.*
  - b. pereodevanie artistov (Russian)  
*re-dressing or changing of clothes (of) artists-GEN*

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<sup>33</sup> The event nominals of French 'grooming' reflexives such as *lavement* 'washing' and *habillement* 'dressing' are still listed in recent dictionaries with their reflexive meanings, but native speakers no longer accept them. For example, for the native speaker, 'habillement' can mean only clothes and not dressing. French speakers use the noun *lavage* 'washing' in place of *lavement* and *habillage* 'dressing' in place of *habillement*. This tendency is also seen in Russian. The event nominals such as *odevanie* 'dressing' and *umyvanie* 'washing of face' are no longer in use. In place of the event nominals, Russian has nouns that can be derived from transitive verbs, for example: *myt'jo* 'washing' from the transitive verb *myt'* 'wash'. Therefore, the decreasing use of reflexive nominals seems to be a general tendency across languages, rather than due to the fact that French has no reflexive nominals.

- (26)
- a. armement des militaires (French)  
*armament of soldiers*
  - b. vooruzhenie soldat (Russian)  
*armament (of) soldiers-GEN*
- (27)
- a. partiel désarmement de la France (French)  
*partial disarmament of France*
  - b. chastichnoe razoruzhenie Rossii (Russian)  
*partial disarmament (of) Russia-GEN*
- (28)
- a. lavement des pieds (French)  
*washing (relig.) of legs*
  - b. omovenie nog (Russian)  
*washing (relig.) (of) legs-GEN*
- (29)<sup>34</sup>
- a. avancement (de quelqu'un) (French)  
*advancement (of somebody)*
  - b. prodvizhenie (Russian)  
*advancement*

I do not find anything of the sort in French reflexives formed in syntax. In fact, I find two possibilities with syntactic reflexives: first, there are syntactic reflexive verbs that lack the corresponding event nominal altogether; and second, there are syntactic reflexives which have the event nominal, but the latter does not have the reflexive interpretation. Specifically, French

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<sup>34</sup> Additional examples of event nominals found in French are mentioned below:

- a. entraînement des athlètes  
training of athletes
- b. attachement (de quelqu'un)  
attachment (of somebody) (also figuratively)
- c. redressement du gymnaste a la barre  
straightening of gymnast on the bar  
(maison de redressement -- figuratively, rectification)
- d. rétablissement de malade  
reestablishment; reinstatement of patient
- e. enracinement (de quelqu'un)  
taking root (of somebody)
- f. arrangement (de quelqu'un)  
arrangement (of somebody), settlement

reflexive verbs such as *s'apprécier* ('appreciate'-refl.), *s'aimer* ('love'-refl.), *se connaître* ('know'-refl.), *se mordre* ('bite'-refl.), *se dessiner* ('draw'-refl.), *s'accuser* ('accuse'-refl.), etc., which are not related to the reflexive set in lexical languages, are related to the first type of syntactic reflexives, namely, they lack the corresponding event nominal altogether. As an example of the second type of syntactic reflexives, there is *se pincer* ('pinch' -refl.), which has the event nominal *pincement* ('pinch'), but the latter lacks a reflexive meaning. Although this nominal (*pincement*) shows derived morphology, which is compatible with reflexive derived morphology in French, it does not seem to correspond to the reflexive predicate *se pincer* ('pinch'-refl.), but rather to some other predicate which is presumably available in the lexicon and can therefore give rise to nominalization.<sup>35</sup>

In this section, I examined French reflexive verbs using the diagnostics proposed by Reinhart and Siloni (2005), Horvath and Siloni (2005), Horvath and Siloni (2008) and Siloni (2008), and compared the findings in French with those in Russian, a language in which the parameter is set to lexicon. It was shown that French reflexive verbs that belong to the set typical of languages with a lexical setting of the parameter give rise to idioms, event nominals and undergo semantic drift, similarly to Russian reflexive verbs, providing evidence for the existence of instances of lexical reflexives in French. How can these findings be explained?

There are two possibilities: the first is that French has a set of lexical reflexives just like lexical languages; the second is that lexical reflexives in French are lexicalized predicates that have to be acquired on an individual basis, as was proposed by Siloni (2008) for reciprocals. Namely, Siloni (2008) suggests that the instances of lexical reciprocals found in syntax languages are not outputs of lexical reciprocalization but reciprocals that have gotten lexicalized as such, and have to be acquired on an individual basis. The same could be suggested for lexical reflexives in syntax language. Namely, in view of the fact that instances of lexical reflexives were found in French, a syntax language, it can be assumed that these are not outputs of lexical reflexivization but reflexives that have gotten lexicalized as such, and have to be acquired on an individual basis. However, such a suggestion conflicts with the findings of the present study.

First, based on the above suggestion, we would expect to find overgeneralizations in the early period of acquisition. However, our results showed that French-speaking children do not

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<sup>35</sup> Note, the Russian event nominal *shhipanie* 'pinch' shows derived morphology, exactly like its French equivalent *pincement*, and the former lacks the reflexive meaning, exactly like the latter. Remember, the reflexive verb *se pincer* ('pinch'-refl.) is formed in syntax; Russian (a lexical language) does not have such a verb. It seems that both the Russian and French event nominals 'pinch' are formed from some other, i.e. not reflexive, predicate which explains the lack of reflexive meaning in them.

reflexivize the verbs of the productive set, such as 'bite'. This means that French-speaking children 'know' which concepts can give rise to reflexive verbs in the lexicon from the early verbal formations and they initially show the knowledge of the operation of reflexivization in the lexicon without making overgeneralizations. Thus, it would be wrong to assume that the instances of lexical reflexives in French are not outputs of lexical reflexivization, but reflexives that have gotten lexicalized as such, and have to be acquired on an individual basis.<sup>36</sup>

Second, it is important to remember that the set of reflexive verbs in 'lexical' languages is approximately the same across languages and is limited. For example, as shown earlier, in Russian it consists of 61 verbs. A restricted number of these reflexives give rise to idioms and undergo semantic drift in Russian. As we have seen in this section, the numbers in French are very similar to those in Russian. Therefore, one need not expect to find additional examples in French in order to conclude that French has a set of lexical reflexives just like in Russian or Hebrew. That is, to state that only those reflexive verbs which are found in the idioms, event nominals and semantic drift are instances of lexical reflexives in syntax language would be an implausible conclusion (since we do not require this of the lexical languages).

Based on the above, I propose that the formation of the French reflexive verbs, which belong to the core set typical of languages with a lexical setting of the parameter, takes place in the lexicon. This proposal means that French has a set of lexical reflexives just like lexical languages.

The next section supports the hypothesis that French has a set of lexical reflexives through an investigation of the particular semantic property of the reflexive verbs formed in the lexicon.

## **8. A note on the interpretation of reflexive verbs**

In this section, I will compare the particular interpretive property of Russian reflexive verbs with parallel examples of reflexives in French (i.e. those reflexive verbs in French that belong to the set typical of languages with a lexical set) to detect possible similarities, and then determine whether those similarities (or lack thereof) are predicted by the nature of the operation of reflexivization and by the locus of its application. Namely, we will see whether, in order to have such a property, the verb has to be formed in the lexicon, and why. I will also compare the interpretation of those reflexive verbs in French that pattern with lexical reflexives with the interpretation of the rest of the French reflexives (i.e. reflexives formed in syntax)—in this case, I am looking for potential differences. I will then determine whether those differences (or lack thereof) are predicted by the nature of the operation by which the particular verbs are formed.

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<sup>36</sup> Tali Siloni (p.c.) points out that this is a more general question, i.e. which concepts tend to get lexicalized.

While the Russian *myt'sja* ('wash'-refl.) can be used when someone other than the referent of the Agent argument is doing the washing (when the referent of the Agent argument is a child, aged or ill person) (in 30a), the same is true for the French *se laver* ('wash'-refl.) (in 30b), but crucially, not for *se dessiner* ('draw'-refl.) (in 30c) or *se mordre* ('bite'-refl.) (in 30d), which are formed in syntax.

(30) Context: Mathilde is a 2-year-old girl visiting her grandma.

- (a) Kogda Matil'da moetsja u svoej babushki, ona ne moetsja sama. (Russian)  
*when Mathilde wash-refl. at her grandma, she neg wash-refl. herself-intensifier*  
 When Mathilde washes at her grandma's, she does not wash (by) herself.
- (b) Quand Mathilde se lave chez sa grand mère elle ne se lave pas elle-même/toute seul. (French)  
*when Mathilde wash-refl. at her grandma, she neg wash-refl. herself/intensifier*  
 When Mathilde washes at her grandma's, she does not wash (by) herself.
- (c) Quand Mathilde se dessine chez sa grand mère elle ne se dessine pas elle-même/toute seul. (Contradiction) (French)  
*when Mathilde -refl. draw-refl. at her grandma, she neg draw-refl. herself/intensifier*  
 When Mathilde draws herself at her grandma's, she does not draw herself.
- (d) Quand Mathilde se mord elle ne se mord pas elle-même/toute seul. (Contradiction) (French)  
*when Mathilde bite-refl., she neg bite -refl. herself/intensifier*  
 When Mathilde bites herself, she does not bite herself.

Sentences (30c) and (30d) are contradictions, but (30a) and (30b) are not. The question is how the verb receives the particular interpretation as in (30a) and (30b), namely that of someone other than the referent of the Agent argument doing the washing, and the 'true' Agent becoming Theme. Tali Siloni (p.c.) points out that this particular interpretation can be viewed as semantic drift allowed by lexical reflexives, a sort of "loose" interpretation, where the Agent is responsible for the occurrence of the event but does not actually perform it. Note that the ability of the predicate to undergo semantic drift that is not shared by its transitive counterpart is a property of the predicates formed in the lexicon. Indeed, the particular interpretation exhibited by the reflexive verbs in the examples in (30a) and (30b) cannot be obtained with their transitive verb counterparts. Attempts to construct such examples with transitives give very odd sentences. The ensuing question is whether lexical reflexives have some property that allows this sort of semantic drift; in other words how is this sort of "loose" interpretation formed?

As it was shown in section 2.1.1, the output of lexical reflexivization is interpreted as an Agent that operates on itself, namely, an Agent that is also a Theme. Both roles, Agent and Theme,

participate in the event; therefore, both are present in the semantics. (Remember, the bundling operation bundles the Theme role with the Agent role, and this bundle of two  $\theta$ -roles is assigned to one (external) argument of the verb).

Based on the above, I propose the following. It appears that we have access (at the semantic level) to the bundle of two  $\theta$ -roles, Agent-Theme, when the verb is derived in the lexicon. This particular interpretation, as in (30a) and (30b), can be viewed as a result of the separation (at the semantic level) of the complex Agent-Theme, in the course of which the verb receives a transitive interpretation instead of a reflexive one. Namely, the complex Agent-Theme is separated into two roles: an Agent and a Theme, and both roles remain as is, with no change. What do change are the referents of these roles: the Agent gets a new referent and the referent of the 'true' Agent becomes Theme.

To summarize, what we have in (30) is the particular interpretation conferred upon the lexical reflexive in Russian (30a) and its parallel example in French (30b), although this interpretive property is not found with reflexives formed in syntax (30c and 30d) and furthermore, it seems to be a result of semantic drift not shared by the transitive verb counterpart.

The fact that French verbs such as *se mordre* ('bite'-refl.) and *se dessiner* ('draw'-refl.), which are not related to the reflexive set in lexical languages, lack this interpretation (see (30c) and (30d)) can be explained in the following ways: first, the predicate formed in syntax cannot undergo semantic drift that is not shared by its transitive verb counterpart, as discussed in section 7; second, syntactic operation does not form a complex  $\theta$ -role and therefore, there is no source for separation and for respectively obtaining the new interpretation. Note that both bundling and separation of two  $\theta$ -roles is impossible in the syntax for the same reason: manipulation of  $\theta$ -grids is illicit in syntax, following The Lexicon Interface Guideline (see (4)).

Importantly, it seems that this particular interpretation is possible not only with 'grooming' verbs, but also with 'non-grooming' lexical reflexives in Russian (31) and in French (32), respectively. As far as I can see, each French reflexive verb that belongs to the core set typical of languages with a lexical setting of the parameter will exhibit this interpretive property.

(31)

- a. Kogda Mark snarjazhaetsja v ekspediciju on ne snarjazhaetsja sam, (ego zhen  
snarjazhaet ego). (Russian)

*When Mark equip-refl. in expedition he neg equip-refl. himself-intensifier (his wife equip him)*

When Mark equips for the expedition he does not equip (by) himself (his wife equips him).



- b. Kogda Sirija vooruzhaetsja protiv Izrailja, ona ne vooruzhaetsja sama, (Rossija vooruzhaet ejo). (Russian)

*When Syria arm-refl. contra Israel, it neg. arm-refl. herself-intensifier (Russia arm it)*

When Syria arms against Israel, it does not arm itself (Russia arms it).

(32)

- a. Quand Mark s'équipe pour l'expédition il ne s'équipe pas lui-même/tout seul (sa femme l'équipe). (French)

*When Mark equip-refl. for expedition he neg equip-refl. himself/intensifier (his wife equip him)*

When Mark equips for the expedition he does not equip (by) himself (his wife equips him).

- b. Quand la Syrie s'arme contre Israël elle ne s'arme pas elle-même/toute seul (la Russie l'arme). (French)

*When Syria arm-refl. contra Israel, it neg. arm-refl. herself/intensifier (Russia arm it)*

When Syria arms against Israel, it does not arm itself (Russia arms it).

In this section, it was shown that the interpretation of those reflexive verbs in French that belong to the set typical of languages with a lexical set is different in one particular respect from the interpretation of the rest of the French reflexives (i.e. reflexives formed in syntax), and that this interpretive property is exhibited by reflexives in 'lexicon' languages. This difference was explained by the nature of the operation of reflexivization and by the locus of its application. Namely, it was suggested that in order to derive this particular interpretation, the verb has to be formed in the lexicon.

To conclude, the findings in sections 7 and 8, namely, the manifestation of idioms, semantic drift and event nominals, as well as the particular interpretive property shown by French reflexives that belong to the set typical of languages with a lexical set, led me to suggest that these reflexives are indeed formed in the lexicon in French, in contrast to the rest of the French reflexives which are formed in syntax. Based on this, it might be assumed that the operation of reflexivization is applied crosslinguistically in the lexicon, and that only in syntax languages it is applied, in addition, in syntax. In fact, it was already proposed by Dimitriadis (2004) that the Lex-Syn parameter should only determine whether or not an operation can apply in the syntax, whereas lexical application is always possible. Julia Horvath (p.c.) points out that this assumption could be judged unlikely since it might seem not economical to derive reflexive

verbs in two grammar components of a single language. Abstracting away from economy, the fact remains that French has two types of reflexive predicates, and the properties of one of these types pattern with the properties of lexical reflexives in lexicon languages. Taking this into consideration, the results of the L1 study experiments can and probably should be interpreted somewhat differently. Namely, another possible interpretation of these results is based on the assumption that French has a set of lexical reflexives.<sup>37</sup> Hence, the second possible interpretation of the results of the L1 study can be formulated as follows: *A knowledge of lexical reflexives manifested from the early stage of acquisition across languages.*<sup>38</sup>

## 9. Further research: Investigation of syntactic reflexives

To resolve the aforementioned problem of economy, the 'syntactic reflexives' need to be further investigated. A thorough investigation could potentially show whether these predicates are full equivalents of the lexical reflexives. If they are not, there may be no problem of economy at all. Note that a first step in this direction was made here: in section 8, we saw that reflexives formed in the lexicon differ semantically from those formed in syntax. Further examination could provide information regarding the nature of these predicates.

Consider the following contrast in French noted by Pica and Snyder (1997):

(33)

- a. ??Jean s'apprécie.
- b. Jean s'apprécie beaucoup.  
'Jean appreciates himself (a great deal).' (conscious knowledge implied)
- c. ??Jean s'aime.
- d. Jean s'aime bien.  
'Jean likes himself (well).' (conscious knowledge implied)

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<sup>37</sup> Remember that the results of the L1 study showed that the subjects in both groups (Hebrew and French) had knowledge of the reflexive verbs formed in the lexicon from the early stage of verbal acquisition or during the one-word acquisition stage, while the French-acquiring subjects had no knowledge of the syntactic reflexives, because the ability to perform syntactic operations such as reflexivization in syntax have to be acquired later than the one-word acquisition stage.

<sup>38</sup> Remember that the first possible interpretation of the results of the L1 study experiments was: *Default setting of the parameter as 'lexicon' manifested at the early stage of acquisition.* This hypothesis implies that the parameter can be reset in the course of syntactic development (see section 5).

- e. ??Jean se connaît.
- f. Jean se connaît bien.  
 ‘Jean knows himself (well).’ (conscious knowledge implied)

The above examples show that syntactic reflexives whose external argument is Experiencer are systematically improved by the addition of an adverb indicating degree. Pica and Snyder (1997) argue that "these examples illustrate that reflexive clitic must have an agentive antecedent".

Rooryck and Vanden Wyngaerd (1999) illustrate that the above examples with a complex reflexive (i.e. reflexive containing the long-distance anaphora *lui-même* himself) (33) are good regardless of the presence of an adverb.

(34)

- a. Mathilde s’aimait (beaucoup) elle-même.  
 ‘Mathilde loved herself (a great deal).’
- b. Jean se connaît (bien) lui-même.  
 ‘Jean knows himself (well).’

In addition, when the above sentences are used in a compound tense indicating a perfective aspect, they are sharply ungrammatical:

(35)

- a. \*Après un traitement psychiatrique prolongé, Louis s’est (beaucoup) apprécié.  
 ‘After prolonged psychiatric treatment, Louis appreciated himself (a great deal).’
- b. \*Mathilde s’est (bien) aimée.  
 ‘Mathilde liked herself (well).’
- c. \*Jean s’est (bien) connu, mais maintenant ce n’est plus le cas.  
 ‘Jean knew himself (well), but that’s no longer the case.’

Again Rooryck and Vanden Wyngaerd (1999) found that this restriction does not hold with complex reflexives (35), i.e. the sentences are improved through the addition of *lui-même* ‘himself’.

(36)

- a. Après un traitement psychiatrique prolongé, Louis s’est finalement apprécié \*(lui-même).  
 ‘After prolonged psychiatric treatment, Louis finally appreciated himself.’
- b. Mathilde s’est longtemps aimée \*(elle-même).

‘Mathilde has liked herself for a long time.’

c. Jean s’est toujours connu \*(lui-même), mais maintenant ce n’est plus le cas.

‘Jean always knew himself, but that’s no longer the case.’

Examples (33) and (34) show that subject-Experiencer reflexives display temporal and adverbial restrictions. These verbs need to be further examined to determine whether they are similar to other reflexives formed in syntax or if there is a particular subset that is semantically and syntactically distinct from the rest of the reflexives formed in syntax. An additional possibility that warrants further exploration is that the transitive verbs with Experiencer as an external argument cannot give rise to reflexive verbs, even in syntax.

Importantly, French reflexives that belong to the core set typical of languages with a lexical setting of the parameter do not exhibit either temporal or adverbial restrictions:

(37)

a. Sophie se lave (bien).

‘Sophie washes herself (well).’

b. Sophie s’est (bien) lavée.

‘Sophie has washed herself (well).’

To summarize, an investigation of reflexives formed in syntax will show their semantic and syntactic properties, which will help determine whether they form a homogeneous set or in fact are different subtypes, providing a better understanding of the nature of these predicates.

## 10. Conclusions

In the first part of this work, the theory of the Lex-Syn parameter was introduced. In the second part, the validity of the Lex-Syn parameter was examined using data from the acquisition of L1 French and L1 Hebrew. This examination was guided by the following research questions: *Do unaccusative and reflexive verbs emerge at the same period of acquisition, i.e. during the time of early verbal production, in both French and Hebrew? Which steps of lexical, morphological and syntactic development correlate with emergence of the reflexive verbs in each language, i.e. French and Hebrew?* The relevant predictions of the theory were given. Two measures, *inflectional verbal morphology acquisition (IVMA)* and *predominant length of utterance (PLU)*, were proposed to analyze the children's stage of language development in order to compare them. The designed experiments enabled us to answer the research questions and thus test the predictions. Section 4 delineated the first set of experiments—the production study, and outlined

the question that arose during experimentation. Section 5 delineated the second set of experiments—the comprehension study, which allowed us to answer the question raised in the production study. At the end of the experimental part of this study, it was shown that the French-acquiring subjects were able to produce and understand reflexive verbs that belong to the set typical of languages with a lexical set. However, they were unable to produce and understand 'productive' reflexives, and reflexives with a direct object (both derived by syntactic reflexivization). These results partially supported the predictions that were based on the Lex-Syn parameter hypothesis: while they supported the predictions made for French regarding syntactic reflexives, they did not support the predictions made for French regarding the 'grooming' reflexives. Namely, the results regarding the reflexives derived by syntactic reflexivization showed that they do not appear among the first early verbal productions or during the one-word stage of acquisition; there is a period during which the children produce and understand unaccusative verbs but not the syntactic reflexives. However, the results also showed that the so-called 'grooming' reflexives appear among the early verbal productions or during the one-word stage of acquisition in French, just like in lexical languages (Hebrew). This result was not predicted by the Lex-Syn parameter hypothesis, but it does not conflict with it either, because it can be assumed that the default setting of the Lex-Syn parameter as 'lexicon' is manifested at the early stage of acquisition crosslinguistically. However, the dissociation found in French between syntactic reflexives and reflexive verbs that belong to the set typical of languages with a lexical set raised an additional question: Is the default setting of the Lex-Syn parameter as 'lexicon' manifested at the early stage of acquisition crosslinguistically, or is there a lexical set of reflexives across languages? Closer inspection, discussed in Part 3, revealed that certain reflexive verbs in French (a 'syntax' language) pattern with lexical reflexives. These verbs seem to belong to the core set typical of languages with a lexical setting of the parameter. Namely, it was shown that these verbs are found in idioms, event nominals and undergo semantic drift, similar to their reflexive counterparts in a lexical language like Russian. In addition, the interpretation of those reflexive verbs in French that belong to the set typical of languages with a lexical setting of the parameter was found to differ in one particular respect from the interpretation of the rest of the French reflexives (i.e. reflexives formed in syntax), and this interpretive property was exhibited by reflexives in 'lexicon' languages. It was assumed that in order to derive this particular interpretation, the verb has to be formed in the lexicon. Consequently, it was suggested that the French reflexives having this property are formed in the lexicon.

Based on the findings of both the experiments and the theoretical examination, I proposed that the formation of the French reflexive verbs, which belong to the core set typical of languages with a lexical setting of the parameter, takes place in the lexicon. This means that French has a set of lexical reflexives just like lexical languages.

An important conclusion emerging from this study is that the Lex-Syn parameter should, in fact, determine whether or not an operation can apply in syntax, whereas lexical application is always possible, as proposed in Dimitriadis (2004). While this conclusion appears to suffer from a problem of economy (since it is not economical to derive reflexive verbs in two grammar components of a single language), this problem can be dealt with by verifying that the semantic and syntactic properties of lexical reflexives differ substantially from those of syntactic reflexives. A challenge for future study is therefore to investigate reflexives formed in syntax in order to better understand the nature of these predicates. A comparative analysis of syntactic reflexives is beyond the scope of this thesis and the relevant contrasts are only touched upon here, but these facts definitely deserve more attention.

## APPENDIXES

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### Appendix A1: Developmental stages

#### Definitions of PLU Stages (from Vainikka et al. 1999)

Stage 1: Predominantly one-word stage

- Almost all utterances (90%) are of the one-word sentence type

Stage 2: Intermediate stage between one-word and two-word stage

- The one-word sentence type is still very common (60%-89% of the utterances are of the one word-type)

Stage 3: "Two-word" stage

- The one-word sentence type no longer clearly predominates (i.e. fewer than 60% of all utterances are one-word utterances)
- The multiword sentence type is not the most common one

Stage 4: Predominantly multiword stage

- The multiword sentence type is the most common one

#### *Secondary PLU stages* (from Vainikka et al. 1999)

Secondary stage a: at most 10% of all utterances contain a verb

Secondary stage b: 11%-60% of all utterances contain a verb

Secondary stage c: more than 60% of all utterances contain a verb

### Appendix A2: A note on the one-word stage

It is important to note at exactly which 'moment' of the one-word stage of syntactic development the subjects were tested. Studies on lexical acquisition make the important generalization that children's early productive vocabulary consists almost exclusively of nouns, regardless of the culture in which they are reared. Verbs appear later, and for a while they remain the minority (Gentner, 1982; Bates, Dale, and Thak, 1995; Caselli et al., 1995; Gillette et al., 1999 as cited in Guasti, 2002). Indeed, my observation of the subjects<sup>39</sup> at the beginning of my work with them (while gathering the preliminary data), as well as during the retelling task itself, showed that children at the one-word stage of syntactic development first produce/repeat utterances consisting of a subject, i.e., the children omit the verb in the target sentence. Later on in the one-word stage of syntactic development, the children began to produce utterances consisting of verbs, omitting the subjects (not always, but percentage of omissions was consistent). This observation fits the above-cited crosslinguistic data concerning the steps of lexicon acquisition. It seems that when the children's acquisition stage

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<sup>39</sup> Initially I worked with seven children in the Hebrew group and six children in the French group.

permits them to produce verbs but they are still 'limited' by the one-word stage, the children prefer to produce the verb and omit the subject, and not vice versa (this is not an analysis but a description; possible explanations for this phenomenon are beyond the scope of this study). The subjects of the present study were tested at precisely this stage of acquisition. Furthermore, only the data of those children who showed exactly this stage of acquisition from beginning to end of the experiments were included and analyzed.



## Appendix B: Stories for the production study

### B.1 Hebrew:

#### I.

1. Ha-nesixa ve ha-namer hit'ayfu.
2. Hem rocim lishon.
3. Ha-nesiha mexasa et ha-namer.
4. Ha-nesixa mitkasa.

#### II.

1. Ha-nesixa ve ha-namer yeshenim.
2. Ha-nesixa hitorera.
3. Ha-nesixa mitlabeshet.
4. Ha-nesixa malbisha et ha-namer
5. Ha-nesixa loveshet le namer et ha-xulca.

#### III.

1. Ha-nesixa ve ha-namer yacu le tiyul.
2. (Pit'om) ha-geshem yarad.
3. Ha-nesiha hitratva!
4. (Axshav)h a-nesixa mitnagevet.

#### IV.

1. Ha-oxel hitxamem '.
2. Ha-namer ox'el (pasta).
3. Ha- namer hitlaxlex.
4. Ha- namer mitraxec.
5. Ha- namer roxec yadaim.

#### V.

1. Ha- namer menadned et ha-nesixa.
2. Ha-nesixa mitnadnedet.
3. (Pit'om) ha-nesixa nafla.
4. Ha-nesiha hitlaxlexa!
5. (Axshav) ha-nesixa mitraxecet.

#### VI.

1. Ha-nesixa mitkonehet le mesiba.
2. Ha-nesixa mistareket.
3. Ha-nesixa mitaperet.
4. Ha-nesixa muxana!
5. Ha-nesixa holexet le mesiba.

## **B.2 French:**

### *L'histoire 1*

1. La princesse et le tigre se sont fatigués.
2. Ils vont dormir.
3. (D'abord) La princesse couvre le tigre.
4. (Ensuite) La princesse se couvre.

### *L'histoire 2*

1. La princesse et le tigre dorment.
2. La princesse se réveille.
3. (D'abord) La princesse s'habille.
4. (Ensuit) la princesse habille le tigre.

### *L'histoire 3*

1. La princesse et le tigre se promènent.
2. (Brusquement) La pluie est tombée.
3. Oh! La princesse s'est mouillée.
4. (Maintenant) La princesse s'essuie.
5. (Là) La princesse s'essuie les cheveux.
6. (Là) Le tigre essuie les cheveux (de la princesse).

### *L'histoire 4*

1. La princesse réchauffe le repas.
2. Le tigre mange.
3. Oh! Le tigre s'est sali.
4. (Là) Le tigre se lave.
- 5/6. Le tigre se lave le visage/les mains.

### *L'histoire 5*

1. Le tigre se balance.
2. (Brusquement) le tigre est tombé.
3. Le tigre se touche (la tête).
4. Il a mal.

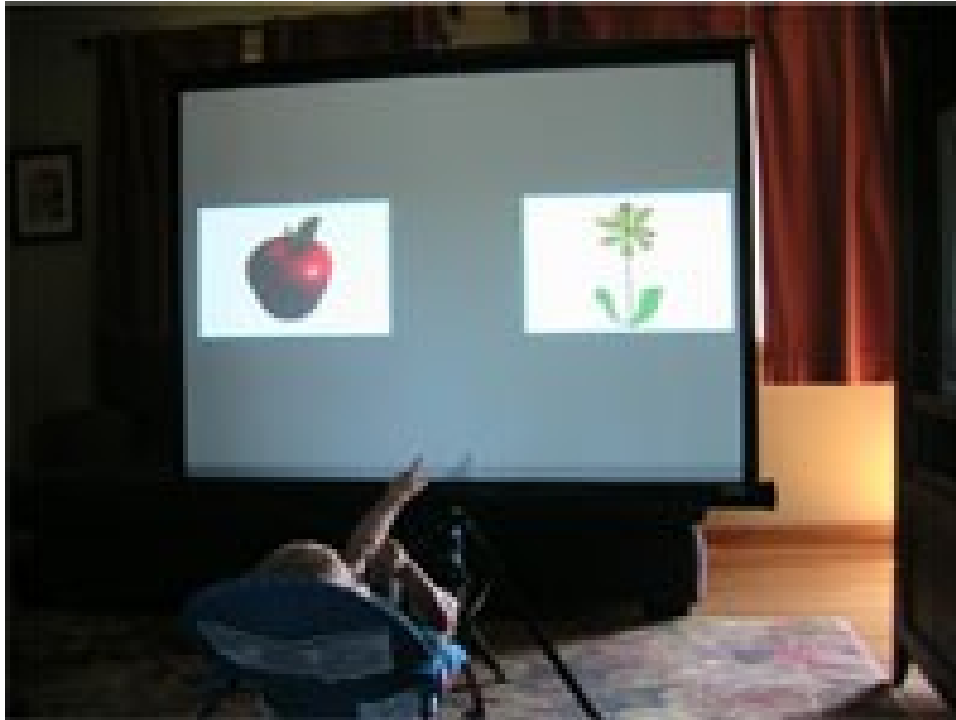
### *L'histoire6*

1. Le Tigre dessine.
2. (D'abord) le Tigre dessine la princesse.
3. (Après) le Tigre se dessine.

### *L'histoire 7*

1. Le Tigre n'est pas content.
2. Le Tigre ne se comporte pas bien.
3. (D'abord) Le Tigre a mordu le lapin.
4. (Ensuite) le Tigre s'est mordu.

## Appendix C: Preferential-Looking Paradigm



Picture 1: Child Watching Videos at Home (from [www.cll.uconn.edu/ipl.html](http://www.cll.uconn.edu/ipl.html))

## Appendix D: Russian idioms with reflexive verbs

### **umyvatsja krov'ju**

wash-refl blood-Instr.

'To wash one's face with blood.'

**Idiomatic:**

1. 'To fight in order to defend something.'
2. 'To be beaten.'

### **umyvatsja potom**

wash-refl sweat-Instr.

'To wash one's face with sweat.'

**Idiomatic:** 'To work very hard.'

### **sobiratsja s duxom**

gather-refl with spirit

'Gather oneself with spirit.'

**Idiomatic:** 'Pull oneself together.'

### **sobiratsja s mysljami**

gather-refl with thoughts

'Gather oneself with thoughts.'

**Idiomatic:** 'Collect one's thoughts.'

### **kupatsja v krovi**

bath-refl in blood

'Bathe oneself in blood.'

**Idiomatic:** 'To kill/be responsible for killing many people.'

### **kupatsja v slave**

bath-refl in glory

'To bathe oneself in glory.'

**Idiomatic:** 'To be very famous.'

### **oblivatsja slezami**

shower-refl tears-Instr.

'To shower oneself with tears.'

**Idiomatic:** 'To melt into tears.'

### **oblivatsja potom**

shower-refl sweat-Instr.

'To shower oneself with sweat.'

**Idiomatic:** 'To work very hard.'

### **vytjagivat'sja v strunku**

stretch-refl into string

'To stretch oneself into a string.'

**Idiomatic:** 'To stand stiffly erect; to stand at attention.'

## Appendix E: The set of reflexive verbs in Russian

verb	gloss
1. brit'sja	shave-refl
2. vooruzhat'sja	arm-refl
3. myt'sja	wash-refl
4. umyvat'sja	wash-refl (only the face)
5. mylit'sja / namylivat'sja	soap-refl
6. odevat'sja	dress-refl
7. pereodevat'sja	change clothes-refl
8. razdevat'sja	undress-refl
9. prichjosyvat'sja / raschjosyvat'sja	comb-refl
10. smorkat'sja	blow-nose refl
11. dushit'sja	put perfume on oneself
12. sobirat'sja	gather, assemble-refl.
13. trenirovat'sja	train-refl
14. razoruzhat'sja	disarm-refl
15. zashhishhat'sja	defend-refl
16. nakryvat'sja / ukryvat'sja	cover-refl
17. grimmirovat'sja	make-up-refl
18. narjazhatsja	dress up-refl
19. kupat'sja	bathe-refl
20. prjatat'sja	hide-refl
21. obuvat'sja	put on one's shoes
22. strich'sja	cut hair-refl.
23. zastrelit'sja	kill-refl by shooting
24. utopit'sja	drown-refl
25. veshat'sja/povesit'sja	hang-refl
26. rumjanit'sja	put on rouge-refl
27. krasit'sja	colour-refl. (hair/make-up)
28. pudrit'sja	powder one's face
29. belit'sja	whiten, put ceruse on-refl.

30. ukrashat'sja	adorn-refl
31. oblivat'sja	shower / spill over oneself
32. snarjazhat'sja	equip-refl
33. okunat'sja	plunge-refl
34. ochishhat'sja	clean-refl
35. otrjaxivat'sja	shake off-refl
36. pristegivat'sja	fasten-refl.
37. obnazhat'sja	strip oneself naked
38. oblokachivat'sja	lean one's elbow
39. vybrosit'sja	throw oneself out
40. pripodnimat'sja / podnimat'sja	raise oneself
41. oblizyvat'sja	lick-refl
42. vytjagivat'sja	stretch-refl
43. prigotovit'sja / podgotovit'sja	get oneself ready for
44. prixorashivat'sja	doll oneself up
45. rasfufyrvat'sja	dress oneself up
46. zakutat'sja / ukutat'sja	wrap-refl
47. oblekat'sja	dress/shape oneself in
48. sovat'sja	butt in
49. vtisnut'sja	squeeze, press oneself (into something)
50. vsunut'sja	shove oneself (into something)
51. vyprjamat'sja	straighten oneself
52. rasprjamat'sja	straighten oneself up
53. potjanut'sja	stretch oneself
54. naprjachsja	strain oneself
55. uperet'sja	set oneself (against something)
56. otodvinut'sja	push oneself backwards
57. podvinut'sja	move oneself
58. pridvinut'sja	draw oneself near something
59. prodvinut'sja	advance oneself
60. ustroit'sja	settle down
61. nagnut'sja	bend oneself

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