We will talk about the phenomenon of parentese itself, about our approach to study its prosody and about the outcome pertaining to male & female substyles and the way parentese prosody is fine-tuned to the child's age.

It is the particular style of speaking every speaker uses when addressing a child. It is thought to regulate attention and to communicate affect.
Parentese linguistics
- limited vocabulary, short repeated utterances, and referents that are concrete and present
- grammar complexity tuned to children's language development
- thought to facilitate language learning

Parentese phonetics
- hyper-articulated vowels
- slower speech and articulation rate
- raised voice pitch
- exaggerated sing-song intonation
- segment-marking, "didactic" prosody

We have asked ourselves if and how male and female parentese users differ as far as these phonetic features are concerned and if the phonetics of parentese evolve as a function of child age. The basic hypothesis is that there are male and female substyles.

Participants & recordings
- native speakers of Flemish Dutch
  - most often, but not always son or daughter
  - typically developing children

Participants
- American English
  - smaller sample: native speakers of American English

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<thead>
<tr>
<th></th>
<th>ADULTS</th>
<th>MALE</th>
<th>FEMALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flemish Dutch</td>
<td>57</td>
<td>23</td>
<td>34</td>
</tr>
<tr>
<td>(23 up to 61 yrs)</td>
<td>av. age 35 years</td>
<td>av. age 33 years</td>
<td></td>
</tr>
<tr>
<td>speaking to children of (mean age):</td>
<td>25 months</td>
<td>26 months</td>
<td></td>
</tr>
<tr>
<td>Average recording:</td>
<td>306 seconds (i.e. 5 mins.)</td>
<td>440 words</td>
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<thead>
<tr>
<th></th>
<th>ADULTS</th>
<th>MALE</th>
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</thead>
<tbody>
<tr>
<td>American English</td>
<td>18</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>(25 up to 42 yrs)</td>
<td>av. age 33 years</td>
<td>av. age 33 years</td>
<td></td>
</tr>
<tr>
<td>speaking to children of (mean age):</td>
<td>12 months</td>
<td>11 months</td>
<td></td>
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These children are younger!
We collected 2 recordings per person: one AD and one CD during dyadic sessions in the participants’ home. Spontaneous speech, no particular instructions. The idea here is to verify acoustically what a speaker changes to his voice and speech when the conversation partner is a child. Praat software was used to make the recordings. Note that, by subtracting AD results from CD results, we are measuring is the EFFORT a speaker makes when switching to the parentese register. This is not a repeated measures design.

These recordings were annotated in order to locate relevant fragments, that is fragments with just one voice, namely the adult speaker’s voice. As you can see the were tiers to annotate the number of words and syllables and pinpoint syntactic boundaries.

We programmed purpose-built scripts in Praat software to extract these parameters.

1) Speech rate efforts (i.e. using less words and syllables per unit of time than in adult directed speech)
2) Voice pitch efforts (i.e. speaking with a higher voice and using more “spectacular” intonation)
3) Voice intensity efforts (i.e. speaking with a softer/louder voice and using more “spectacular” stress)
Ideally, in these conditions, one uses MANCOVA. It is a statistical procedure to study
- the effect of two independent variables (factors) (adult gender and native language) on
- more than one dependent variable (all the acoustic markers for prosody)
- all while partialling out the effect of one possible covariate, child age

However, not all statistical conditions to use MANCOVA were met (conditions in red)

- Statistical conditions to use ANCOVA were met
to study the effect of one factor (namely speaker gender) on one prosody marker at a time while partialling out the effect of child age;
- we know that the linguistic complexity of parentese is tuned to the child's age and this could very well be the case for its' phonetic features too, that is: changes in prosody might depend on child age
- now suppose that the children, whom our female participants were talking to, were younger than the children whom our male participants were interacting with, then a false gender effect could emerge, caused not by gender but by their attempt to tune in to different child ages and capacities
- since in many cases our speakers were mothers and fathers addressing the same child (their own son or daughter), this is not likely to happen
- nevertheless, statistics like covariate analysis can help us partial out the influence of a covariate and reveal the genuine and direct effects of independent variables (speaker gender) on the dependent variable (parentese prosody)
Let's first speak about the effect of speaker gender on the prosody of parentese: are there male and female sub-styles?

Using one-way anova as a first step, we found three prosodic markers that differed significantly in men and women...

To study the evolution of prosodic changes as a function of increasing age of the child, we used regressions, treating child age as a predictor variable.
Results

- Gender effects
  - extent of intonation maneuvers
    - still significant when effect of covariate (child age) is partialled out

After partialling out the effect of child age using analysis of covariance for each of these 3 prosodic markers, they still differed significantly in men and women. Here we see the gender effect for the extent of intonation maneuvers (modulation depth). Note that child age did have an impact (1, green). Anyway, that impact was partialled out and the gender effect remains significant.

Results

- Gender effects
  - pause and voice pitch change to mark syntactic boundary
    - still significant when effect of child age is partialled out

Here we see the gender effect for constituent-marking prosody efforts. Note that child age, again, did have an impact on pitch jumps across syntactic boundaries (3, green). Anyway, that impact was partialled out and the two gender effects remain.

Results

- Gender effect
  - extent of intonation maneuvers

The gender effects lead to these conclusions:

1. though male speakers also tend to intonate more, the modulation depth of voice pitch (the extent of intonation maneuvers) was significantly larger in female parentese.
2. though male speakers also tend to pause longer when addressing a child, there are significantly longer pauses at syntactic boundaries in female parentese.

3. though male speakers also tend to change their voice pitch more when addressing a child, there are significantly larger pitch jumps at syntactic boundaries in female parentese.

As to language effects: speech rate was reduced more in Flemish parentese samples. It was the only significant effect resulting from the one way anova.
As we said before, language effects should be interpreted with some caution, because the American speakers in our data set were addressing younger children. But, if child age does play a role, and if prosody in the American-English samples is different not because of the language spoken but rather as a result of an attempt to tune in to a younger child’s capacities, one would expect the American speakers to use the slowest speech rate, since they interacted with the younger children. However, this is not what we see. This is a remarkable result and we will come back to it when we look at the regression results.

This is an overview of the group differences (gender, language). Let’s now see how these effects vary as a function of child age. In the regression analyses, we treat child age as a predictor variable, influencing several aspects of prosody.

In the Flemish-Dutch data set there was a clear tendency: the younger the child, the more speech rate (words per minute) is lowered. There was no particular gender difference in the regression outcomes and neither did the ANOVA results reveal an overall gender difference.
**Results**

- **Language effect:** speech rate lowered, exception: American English speakers addressing youngest children (before/after one word stage?)

The regression line in black represents all data from both language groups together. We also tried to fit non-linear regression lines for each language group separately covering 90% of the data points. The Flemish data (blue non-linear regression line) follow the general trend: the younger the child, the slower the rate of speech. The green line, representing 90% of the American English data, suggests that the age of 12 months may be a turning point. From that age on, the American English speakers also follow the same trend. Before that age however, some of them do not lower their speech rate. Some even speak faster than in adult directed conversations (above zero). One possible explanation is that from the age of 12 months on, children are in the one-word stage of language development and therefore can react using spoken words themselves. So, from then on, there is communication on a verbal level, whereas before that age, communication probably is more emotional and affective than verbal. If this is the case, and it seems plausible to me, speech rate does not matter before this critical age, since the content of the message is not really meant to initiate a conversation. However, we know that small children do learn from language input. To verify this, we should analyse both prosody and meaning in a series of samples of parentese users addressing children of varying ages.

- **(St)Age tuning:** the younger the child, the more articulation rate (syll./sec.) is lowered (in female parentese users)

The younger the child, ....

According to the regression outcome, male parentese speakers do not seem to lower articulation rate as a function of child age. The ANOVA results did not reveal an overall gender difference here.
The younger the child...
According to the regression outcome, male parentese speakers do not raise voice pitch as a function of age. The ANOVA results did not reveal an overall gender difference here.
The results below the zero reference level point to a particular phenomenon: the use of a creaky voice or vocal fry by some American female parentese users. Perhaps this is done in an attempt to communicate feelings of calmness and acceptance.

The younger the child....
This corroborates the gender effect for intonation we found in the covariance analyses. In female parentese, intonation is more spectacular, but both female and male parentese users try to intonate more. Here we see that female speakers also do it as a function of age. In contrast, there is no significant age-pitch modulation regression in male data.

The younger the child...
This corroborates the gender effect for boundary marking by pitch we found in the covariance analyses. In female parentese, pitch jumps from one constituent to another are more spectacular. Here we see that both genders female speakers do it as a function of age.

As for pausing between constituents, no significant age regression found, but remember the variance analyses revealed a gender effect: significantly longer pauses at syntactic boundaries in female speakers.
1. The prosody of parenthetical marking and tuned to child age, hence this prosody is “didactic”

2. Didactic prosody: female speakers do it better (but perhaps men compensate otherwise?)

3. Boost for language development? Ramifications for child directed multimedia?

Acknowledgements