Modeling comprehension of deictic personal pronouns:
What are French children capable of?

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1. Children vs. adult grammars

Growing evidence shows that children grammars differ from adult target grammars along two dimensions, one is the nature of the optimization required in comprehension, the other is constraint ranking.

1. Adults integrate both speaker's and hearer's perspectives when interpreting language (e.g. word order, Hendriks, de Hoop, & Lamers 2005; anaphoric pronouns, Hendriks & Spenader 2005/6, indefinite noun phrase interpretation, de Hoop & Krämer 2005/6). They discard form-meaning associations that are not optimal in the opposite direction of optimization. They compute bi-directionally.
Children can't compute bi-directionally (until at least age 5-6) => They freely produce forms which they don't comprehend in context.

2. Constraint rankings are immature in young children, resulting in non-target like morphosyntax, e.g. root infinitives, reduced aspectual systems, etc. (e.g. Legendre, Hagstrom, Vainikka, & Todorova, 2002; Legendre, Hagstrom, Chen-Main, Tao, & Smolensky, 2004). Children appear to comprehend the forms that they do not systematically spontaneously produce.

2. Goal & plan of talk

Present evidence grounded in the semantics/pragmatics of deictic personal pronouns that child grammars are both uni-directional and immature w.r.t. constraint rankings.

1. Present an influential presuppositional analysis of personal pronouns from the theoretical semantics/pragmatics literature (Heim, 1991; Sauerland, 2008) and extract a prediction
2. Summarize existing production studies
3. Present a recent comprehension experiment (Legendre et al., 2010, GALANA)
4. Propose an OT analysis, investigating both the nature of the optimization and of the constraint ranking.

3. Presuppositional properties of personal pronouns

Using and interpreting personal pronouns requires establishing a relationship between a given utterance and an entity in the contextual environment. Reference resolution depends on extra-linguistic knowledge that is shared by the speaker and the hearer.

Heim (1991): Personal pronouns are made up of phi-features (person, number, gender) which are **presupposition triggers** (Heim 1991; Sauerland 2008):

1st and 2nd person pronouns have *lexical presuppositions* (core meaning):
- 1st presupposes the existence of the speaker (participant).
- 2nd presupposes the existence of the hearer (participant).

3rd person pronouns have an ***implicated presupposition***: **non-participant** (inferred)

(1) Semantic markedness scale (Sauerland, 2008):
1st [participant] [speaker] > 2nd [participant] > 3rd

→ e.g. Subject-verb agreement: X + Y = X, X is the more marked person

(2) 2nd + 3rd = 2nd
a. *Tanja und Du sollte-**t** miteinander reden*
T and you-sg should-**2pl** with each other talk
'Tanja and you should talk with each other'
b. *Pierre et toi (vous) devri-**ez** vous réconcilier*
P and you-sg (you-pl) should-**2pl** self reconcile
'Peter and you should reconcile with each other'

(3) 1st + 2nd = 1st
a. *Toi et moi **(nous)** sommes spéciaux*
you and I (we) are-**1pl** special
You and I, we are special.
b. *Du und ich sind einander noch nie begegnet*
you and I are.**1pl** each other yet never met.
'You and I haven't met yet.'

(4) Impersonal use of 3rd
Es regent/Il pleut 'it is raining'

Heim (1991) posits a grammatical principle (*Maximize Presupposition* or MaxPresup) which forces a speaker to use the expression associated with the strongest presupposition possible that is compatible with his/her knowledge.

(5) MaxPresup (Heim, 1991): Make your contribution presuppose as much as possible

This entails that during interpretation of 3rd person pronouns a hearer computes its implicated presupposition by comparing members of the person scale. This comparison of alternatives predicts that 3rd person pronouns are harder to acquire than 1st and 2nd person (the latter are expected to be learned on a par with other lexical restrictions).

4. Acquiring inferred meaning

Computing **scalar implicatures** is difficult for children (e.g. Novek 2001, Chierchia et al. 2001, etc.).

(6) **Some** giraffes have long legs. (pragmatically infelicitous)

Implicature Judgment Task (Novek 2001)
Age range: 31 8-year olds, 30 10-year-olds, 15 adults
Results: 7-9 year-olds are more likely than adults to accept (6).
Explanation: Children fail to generate the implicature 'not all giraffes…'

Lexical presuppositions (part of core meaning) are acquired before the implicated presupposition of anti-uniqueness associated with the universal quantifier *jeder* 'every'.

(7) a. *Jeder Onkel von mir sitzt auch auf einem Stuhl* (no uncle present in the picture)
every uncle of mine sits also on a chair
'Every uncle of mine is also sitting on a chair'

b. *Jeder Mutter von mir sitzt hier auf einem Stuhl.* (only one mother present in the picture)
every mother of mine sits here on a chair
'Every mother of mine is sitting on a chair here'

Presupposition Judgment task (Yatsushiro, 2008)
Results: 6-Six-year-old subjects accepted (7a) 90% of the time (=adult) whereas they rejected (7b) only 34% of the time (adults: 90%).
Explanation: The lexical presupposition of existence is acquired earlier than the implicated presupposition of anti-uniqueness

General Prediction:
3rd person pronouns should be more difficult to acquire than 1st and 2nd because they have an implicated presupposition (generated like scalar implicatures, by contrast with 1st and 2nd person).

5. Early production of French deictic personal pronouns

Longitudinal studies of child production have concluded that 3rd person singular pronouns typically emerge first in spontaneous speech, slightly ahead of 1st and 2nd person pronouns (e.g. Clark 1998; Hamann et al. 1996; Kaiser 1994; Pierce 1992).

Table 1. Age of first spontaneous use of singular personal pronouns

	1st	2nd	3rd
Grégoire	1;10	2;1	1;9
Nathalie	2;2	after 2;2	1;10
Daniel	1;8	after 1;11	1;8
Pascal (bilingual F-G)	2;5	2;5	2;3
Ivar (bilingual G-F)	2;5	2;5	2;3

Elicited production task targeting production of DP vs. 3rd person pronoun subjects (Jakubowicz & Rigaut 1997)
A story of daily life activities is told with pictures: 'What is X doing?' 'What is X doing to Y?'
Age range (3 groups based on MLU; I= Age 3, II: age 4; 12 monolingual children)

Table 2. Percentage of personal pronouns vs. DPs produced (out of all subject types)

	1st sg	2nd sg	3rd sg&pl	1st pl (*on*)	DP subjects
Group I	6.6%	2.6%	**40.5%**	3.9%	5.7%
Group II	19.4%	3.9%	**54.2%**	8.5%	6.4%

→ Children have no problem producing 3rd person pronouns (the 1st/2nd vs. 3rd asymmetry is due to the nature of the task)

6. What about comprehension?

Comprehension task (Legendre, Barrière, Goyet, & Nazzi, 2010): Fishing game involving 1 child and 2 experimenters fishing for pictures out of a basket and identifying by naming or pointing the objects selected by participants identified by a personal pronoun (*je/I, tu/you, elle/she*).
Age range: 30-month-olds; 16 monolingual children (one child was exposed to masc pronoun *il*)

Preparatory phase: All participants (two female experimenters and a child sitting on a parent's lap) were introduced until the child was comfortable identifying both experimenters. Pictures of correctly identified objects (e.g. *Montre-moi la vache* 'show me the cow') were placed in a basket.

<u>Familiarization phase</u> (talking to the child): The two experimenters and the child then picked one picture each out of the basket in preparation for the familiarization phase. Questions were asked when everyone was <u>still</u> in the process of fishing for a picture.

(8) Experimenter 1: Qu'est-ce que "nom de l'enfant" attrape? 'what is "CH's name" catching?'
Experimenter 2: Qu'est-ce-que "nom de Exp 1" attrape ? 'what is "Exp 1's name" catching?'
Experimenter 1: Qu'est-ce-que "nom de Exp 2" attrape? 'what is "name of Exp 2" catching?'

<u>Test phase</u>: Two singular blocks were run involving two rounds of fishing for new pictures out of the basket. The order of the questions (1st, 2nd, or 3rd person) was randomized across the two blocks. Answers were coded on-line.

(9) Experimenter 1: Qu'est-ce que <u>tu</u> attrapes? 'what are you catching?'
Experimenter 2: Qu'est-ce-que <u>j'</u> attrape? 'what am I catching ?'
Experimenter 2: Qu'est-ce-qu'<u>il/elle</u> attrape? 'what is he/she catching?'

<u>Results</u>

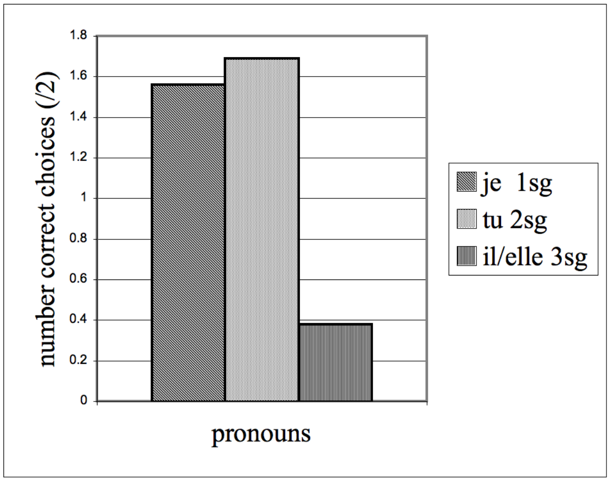

Figure 1. Number of correct choices (out of 2) for singular pronouns at 30 months of age

→ Only the results for the 1st and 2nd singular are significantly above chance level, $p < .001$.

→ As predicted by the implicated presupposition hypothesis, **French-learning children under the age of 3 failed to show comprehension of 3rd person reference**.

<u>Parental MCDI questionnaires</u> (Fenson et al. 1993, Kern 2003) were collected for the subjects tested in the Comprehension Task.

<u>Results:</u> While not all 30-month-olds produce all pronouns, the level of production is the same across persons → **No asymmetry** (in contrast with comprehension results)

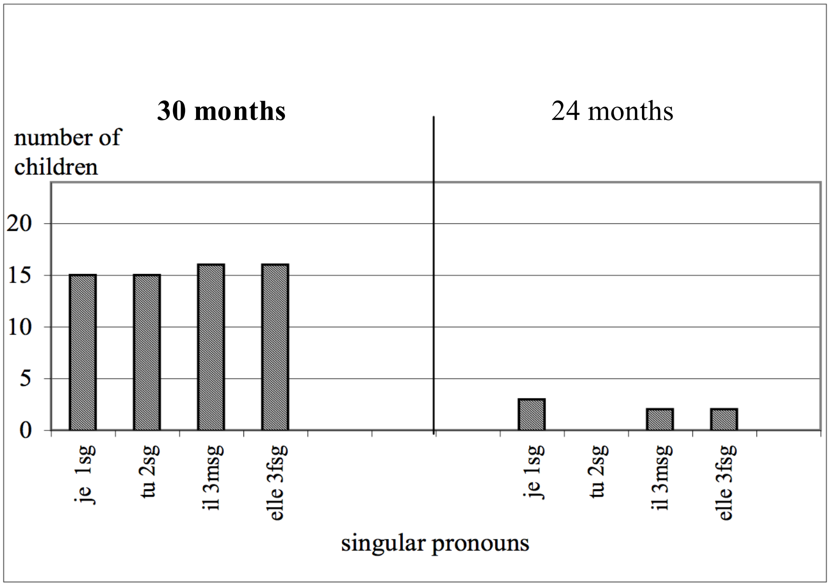

Figure 2. Number of children out of 24 (left panel) and out of 15 (right panel) producing subject pronouns.

7. Interim conclusions

- **Comprehension of 3rd person pronouns is harder** than 1st and 2nd as predicted by the Heim/Sauerland presuppositional account of person
- **Production of 3rd person pronouns precedes comprehension**. Heim's prediction that the meaning of 3rd person is harder to compute does not extend to production

8. What's going on?

- Figuring out that the meaning of 3rd person has to be computed over alternatives is only part of the puzzle; the rest is the nature of computation per se
- Children's computational abilities are limited to uni-directional optimization
- Children start with the 'wrong' constraint ranking

8.1. Candidates

Table 3. Summary of adult vs. child interpretations (Fishing Task)

Exp's question	Adult comprehension	Child comprehension
je 'I'?	= speaker	= speaker (√)
tu 'you'?	= hearer	= hearer/self (√)
elle 'she'?	= non-participant	= 6 non-participant, 7 hearer/self, 5 speaker (<u>ambiguous</u>)

(10) An *expression* is a single pronoun *pro* from the set {*I, you, she*}, together with its associated lexical presuppositions

(11) a. An INTERPRETATION of the expression *pro* is a pair of values ({+, –, 0}) for two features P, S interpreted as:

+P = referent of *pro* is a PARTICIPANT; –P = referent of *pro* is not a PARTICIPANT

+S = referent of *pro* is the SPEAKER; –S = referent of *pro* is not the SPEAKER

b. The feature value 0 denotes **unspecified**.

c. The speaker, the hearer, and a specific non-participant referent will be respectively abbreviated S, H, N; their featural specifications are [+P +S], [+P –S], [–P –S].

(12) Candidates

a. The presuppositions in the lexical entry of an expression are a pair of values (from the set {+, –, 0}) for two features *P*, *S*, which have the same interpretation as P, S .

b. **A candidate is a pair ⟨*expression*$_{[\alpha P\ \beta S]}$, INTERPRETATION[γP, δS]⟩ such that the feature values of INTERPRETATION match the specified feature values of *expression***, i.e.:

if $\alpha \neq 0$ then $\gamma = \alpha$; if $\beta \neq 0$ then $\delta = \beta$.

(If $\alpha = 0$, γ can have any value in {+, –, 0}. If $\beta = 0$, δ can have any such value.)

c. +*S* implies +*P*: the combination [–*P* +*S*] does not appear in any candidate.

(13) Lexical presuppositions: $I_{[+P\ +S]}$; $you_{[+P\ -S]}$; $she_{[0P\ 0S]}$

(14) The candidate set

		INTERPRETATION							
	Referent:	S	H	N	SH	N	S	HN	SHN
	Presuppositions:	+P +S	+P –S	–P –S	+P 0S	–P 0S	0P +S	0P –S	0P 0S
Expression	$I_{[+P\ +S]}$		▨	▨	▨	▨	▨	▨	▨
	$you_{[+P\ -S]}$	▨		▨	▨	▨	▨	▨	▨
	$she_{[0P\ 0S]}$								$\surd_{\text{child}}$

e.g. candidate pairs

- ⟨$you_{[+P\ -S]}$, H[+P –S]⟩ denotes the interpretation of *you* as referring to the hearer H, with lexical presuppositions [+P –S]. Optimal in the adult grammar.
- ⟨$you_{[+P\ -S]}$, S[+P +S]⟩ is not a candidate, as the interpretation's [+S] 'SPEAKER' is inconsistent with *you*'s lexically-determined value [–*S*] '*non-speaker*'.
- ⟨$she_{[0P\ 0S]}$, H[+P –S]⟩ denotes *she* referring to the hearer; not optimal in the adult grammar.
- ⟨$she_{[0P\ 0S]}$, N[–P –S]⟩ denotes *she* referring to a non-speaker non-participant N. The values [–P –S] are *implicated* presuppositions. Optimal in the adult grammar.
- ⟨$she_{[0P\ 0S]}$, [+P 0S]⟩ denotes an interpretation of *she* as referring to a participant that may or may not be the speaker — a 1st *or* 2nd-person referent, SH. Never optimal.
- **⟨*she*$_{[0P\ 0S]}$, [0P 0S]⟩** interprets *she* as having unconstrained referent, SHN. **This candidate must be optimal in the child grammar**.

Important aspects of the analysis:

- A three-way distinction in feature values for INTERPRETATIONS is necessary because while the adult interpretation of *she* is a non-participant N, the child's interpretation of *she* is completely unspecified. These interpretations must be distinguished, N has the feature values [–P, –S], and the child's interpretation, the feature values [0P 0S].
- The distinction between feature values 0 and – is also needed for *expressions*. According to the Heim & Sauerland theory, although interpreting *she* involves *computing* (implicated) presuppositions, interpreting *you* does not. The adult interpretations of *you* and *she* both include [–S], but this is lexical for *you* vs. implicated for *she*. *You* is assigned the lexical value [–*S*] and *she* the lexical value [0*S*]: the [–S] of the interpretation H is forced by the lexical specification of *you*, but the [–S] of N must be computed because the lexical entry of *she* has [0*S*].

8.2 Optimizations: uni-directional vs. bi-directional

(15) Weak bi-directional optimization (Blutner 2000):

An expression-interpretation pair ⟨e_0, I_0⟩ is *SUPEROPTIMAL* iff:

a. *Expressive* competition. There is no expression *e* such that:
   $\langle e, \mathrm{I}_0\rangle$ is a superoptimal pair that is more harmonic than $\langle e_0, \mathrm{I}_0\rangle$.

b. INTERPRETIVE competition. There is no interpretation I such that:
   $\langle e_0, \mathrm{I}\rangle$ is a superoptimal pair that is more harmonic than $\langle e_0, \mathrm{I}_0\rangle$.

(16) Bi-OT: Grammaticality defined recursively by weak ('super') optimality (Jäger 2002)
   a. The globally most harmonic pair $\langle e_0, \mathrm{I}_0\rangle$ (the most harmonic of all candidates) is grammatical: remove it from the candidate set and put it in the set of grammatical forms.
   b. By *expressive* competition, grammaticality of $\langle e_0, \mathrm{I}_0\rangle$ entails that all other pairs $\langle e, \mathrm{I}_0\rangle$ are ungrammatical. Remove them from the candidate set.
   c. By INTERPRETIVE competition, grammaticality of $\langle e_0, \mathrm{I}_0\rangle$ also entails that all other pairs $\langle e_0, \mathrm{I}\rangle$ are ungrammatical; remove them too.
   d. Repeat the whole process with the remaining candidates.

(17) Uni-directional optimizations: Inputs and outputs
   a. **Uni-comp: Interpretive optimization** (for comprehension)
      Input = an expression: *pro* with its lexical presuppositions, e.g., $she_{[0P\ 0S]}$
      Output = an interpretation of *pro*: values (+, –, or 0) for presupposition features determining the referent of *pro*, e.g., [+P –S] specifies the referent as the hearer H
      [Competition between candidates in a given *row* of the candidate set (14)]

   b. **Uni-prod: Expressive optimization** (for production)
      Input = a presuppositional meaning specifying a particular referent:
      an interpretation from the set {[+P +S], [+P –S], [–P –S]},
      abbreviated {S, H, N}
      Output = an expression from the set {*I*, *you*, *she*}
      [Competition between candidates in a given *column* of the candidate set (14)]

8.3 Constraints

(18) Constraints (partial specification). For all $\phi \in \{P, S\}$,
   a. The strength scale of presupposition-feature values is
      $[0\Phi] < [-\Phi] < [+\Phi]$
   b. **MAXPRESUP, abbreviated 'M'**
      Evaluates the presupposition-strength markedness of $[\alpha\phi]$ in the INTERPRETATION
      $[0\Phi] \prec_{\mathrm{M}} [-\Phi] \prec_{\mathrm{M}} [+\Phi]$
   c. **FAITHPRESUP, abbreviated 'F'** (needed for the computation of implicated presuppositions)
      Evaluates the faithfulness of a candidate's feature pairs $\langle exp_{[0\Phi]}, \mathrm{INT}[\alpha\Phi]\rangle$, $\alpha \in \{0, -, +\}$
      $\langle 0\Phi, 0\Phi\rangle \succ_{\mathrm{F}} \langle 0\Phi, -\Phi\rangle \succ_{\mathrm{F}} \langle 0\Phi, +\Phi\rangle$

[+Φ] violates MAXPRESUP least = 'fully satisfies' MAXPRESUP. Similarly, associating a lexically unspecified value [0*Φ*] with an interpretation [0Φ] fully satisfies FAITHPRESUP.
Note: The optimization of the two features $\phi \in \{P, S\}$ are independent: both constraints treat each feature independently.

(19) Candidate status with respect to constraints M and F (✓ = satisfies; ✗ = violates)

		INTERPRETATION							
	Referent:	S	H	N	SH	N	S	HN	SHN
	Presuppositions:	+P +S	+P –S	–P –S	+P 0S	–P 0S	0P +S	0P –S	0P 0S
Expression	*I*$_{[+P\ +S]}$	✌ ✓M ✓F	▨	▨	▨	▨	▨	▨	▨
	you$_{[+P\ –S]}$	▨	✌ ✗M ✓ F	▨	▨	▨	▨	▨	▨
	she$_{[0P\ 0S]}$	~~✓M ✗ F~~	~~✗M ✗ F~~	✗ M ✗ F	✗ M ✗ F	✗ M ✗ F	✗ M ✗ F	✗ M ✗ F	✗ M ✓ F
	Candidate label:	*A*	*B*	*C*	*D*	*E*	*J*	*K*	*L*

Bi-OT vs. uni-OT
Trivially: The globally most harmonic candidate is the upper left corner one: ⟨*I*$_{[+P\ +S]}$, S[+P +S]⟩. This candidate is perfect hence globally most harmonic; it is bi-directionally optimal, i.e., grammatical. "All candidates" in the first row and first column of (19) are then eliminated. Among the remaining candidates, ⟨*you*$_{[+P\ –S]}$, H[+P –S]⟩ is globally most harmonic; all "remaining candidates" are eliminated in the second row and column.
Note: Uni-directional interpretive optimization yields the same results as bi-OT for 1st and 2nd person pronouns: there is only one competitor in each of the first two rows, so each trivially wins interpretive competition. This is just a direct consequence of the full lexical specification of *I* and *you*.

Non-trivially: Competition in both uni-comp and bi-OT for the 3rd person. The only difference between these two competitions is that in uni-comp, *all* candidates in the bottom row of (19) compete, while in bi-OT the first two (labeled *A*, *B*) are excluded because they are eliminated by the superoptimal pairs for 1st and 2nd person.

8.4 Role of ranking in computing the interpretation of 3rd person

There is one type of ranking for which the difference (uni-comp vs. bi-OT) alters the interpretation of *she*: **when M is top-ranked**, uni-comp(*she*) = S because only candidate *A* fully satisfies M, and the referent in candidate *A* is S[+P +S]. For all other rankings, bi-OT and uni-comp give the same interpretation for *she.* Given Featural Independence, we can focus on a single feature, ϕ (the results are the same for $\phi = P$ and $\phi = S$).

(20) Candidate violations of constraints F^2, F, and M

		INTERPRETATION							
	M violations:		*M	**M	**M	***M	**M	***M	****M
	Referent:	S	H	N	SH	N	S	HN	SHN
	Presuppositions:	+P +S	+P –S	–P –S	+P 0S	–P 0S	0P +S	0P –S	0P 0S
Expression	*I*$_{[+P\ +S]}$	✌	▨	▨	▨	▨	▨	▨	▨
	you$_{[+P\ –S]}$	▨	✌ *M	▨	▨	▨	▨	▨	▨
	she$_{[0P\ 0S]}$	**F^2	*M *F^2 *F	**M **F	**M *F^2	***M *F	**M *F^2	***M *F	****M
	Candidate label:	*A*	*B*	***C***	*D*	*E*	*J*	*K*	***L***

Adult grammar

Starting with uni-comp (*she*$_{[0P\ 0S]}$) = N[–P –S]: the candidate labeled C in (20). For either feature ϕ, we need the optimal pairing to be ⟨0*Φ*, –Φ⟩. By (18c) FAITHPRESUP prefers the pairing ⟨0*Φ*, 0Φ⟩; by (18b) MAXPRESUP's preference for [–Φ] over [0Φ] must prevail:

(21) In the adult grammar, M's preference for [–Φ] over [0Φ] outranks F's reverse preference (given expression *she*$_{[0P\ 0S]}$).

Because M prefers [+Φ] to [–Φ], it prefers ⟨0*Φ*, +Φ⟩ to ⟨0*Φ*, –Φ⟩ — so for the latter to be optimal:

(22) In the adult grammar, F's preference for [–Φ] over [+Φ] (given expression *she*$_{[0P\ 0S]}$) outranks M's reverse preference.

These two requirements can be readily satisfied using a standard concept of OT, encapsulated constraints. F encapsulates two constraints evaluating presuppositional faithfulness between expression and interpretation, and these constraints are universally ranked: $F \equiv [F^2 \gg F]$.

(23) FAITHPRESUP : F encapsulates $\{F^2, F\}$ in a universal sub-hierarchy.
In a candidate ⟨*exp*, INT⟩, for each ϕ ∈ {*P, S*}:
⟨0*Φ*, 0Φ⟩ satisfies F and F^2.
⟨0*Φ*, –Φ⟩ violates F once.
⟨0*Φ*, +Φ⟩ violates F^2 once.

M can be defined as a single constraint M instantiating the three-way distinction (though M could be treated as encapsulating two constraints: $M \equiv [M^2 \gg M]$).

(24) MAXPRESUP, M = M. For each Φ ∈ {P, S}:
[+Φ] satisfies M.
[–Φ] violates M once.
[0Φ] violates M twice.

(25) **Adult ranking: $F^2 \gg M \gg F$**
Violating MAXPRESUP is worse than the weak FAITHPRESUP violation of ⟨0*Φ*, – Φ⟩ but better than the strong FAITHPRESUP violation of ⟨0*Φ*, + Φ⟩.

Child grammar

The optimal interpretation of *she*$_{[0P\ 0S]}$ is SHN[0P 0S] – candidate L. FAITHPRESUP's preference for this pair must prevail over MAXPRESUP's preference for the output feature value [–Φ]:

(26) In the child grammar, F's preference for [0 Φ] over [–Φ] (given expression *she*$_{[0P\ 0S]}$) outranks M's reverse preference.

(27) **Child ranking: $F \gg M$** (hence $F^2 \gg F \gg M$ or equivalently $F \gg M$)
Violating MAXPRESUP is better than any violation of FAITHPRESUP.

The rankings in (25) and (27) yield the desired interpretation behavior: correct interpretation of *I* and *you* for everyone, correct interpretation of *she* for adults, unrestricted interpretation of *she* for children. [The only remaining ranking, $M \gg F^2 \gg F$, is functionally unacceptable as it makes it impossible to refer to a non-participant N]

8.5 Production

In bi-OT, the single bi-directional optimization determines a set of optimal form-meaning pairs that subserves both production and comprehension: there can be no asymmetry. It is thus suitable for the adult grammar (although uni-comp suffices). But to analyze the experimentally observed asymmetry in children, we need uni-directional optimization.

Uni-comp is capable of accounting for interpretation in both adults and children, under different constraint rankings. What of uni-directional *expressive* optimization for production, uni-prod, in which only candidates in the same column compete?

(28) Candidates relevant for uni-directional production (uni-prod): vertical competition

		INTERPRETATION		
	M violations:		*M	**M
	Referent:	S	H	N
	Presuppositions:	+P +S	+P –S	–P –S
Expression	$I_{[+P\ +S]}$	☜	▨	▨
	$you_{[+P\ -S]}$		☜ ~~*M~~	
	$she_{[0P\ 0S]}$	$**F^2$	~~*M~~ $*F^2$ *F	☜ **M **F

Uni-prod gives the correct adult expressions for all three cases.

- 3rd -person case N: the single candidate, *she*, must win under any ranking, so children's 3rd person production is adult-like even through their comprehension is not.
- 1st-person case S: two candidates in the first column, one being perfect, so *I* wins for the expression of S under any ranking.
- 2nd-person case H: two candidates, but one harmonically bounds the other. So *you* wins under any ranking as the expression for H.

9. Conclusion

- A typology of three grammars is predicted by the analysis, each a ranking of the universal constraints constituting MAXPRESUP and FAITHPRESUP. One is functionally deficient, and can be put aside. The other two are both empirically relevant. One is the adult grammar. The other is a grammar in which MAXPRESUP is lowest-ranked (or absent); this predicts just the asymmetrical pattern of production and comprehension observed experimentally in children.

References

Blutner, R. (2000). Some apects of optimality in natural language interpretation. *Journal of Semantics* 17, 189-216.

Chierchia, G., Crain, S., Guasti, M-T., Gualmini, A., & Meroni, L. (2001). The acquisition of disjunction: evidence for a grammatical view of scalar implicatures. *BU proceedings*, 157-168.

Clark, E.V. (1998). Lexique et syntaxe dans l'acquisition du français. In C. Martinot (Ed.), Special issue of *Langue Française*: *l'acquisition du français langue maternelle 118*, 49-60.

De Hoop, H. & Krämer, I. (2005/6). Children's optimal interpretations of indefinite subjects and objects. *Language Acquisition* 13, 103-123.

Girouard, P.C., Ricard, M., & Gouin Decarie, T. (1997). The acquisition of personal pronouns in French-speaking and English-speaking children. *Journal of Child Language* 24, 311-326.

Hamann, C., Rizzi, L., & Frauenfelder, U. (1996). The acquisition of subject and object clitics in French. In H. Clahsen (Ed.), *Generative Perspectives on Language Acquisition*. Amsterdam: John Benjamins. 309-334.

Heim, I. (1991). Artikel und Definitheit. In Von Stechow, A, D. Wunderlich (Eds.). *Semantik: Ein internationales Handbuch der zeitgenoessischen Forschung*. De Gruyter, 487-535.

Hendriks, P., de Hoop, H., & Lamers, M. (2005). Asymmetries in language use reveal asymmetries in the grammar. In *Proceedings of the 15th Amsterdam Colloquium*, 113-118.

Hendriks, P. & Spenader, J. (2005/6). When production precedes comprehension: An optimization approach to the acquisition of pronouns. *Language Acquisition* 13, 319-348.

Jäger, G. (2002). Some notes on the formal properties of bidirectional Optimality Theory. *Journal of Logic, Language, and Information* 11(4), 427-451.

Jakubowicz, C. & Rigaut, C. (1997). L'acquisition des clitiques nominatifs en français. In A. Zribi-Hertz (ed.), *Les pronoms: Morphologie, syntaxe, et typologie*. Presses Universitaires de Vincennes. 57-99.

Kern, S. (2003). Le compte-rendu parental au service de l'évaluation de la production lexicale des enfants français entre 16 et 30 mois. *Glossa 85*, 48-62.

Legendre, G., Hagstrom, P., Vainikka, A., & Todorova, M. (2002). Partial constraint ordering in child French syntax. *Language Acquisition, 10*, 189-227.

Legendre, G., Hagstrom, P., Chen-Main, J. Tao, L., & Smolensky, P. 2004. Deriving output probabilities in child Mandarin from a Dual- Optimization Grammar. *Lingua* 114/9-10, 1147-1185.

Legendre, G., Barrière I., Goyet, L., & Nazzi, T. 2010a. Comprehension of infrequent subject–verb agreement forms: Evidence from French-learning children. *Child Development*, 81:6, 1859–1875.

Legendre, G., Barrière I., Goyet L., & Nazzi, T. 2010b. On the acquisition of implicated presuppositions: Evidence from French personal pronouns. Submitted for the GALANA 2010 Proceedings.

Novek, I. (2001). When children are more logical than adults. *Cognition* 78, 165-188.

Sauerland, U. (2008). On the semantic markedness of phi-features. In D. Harbour, D. Adger, & S. Bejar (Eds.), *Phi-theory: phi-features across modules and interfaces*. Oxford University Press.

Yatsushiro, K. (2008). German determiner presuppositions in first language acquisition. In H. Chan, H. Jacob, and E. Kapia (Eds.), *Proceedings supplement of BUCLD 32*.