PHONOLOGICAL INTERFERENCE WITH MORPHO-SYNTACTIC GUIDELINES:
THE ACQUISITION OF HEBREW VERB INFLECTIONAL SUFFIXES

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(1)　*Introduction*

　　a.　In this talk, I concentrate on the order of the acquisition of three verb inflectional (agreement) suffixes in Hebrew:

- *-im* 'ms.pl. Present'
- *-a* '(3rd pr.) fm.sg. Present and Past'
- *-ti* '1st pr. Past'

　　b.　Why do I find it interesting?

Because data from a longitudinal study of two typically developing Hebrew-acquiring children reveal inter-child variation

- SR (boy) acquired *-im* and *-a* at the same time, both before *-ti*
- RM (girl) acquired *-a* before *-ti*, and both before *-im*

　　c.　Why might this variation be disturbing?

Because morpho-syntactic theories predict that *-ti* (person) will be the last to be acquired among the three suffixes (they do not agree on the order of *-im* (number) and *-a* (gender))

　　d.　The answer to these puzzling data is encountered in the phonological development, in particular the development of word final codas

- SR's development of word final codas synchronized with his morphological development, thus allowing him to follow the morpho-syntactic guidelines
- RM's development of word final codas was slower than her morphological development. When she was supposed to produce the codaed suffix (*-im*) her phonology was not ready for it, and she thus continued with her morphological development, holding on to the codaed suffix (*-im*) and producing the next in line codaless suffix (*-ti*)

　　e.　I thus argue that morpho-syntax provides the children with guidelines, but phonology may interfere to the effect of violating these guidelines

　　f.　Organization of the talk

- Language background (2)
- Morpho-syntactic predictions (3)
- Data:　　• Research method (4)
　　　　　　• Morphological development (5)
- Arguments:• Phonological interference (6)
　　　　　　• (A-)synchronization (7)
　　　　　　• Selectivity and grammatical distinctions (8)
- (Soft) OT analysis (9)
- Concluding remarks (10)

(2) *Relevant language background*

    a.   Hebrew verb inflectional suffixes

	Past		**Present**		**Imperative**	
Sg. 1	***-ti***		Sg. ms. {}		Sg. ms. {}	{ } indicates
2 ms.	*-ta*					the absence of a suffix
2 fm.	*-t*		fm. *-et*, ***-a***		fm. *-i*	
3 ms.	{}					Imperative includes future
3 fm.	***-a***					
Pl. 1	*-nu*		Pl. ms. ***-im***		Pl. *-u*	
2	*-tem*					
3	*-u*		fm. *-ot*			

    b.   Sample paradigms

	Past			**Present**		
Stem	*-ti*	*-a*	**Stem**	*-im*	*-a*	
ba	bá-ti	bá-a	ba	ba-ím	bá-a	'come'
sam	sám-ti	sám-a	sam	sam-ím	sám-a	'put'
baxá	baxí-ti	baxt-á	boxé	box-ím	box-á	'cry'
hevi	hevé-ti	heví-a	meví	mevi-ím	mevi-á	'bring'

(3) *Morpho-syntactic predictions*

    a.   Morphological theory (Harley and Ritter 2001) predicts Number > Gender

        ▪ Morphological features are hierarchically organized, incorporating (as in phonological feature geometry) markedness relations
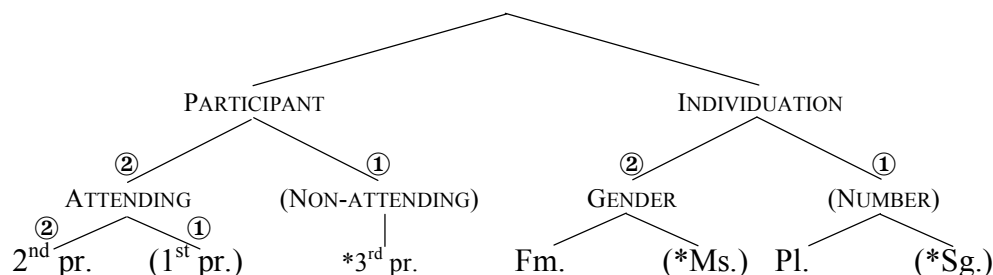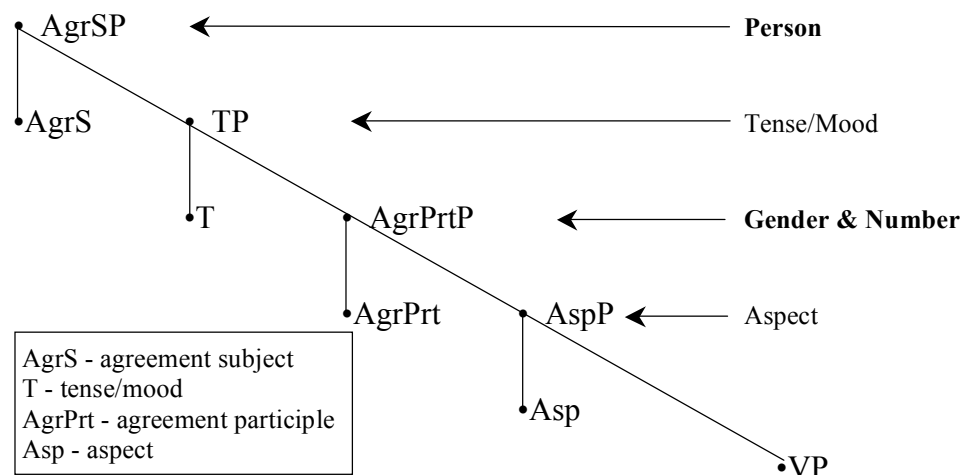

        Parenthesis - unmarked category. * - a category without a corresponding suffix in Hebrew

        ▪ Number > Gender is based on universal typology

        Greenberg (1963) – Universal 32: "Whenever a verb agrees with a nominal subject or object in gender it also agrees in number"

b. Syntactic theory I (Armon-Lotem 2006) predicts Number&Gender > Person

▪ Hebrew phrase marker tree

AgrSP ← **Person**

AgrS · TP ← Tense/Mood

·T AgrPrtP ← **Gender & Number**

·AgrPrt AspP ← Aspect

·Asp

·VP

> AgrS - agreement subject
> T - tense/mood
> AgrPrt - agreement participle
> Asp - aspect

▪ "The children use minimalist bottom-up trees, starting with the smallest subset of possible trees … and gradually building up the tree, using AgrPrt for gender and number, then TNS, and only later AgrS for person agreement" (Armon-Lotem 2006:62)

c. Syntactic theory II (Shlonsky 1989) predicts Gender > Number > Person

▪ The structure of agreement

Person"

Person'

Person · Number"

Number'

Number · Gender"
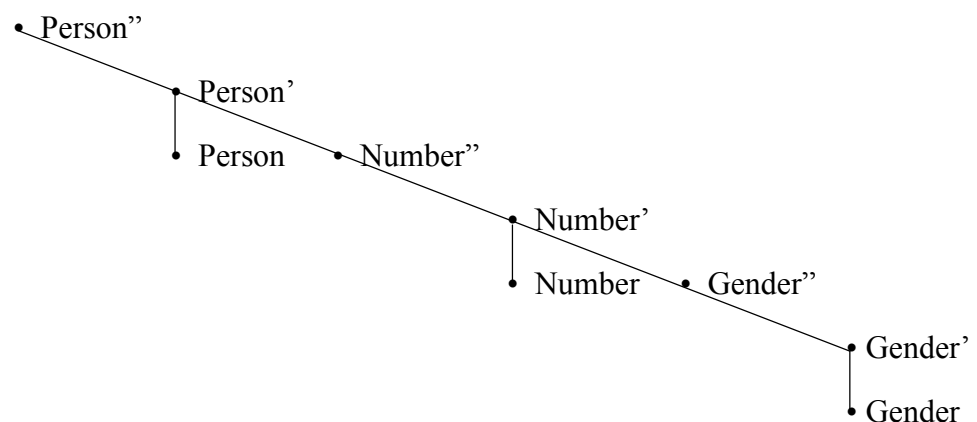
Gender'

Gender

▪ The structure is based on the generalization that there is no verb in Hebrew "which is marked for number and not marked for gender and no verb which is marked for person but not marked for number" (Shlonsky 1989:5)

d. Summary

▪ The theories *disagree* with regard to the order of **number** and **gender**

▪ Number > Gender – Morphological theory

▪ Number = Gender – Syntactic theory I

▪ Gender > Number – Syntactic theory II

▪ The syntactic theories *agree* with regard to the order of **number** and **person** (the morphological theory is mute with regard to this pair)

Number > Person

(4) *Methodology*

    a.   *Data collection*

- The data are drawn from a longitudinal study of two monolingual, typically developing Hebrew-acquiring children

- The productions were drawn from natural speech and picture/object naming, recorded once a week in the children's natural environment

    b.   *Developmental evaluation*

- In order to display a gradual development and a cross-subject comparison, the data are divided into periods, according to the number of cumulative target verbs attempted by the child, i.e. the production verb lexicon (see Appendix A for period-age correlation

- Each period consists of 10 new attempted verbs

- For both children, the studied time-span goes up to 184 cumulative attempted target verbs

Time span with reference to age:

	1st verb	184 verbs	No. of sessions
SR	1;03.14 - 2;02.22		47
RM	1;04.02 - 2;05.29		52

    c.   Criteria for determining order of acquisition

- *Precedence*: Suffix X is acquired before suffix Y, if the verb lexicon at the first productive production of X is smaller than that of the first productive production of Y

- *Quantity*: Suffix X is acquired before suffix Y, if X is produced more times than Y

    d.   *Productivity*: In counting the inflectional suffixes, only productive suffixes were considered, adopting a rather permissive measure of productivity

A suffix $(X+Suf_i)$ is productive if

- it appeared earlier or during the same session with another verb stem $(Y+Suf_i)$, or

- the base of the suffix appeared earlier or during the same session without a suffix (X) or with another suffix $(X+Suf_j)$

- Agreement mismatches were included (e.g. *-a* in *sus dahar-á* 'horse ms. galloped fm.), and thus I only excluded suspected rote learned suffixed forms

    e.   *Quantity*: The quantity criterion had two types of counts

- *Types per session*: The sum of types per session $X+Suf_i$ was produced throughout the time-span, where the same type can appear more than once if produced in different sessions

- *Total types*: The sum of types produced during the time-span, where each type is counted only once regardless of the number of attempts

(5) *Results* (see Appendix B for sample data)

    a. Number and person (see Appendix D for graphs)

		SR			RM		
		-im	>	*-ti*	*-ti*	>	*-im*
Age		1;06.02	>	1;09.00	1;10.28	>	1;11.18
Period - verb lexicon[1]		III - 28	>	VII - 70	IV - 38	>	V - 45
Total types per session[2]	N	64	>ns	38	117	>*	53
	%	24.81%		14.73%	21.71%		9.83%
			ns$p$=0.09			*p=0.005	
Total types	N	39	>	27	42	>	33
	%	21.20%		14.67%	22.83%		17.93%

[1] Verb lexicon: The number of CATVs until the relevant session

[2] % of total types per session (4e): $\dfrac{\text{total types per session of the relevant suffix}}{\text{total types per session of all suffixed forms*}}$

                      *(SR - 258 , RM - 539)

[3] % of total types (4e): $\dfrac{\text{total types of the relevant suffix}}{\text{total types*}}$ *(184 for both children)

Stats – two tailed paired t-test

    b. Number and gender

		SR			RM		
		-a	=	*-im*	*-a*	>	*-im*
Age		1;06.02	=	1;06.02	1;09.10	>	1;11.18
Period - verb lexicon		III - 28	=	III - 28	III - 22	>	V - 45
Total types per session	N	76	>ns	64	108	>*	53
	%	29.46%		24.81%	20.04%		9.83%
			ns$p$=0.38			*p=0.004	
Total types	N	34	<	39	34	>	33
	%	18.48%		21.20%	18.48%		17.93%

    c. Results against morpho-syntactic predictions

        ▪ Predictions: ▪ Morphological theory: *-im > -a*

                      ▪ Syntactic theory I: *-im, -a > -ti*

                      ▪ Syntactic theory II: *-a > -im > -ti*

        ▪ Results: ▪ SR: *-im, -a > -ti* – follows syntactic theory I

                      ▪ RM: *-a > -ti > -im*

                      -a > -im – follows syntactic theory II

                      -a > -ti – follows syntactic theory I and II

                      -ti > -im – does not follow any theory

                  ▪ Neither child seems to support the morphological theory, which may suggest that the universal typology does not hold here. See, however, (9c) below

(6) *Phonological interference*

    a. <u>Phonological and morphological development</u>

P	SR			RM		
	Faithful codas		**Suffix**	**Faithful codas**		**Suffix**
I	68.60%	(59/86)	(-*i*)*	44.58%	(37/83)	-*i*
II	88.89%	(80/90)		66.94%	(83/124)	
III	**93.15%**	(68/73)	-*a*, **-*im***	83.81%	(88/105)	-*a*
IV	97.25%	(106/109)		87.29%	(103/118)	**-*ti***
V	95.95%	(142/148)	-*et*	**89.71%**	(157/175)	**-*im***, -*et*
VI	100.00%	(187/187)		82.02%	(73/89)	
VII	99.00%	(296/299)	**-*ti***	86.87%	(86/99)	

Faithful codas: <u>productions with codas</u>
                targets with codas

P – period (see Appendix A for period-age correlation)

    b. Similarities

- All suffixes, except -*im* and -*ti*, were acquired by both children during the same periods: -*i* – P-I, -*a* – P-III, -*et* – P-V

  *SR's productions of the feminine imperative suffix -*i* were rare. This is probably due to gender distinction (see Uziel-Karl 2001)

-*i*	SR	RM	(see Appendix C for percentages)
Type per session	11	110	
Total type	7	36	

- Both children started producing the codaed suffix -*im* when they reached about 90% of faithful codas. That is, **the production of the codaed suffix was conditioned by phonological development**

    c. Differences

- Phonological development (word final coda) – SR faster than RM

  SR reached about 90% faithful codas at P-III, while RM at P-V

- Morphological development (acquisition of suffixes) – RM faster than SR

  RM acquired all the five suffixes at P-V, while SR at P-VII

(7) *Phonology-morphology (a-)synchronization*

    a.
- The development of SR's phonology and morphology was synchronized

  At the period where he started producing inflectional suffixes, his phonology allowed him to produce the codaed suffix -*im*, as required by the morpho-syntactic guidelines

- The development of RM's phonology and morphology was **not** synchronized

  At the stage where she started producing inflectional suffixes, her phonology had not yet developed to allow her to produce the codaed suffix required by the morpho-syntactic guidelines. In the meantime, she continued her morphological development, producing codaless suffixes

b. (A-)synchronization

	I	II	III	IV	V	VI	VII
SR: Phonology			90% FC				
Morphology	*(-i)*		*-a, -im*		*-et*		*-ti*
RM: Phonology					90% FC		
Morphology	*-i*		*-a*	*-ti*	*-im, -et*		

c. Note that RM's a-synchronization is due to the combination of slow phonological development and fast morphological development (cf. with SR). Only slow phonological development (shown below) could lead to the expected order of acquisition (syntactic theory II)

	I	II	III	IV	V	VI	VII
Phonology					90% FC		
Morphology	*-i*		*-a*		*-im, -et*		*-ti*

d. A methodological note

- The rate of development is evaluated with reference to the size of the verb lexicon (i.e. periods).

- With reference to age, SR was faster than RM in both phonological and morphological development

		SR	RM	
Phonology:	90% word final coda	-1;06.12	-1;11.25	
Morphology:	Production of *-ti*	1;09.00	1;10.28	
	All suffixes in (6a)	5ms16ds	7ms 23ds	ms = months
		1;03.14-1;09.00	1;04.02-1;11.25	ds = days

- Many of the observations obtained with a period-based comparison would not be observable with an age-based comparison

  - An age-based comparison would fail to detect the similarity between the two children with regard to all suffixes except *-im* and *-ti*, i.e. that they were acquired at the same period (6b)

  - An age-based comparison would fail to detect RM's a-synchronization, as she is slower than SR in both phonological and morphological development

e. Further questions on (a-)synchronization (without answers)

- A-synchronization among layers of phonological representation (prosodic word, syllable, segment), have been argued to be the source of atypical phonological development (Bat-El 2009)

- The question left open for further study is at which point phonology-morphology a-synchronization becomes pathological (recall that RM is a typically developing child)

- Do we expect to find an atypically developing child with a very late coda development, who produces all codaless suffixes before codaed ones? For example, do we expect to see *-ta* '2nd pr. ms. Past' before *-im* 'ms. pl. Present'?

f. So far I showed that:

- Phonological development affects morpho-syntactic development

- The condition under which the effect is visible is phonology-morphology a-synchronization

g. The next question: Why did RM (and SR) wait for about 90% faithful codas in order to start producing the verb's codaed suffix?

(8) *Selectivity*

a. Children are selective learners, discriminating among target words according to their phonological grammar (Ferguson and Farwell 1975, Schwartz 1988) and prefer to attempt those that have a smaller processing load (Becker 2007), i.e. avoiding (not entirely) target-output mismatches, which require amendment (see also Lustigman 2007 for category-based selectivity in morphological development)

- The first 10 target words attempted by children are hardly ever trisyllabic. In general, trisyllabic targets are rare during early phonological stages

- Hebrew-acquiring children show preference for the unmarked trochaic foot, not only in their productions but also in their attempted targets (Adam and Bat-El 2008). Note that Hebrew words are predominantly iambic

b. Selectivity and category-distinction

When children start producing a new grammatical form (suffix, lexical category, and even a two-word phrase), they take a step back with their grammar

Morph Cat A: $\boxed{G1}$ ⇨ $\boxed{G2}$ ⇨   … Gn

Morph Cat B: $\boxed{G1}$ ⇨ $\boxed{G2}$ ⇨ … Gn

- [G1] No Coda >> Faith ⇨ [G2] Faith >> No Coda

    First G1 ⇨ G2 in stems and then G1 ⇨ G2 in suffixed forms (presented above)

- [G1] No Complex coda >> Faith ⇨ [G2] Faith >> No Complex coda

    First G1 ⇨ G2 in stems and then G1 ⇨ G2 in suffixed forms

    At the stage where English-acquiring children already produce complex codas in stems (e.g. *boks* 'box') they may still avoid complex codas in suffixed forms (e.g. *socks*) (Bernhardt and Stemberger 1998). That is, the plural suffix first appears in vowel final stems (e.g. *keys*)

- [G1] Trochee >> Faith, Iamb ⇨ [G2] Faith >> Trochee > Iamb

    First G1 ⇨ G2 in nouns and then G1 ⇨ G2 in verbs

    Hebrew-acquiring children prefer the trochaic foot, evidenced by the early acquisition of nouns (Adam and Bat-El 2008). However, also when they start producing verbs, there is evidence for the preference of the trochaic foot (Bat-El 2007), although in nouns there is already a shift to the iambic foot given preference for iambs in the target language

- When children start producing two-word phrases, their phonological representation is less marked (Waterson 1978)

c. RM's selectivity

- Stems vs. suffixed verbs

    Stem:　　　　　　| No Coda >> Faith | ⇨ | Faith >> No Coda |

    Stem+suffix:　　　　　　　　　| No Coda >> Faith | ⇨ | Faith >> No Coda |

- Nouns vs. verbs

    Before producing *-im* in verbs, RM produced 7 noun types with a plural suffix (*-im* or *-ot*), 5 of which were produced productively, i.e. their singular counterpart was also produced

	Plural			Singular		
	Target	**Child**		**Target**	**Child**	
1;07.10	kubiyót	bot	1;07.10	kubijá	eja	'building block'
1;08.27	parparím	paparím	1;06.26	parpár	papá	'butterfly
1;10.00	enáim	ením	1;10.00	áin	—	'eye'
1;10.00	sikót	tot,θitót	1;09.10	siká	ta,šiká	'pin'
1;10.28	searót	šeót	1;10.28	seará	—	'hair'
1;10.28	igulím	ugaím	1;10.28	igúl	ikúl	'circle'
1;10.28	madbekót	mašekót	1;10.28	madbeká	abeká	'stickers'

    Notice, in particular, the plural noun *enáim* 'eyes', with the dual suffix *-áim*. Although she has not produced the singular counterpart *áin*, the plural suffix *-im* in her production *ením* supports the productivity of this suffix

d. Selectivity: Summary

- RM distinguished between **stem codas** and **suffix codas**

    She avoided the codaed suffix *-im* until she reached about 90% faithful codas

- RM distinguished between **noun -im** and **verb -im**

    She started producing *-im* in verbs 3 months after her first production of *-im* in nouns

- RM preferred **avoiding** the suffix *-im* rather than **amending** it, thus reducing the processing load (Becker 2007) required for consonant deletion

    There were only two productions of *-im* without the coda, but way after she started producing the suffix: *šomím* 'hear ms.pl.' → *semí* (2;03.14) and *rocím* 'want ms.pl' → *rocí* (2;05.09)

- **Avoidance indicates knowledge** (Borer and Rohrbacher 2002, Adam and Bat-El 2008)

(9)   *OT Approach*

Optimality Theory (Prince and Smolensky 1993/2004) allows the interaction of phonological and morphological constraints, and thus can be used as a formal model to express the interface of phonology and morphology, and more so the effect of phonological development on morphological development

a.   Constraints

  ▪   Morpho-phonological: NOCODA^{SUFF} – A suffix does not have a coda

  ▪   Morphological: ATTACH^{SUFF} – acts upon morpho-syntactic guidlines

  ▪   I ignore here the low-ranked constraint that does not allow codas in general (NOCODA) and the high-ranked constraint that does not allow deleting segments at the right edge of the word (ANCHORWORDR) and thus eliminates plural forms without the final *m*.

b.   Constraint interaction

  ▪   NOCODA^{SUFF} >> ATTACH^{SUFF} a suffix with a coda is not allowed

  ▪   ATTACH^{SUFF} >> NOCODA^{SUFF} a suffix with a coda is allowed

c.   Morphological theory: Number > Gender > Person

SR	Syntax		-im	-a	-et	-ti		
	Number	-im	–				NOCODA^{SUFF} >> ATTACH^{SUFF}	*For -et, see
III	Gender	-a, -et	√	√	*		ATTACH^{SUFF} >> NOCODA^{SUFF}	Lustigman
V					√			(2007)
VII	Person	-ti	√	√	√	√		

RM	Syntax		-im	-a	-et	-ti	
	Number	-im	–				NOCODA^{SUFF} >> ATTACH^{SUFF}
III	Gender	-a, -et	√	–			
IV	Person	-ti			√		
V			√	√	√	√	ATTACH^{SUFF} >> NOCODA^{SUFF}

* SR does not produce -et when expected, probably because at this stage there is one-to-one relation between form and function, and since he has the feminine -a there is no place for another feminine suffix

  ▪   The suffixes are called for in the order determined the morpho-syntax (pick your favorite theory), but they are produced only when the phonology is ready

  ▪   Note that phonology does not allow number to precede gender. However, the morphological theory predict that a child with fast phonology and slow morphology would produce number before gender

Syntax		-im	-a	-et	-ti	
						NOCODA^{SUFF} >> ATTACH^{SUFF}
Number	-im	√				ATTACH^{SUFF} >> NOCODA^{SUFF}
Gender	-a, -et		√			
				√		
Person	-ti				√	

That is, the morphological theory does hold, but the phonology does not allow it to be manifested

(10) *Summary & Conclusion*

    a.   RM, a typically developing child, did not follow the order of acquisition predicted by the syntax (*-im* before *-ti*). Why?

- There is **a-synchronization** in RM's development, between phonology (slow) and morphology (fast)

- RM followed the morpho-syntactic guidelines, but **selected** only those suffixes that conform to her phonological grammar (so did SR, but in the absence of a-synchronization there is no evidence for selectivity)

- Selectivity is **category specific**, and the phonological grammar of the early suffixes is that of an earlier stage, as is usually the case with new components

    b.   Final word: Early morpho-syntactic development must be viewed in light of phonological development – **phonological restrictions may distort the morpho-syntactic guidelines**

REFERENCES

Adam, G. and O. Bat-El. 2008. Morphological knowledge without morphological structure. In S. Armon-Lotem, G. Danon, and S. Rothstein (eds) *Current Issues in Generative Hebrew Linguistics*. Amsterdam: John Benjamins. 197-222.

Adam, G. and O. Bat-El. 2009. When do universal preferences emerge in language development? The acquisition of Hebrew stress. *Brill's Annual of Afroasiatic Languages and Linguistics* 1:1-28.

Armon-Lotem, S. 2006. Subject use and the acquisition of verbal agreement in Hebrew. In N. Gagarina and I. Guelzow (eds) *Acquisition of Verb Grammar and Verb Arguments*. Dordrecht: Kluwer Academic Publishers. 269-291.

Bat-El, O. 2007. Category-specific phonology in adult and child Hebrew. A paper presented in *OCP 4*, Rhodes.

Bat-El, O. 2009. Harmonic domains and synchronization in typically and atypically developing Hebrew-speaking children. *Language Sciences* 31:117-135.

Becker, M. 2007. Prudent error-driven learning with OT-CC. A paper present in NecPhon 1, UMass.

Borer, H. and B. Rohrbacher. 2002. Minding the absent: Arguments for the Full Competence Hypothesis. *Language Acquisition* 10:123-175.

Bernhardt, B. and Stemberger, J. 1998. *Handbook of phonological development*. London: Academic Press.

Ferguson, C. and C. Farwell. 1975. Words and sounds in early language acquisition. *Language* 51:419-439.

Greenberg, J. 1963. Some universals of grammar with particular reference to the order of meaningful elements. In J. Greenberg (ed.) *Universals of Language*. Cambridge, MA: MIT Press. 73-113.

Harley, H. and E. Ritter. 2002. Person and number in pronouns: A feature-geometric analysis. *Language* 78:45-69.

Lustigman, L. 2007. Selectivity in Early Child Grammar: The Case of Hebrew Verb Morphology. MA thesis, Tel-Aviv University.

Prince, A. and P. Smolensky. 2004. Optimality Theory: Constraint interaction in generative grammar. Oxford, Basil Blackwell. [1993, TR 2, Rutgers University Cognitive Science Center].

Schwartz, R. 1988. Phonological factors in early lexical acquisition. Michael Smith and John Locke (eds) *The Emergent Lexicon: The Child's Development of a Linguistic Vocabulary*. San Diego: Academic Press. 185-222.

Shlonsky, U. 1989. The hierarchical representation of subject verb agreement. Ms., University of Geneva.

Uziel-Karl, S. 2001. *The Multidimensional Perspective on the Acquisition of Verb Argument Structure*. MIT, Ph.D. dissertation.

Waterson, N. 1978. Growth of complexity in phonological development. In N. Waterson and C. Snow (eds) The development of communication. Chichester: Wiley. 415-442.

APPENDIX A: Period–age correlation (CATV - number of cumulative attempted target verbs)

	SR (47 sessions)			RM (52 sessions)		
Period	**Age**		**CATV**	**Age**		**CATV**
I	*1;03.14 - 1;05.04		9	*1;04.02 - 1;06.26		9
II	1;05.08 - 1;05.21		17	1;07.03 - 1;08.27		21
III	1;05.29 - 1;06.12		30	1;09.10 - 1;09.27		31
IV	1;06.20 - 1;06.26		39	1;10.06 - 1;10.28		38
V	1;07.02 - 1;07.09		49	1;11.18 - 1;11.25		48
VI	1;07.17 - 1;07.23		60	2;00.02 - 2;00.02		57
VII	1;08.03 - 1;09.00		70	2;00.09 - 2;00.09		70
↓						
XVII	- 2;02.22		184	- 2;05.29		184

* Age of first verb

APPENDIX B: Sample data

-im 'ms. pl. Present'

Child	Target		
koθím	kofcím	'jump'	SR (1;06.02)
falím	noflím	'fall'	SR (1;08.17)
θajrím	mecajrím	'paint'	SR (1;10.26)
olxím	olxím	'go'	SR (1;11.22)
štefím	šotfím	'wash'	RM (2;00.09)
samím	samím	'put'	RM (2;03.24)
edagvím	menagvím	'wipe'	RM (2;04.19)
oxlím	oxlím	'eat'	RM (2;05.09)

-ti '1st pr. sg. Past'

Child	Target		
báti	báti	'came'	SR (1;00.09)
θagáti	sagárti	'closed'	SR (1;11.02)
ibalbálti	itbalbálti	'confused'	SR (2;00.21)
badákti	badákti	'checked'	SR (2;02.06)
esáti	macáti	'found	RM (1;10.28)
ijámti	sijámti	'finished'	RM (2;00.16)
tefáfti	tafásti	'caught'	RM (2;00.30)
asíti	asíti	'did'	RM (2;02.04)

-a 'fm. sg. Present'

Child	Target		
boxá	boxá	'cries'	SR (1;08.10)
oxelá	oxélet	'eats'	SR (1;09.27)
oθá	osá	'does'	SR (1;11.06)
aðiká	maxzika	'holds	SR (2;01.06)
šená	ješená	'sleeps'	RM (1;09.10)
bodá	boná	'builds'	RM (2;02.04)
joxolá	jexolá	'can'	RM (2;03.29)
mešgišá	margišá	'feels'	RM (2;04.19)

-a '3rd fm. sg. Past'

Child	Target		
afelá	naflá	'fell'	SR (1;07.09)
abrá	šavrá	'broke trn.'	SR (1;11.07)
niberá	nišberá	'broke int.'	SR (1;11.07)
paxtá	patxá	'opened'	SR (2;02.06)
ispará	nišberá	'broke int.'	RM (2;01.27)
netá	natná	'gave'	RM (2;02.11)
xlá	axlá	'ate'	RM (2;04.25)
sijrá	cijerá	'drew'	RM (2;05.29)

-et 'fm. sg. Present'

Child	Target		
xélet	oxélet	'eats'	SR (1;10.07)
koféθet	kofécet	'jumps'	SR (2;00.00)
miθaxéket	mesaxéket	'plays'	SR (2;01.06)
nofélet	nofélet	'falls'	SR (2;02.22)
péðet	mekapélet	'folds'	RM (1;09.27)
exepéset	mexapéset	'searches'	RM (2;02.25)
šutéfet	šotéfet	'washes'	RM (2;03.01)
évet	oévet	'loves'	RM (2;04.19)

-i 'fm. sg. Imperative/future'

Child	Target		
tazízi	tazízi	'move'	SR (1;05.04)
tisí	tišví	'sit'	SR (1;05.08)
bói	bói	'come'	SR (1;06.02)
tirí	tirí	'look'	SR (2;02.02)
kxi	kxi	'take'	RM (1;11.18)
teteftí	tiftexí	'open'	RM (2;02.25)
tetí	titní	'give'	RM (2;03.14)
texakí	texakí	'wait'	RM (2;04.19)

APPENDIX C: All suffixes

Suffix		SR TPS		SR TT		RM TPS		RM TT	
-i	'fm.sg. Imperative'	11	4.26%	7	3.80%	110	20.41%	36	19.57%
-a	'(3) fm.sg. Past & Present'	76	29.46%	34	18.48%	108	20.04%	34	18.48%
-im	'ms.pl. Present'	64	24.81%	39	21.20%	53	9.83%	33	17.93%
-ti	'1st sg. Past'	38	14.73%	27	14.67%	117	21.71%	42	22.83%
-et	'fm.sg. Present'	35	13.57%	19	10.33%	90	16.70%	41	22.28%
-u	'(3) pl. Past & Imperative'	30	11.63%	17	9.24%	12	2.23%	9	4.89%
-ot	'fm.pl. Present'	2	0.78%	2	1.09%	4	0.74%	4	2.17%
-t	'2nd fm.sg. Past'	2	0.78%	2	1.09%	19	3.53%	11	5.98%
-nu	'1st pl. Past'	–		–		26	4.82%	15	8.15%
Total		258				539			

TPS - type per session; TT - total type. % of total type is calculated out of a verb lexicon of 184 verbs
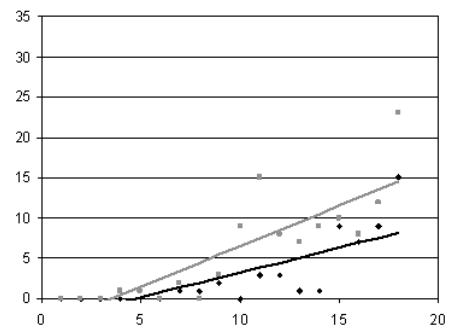
APPENDIX D
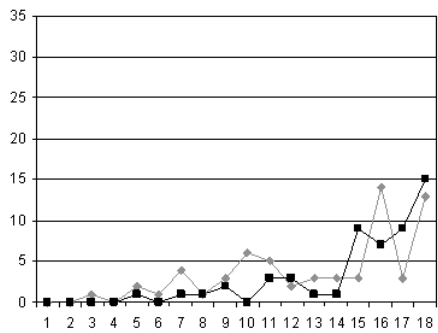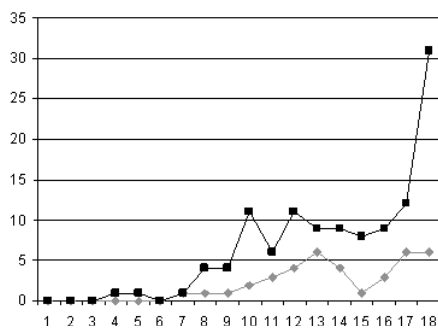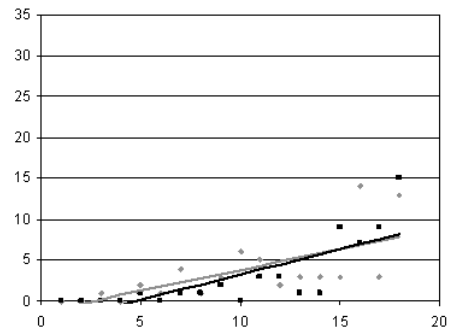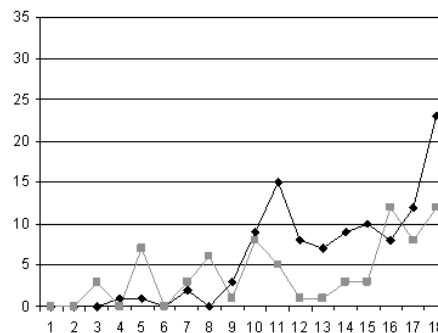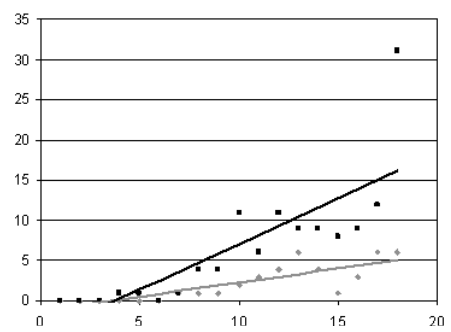
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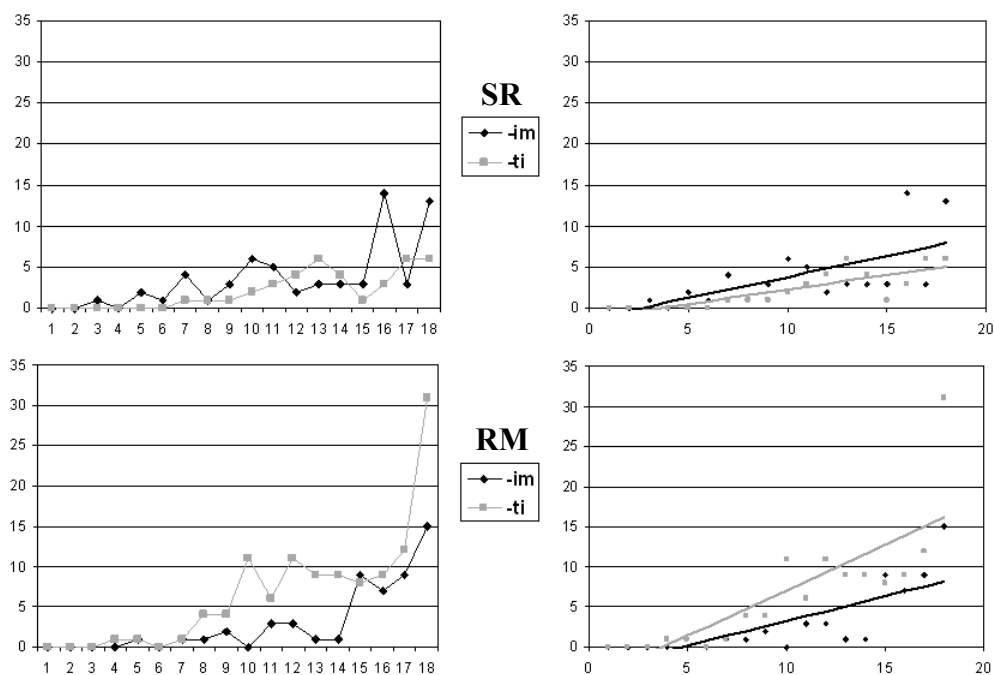
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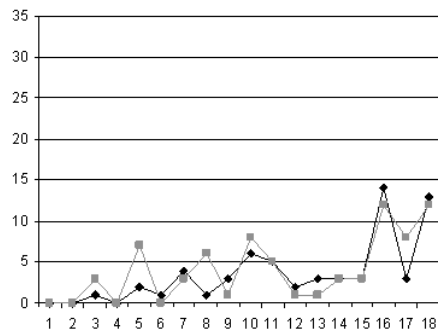
SR

RM

Cross-children

-im

-ti

-a