Gender Typicality in Children's Speech 1:

Breathiness and Perceived Sex Typicality

Kari Urberg Carlson and Benjamin Munson
Department of Speech-Language-Hearing Sciences, University of Minnesota

Genderdifferences in children's speech are not accounted for by anatomical differences.

•Adults perceive boys and girls to sound different from one another well in advance of the marked sex differentiation in the speech-production mechanism that occurs at puberty (Perry, Ohde, &Ashmead, 2001 *inter alia*)
•Gender differences in children's pronunciation are not 'across the board'. As with adults, boys and girls' speech differs more in some sounds and sound classes than others.
•Sex differences in speech likely represent learned behaviors, which perhaps result from selective attention to and emulation of specific models in the ambient language.
•In our laboratory, we have studied gender typicality in children's speech by comparing the productions of 5-13 year old boys with Gender Identity Disorder (GID, i.e., boys whose gender expression has been deemed not to meet cultural expectations, Zucker, 2005, henceforth referred to as gender non-conforming, [GNC]) to children whose gender expression is deemed to meet cultural expectations (henceforth Expected Gender Development [EGD], Crocker & Munson, 2006). This provides us with an opportunity to study gender in speech without the confounding influence of biological sex.
•Our previous research on this topic has examined acoustic differences between GID and EGD boys' single words (Crocker & Munson, 2006) and sentences (Kaiser & Munson, in preparation), compared to perceptual ratings of gender typicality. We observed larger differences in perceived gender typicality in sentences than in words. Although gender typicality was found to correlate with some acoustic parameters, no correlation was found between gender typicality and average F0.
•Impressionistic observations suggested that children's voice quality varied substantially. This experiment examined whether the groups differed in perceived breathiness.

Is there a relationship between perceived gender and vocal breathiness in children?

The current study examines three questions:
1. Are gender non-conforming boys perceived to have breathier voices than those with expected gender development?
2. Is there a correlation between perceived breathiness and perceived gender typicality?
3. Will listeners rate the breathiness of a voice differently if they think the speaker is male or female?

Paired-comparison judgments of breathiness were compared to gender-typicality ratings.

•Multiple sentence imitations were recorded for each child. Children repeated sentences pre-recorded by a speaker of the same dialect as the children. The recordings were made for a broad-based study on the acoustic and perceptual characteristics of gender typicality in children voices, and not for the specific purpose of voice judgments. They were made in a quiet clinic room.
•Data from 28 children was used. Each speaker was categorized as either GNC or EGD. The children who we refer to as GNC received a diagnosis of Gender Identity Disorder (DSM-IV) from a psychometrist with expertise in children's gender development. Children were recorded at a clinic in Toronto, Ontario.
•From the multiple recorded sentences, the sentence *Are you Melanie or Mario?* was chosen for analysis in this study because it contained primarily sonorant consonants, and because most children repeated this sentence accurately and fluently.
•Listeners in this study were speech-language pathology students, or speech-language pathologists who had either taken a course in voice disorders in the past two years, or who regularly assessed and treated voice patients.
•Listeners heard each combination of pairs of sentences and were asked to indicate which of the pair they thought was breathier.
•The paired-comparison data were converted to rank orders of breathiness using a Bradley-Terry statistical model (Firth, 2005).
•In this model, "winners" were defined as boys who were chosen to have breathier voices in the paired comparison, while "losers" had less-breathy voices.

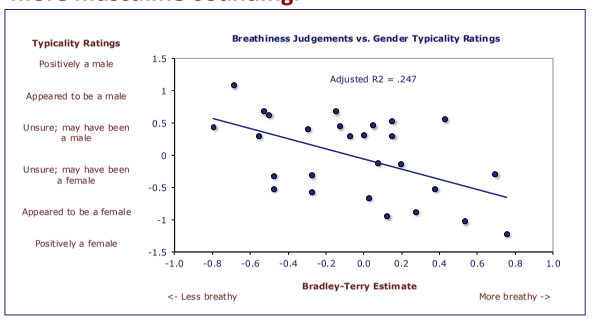
Gender labels were added to see if information about gender would affect breathiness ratings.

•In the second experiment, the label "male" or "female" appeared on the screen while the sentences were presented to listeners.
•Female voices tend to be breathier than male voices (i.e., Mendoza et al., 1996, *inter alia*). We anticipated that labeling the voices would bias the listeners to hear the voices as breathier than if they thought the speaker was male.

There was no significant difference in breathiness between gender non-conforming boys and those with expected gender development.

	Winners (breathier)	Losers (less breathy)
Gender non-conforming	6	6
Expected gender development	5	6

Boys that were rated as more feminine-sounding had breathier voices than those that were rated as more masculine-sounding.



Labeling the voices as "male" or "female" did not affect judgments of breathiness.

•In the second experiment, the label "male" or "female" appeared on the screen while the sentences were presented to listeners.
•Individual speakers were labeled consistently as male or female within each listener, and counterbalanced across listeners.
•Separate rankings the were made for each sample for the "male" and "female" conditions with the Bradley-Terry model, then the samples were divided into "winners" and "losers".

	Winners (breathier)	Losers (less breathy)
"Male"	12	12
"Female"	13	11

These results should be interpreted with caution.

•The speech samples were not collected for the purpose of making voice judgments, and no evaluation of the vocal health of the children was made when the samples were collected.
•Although in the second experiment, listeners were given labels of "male" and "female", it can be seen from the scatterplot above that some of the voices were strongly perceived as either masculine or feminine (Kaiser and Munson, in preparation). The voice cues may have been stronger than the label in influencing listener' s perception of the gender of the speaker.

Acknowledgements
Kari Urberg-Carlson's work on this project was supported by a University of Minnesota Graduate Research Partnership Program Grant.
The research on the acoustic and perceptual characteristics of the speech of children with Gender Identity Disorder was completed in collaboration initiated by J. Michael Bailey of the Northwestern University Department of Psychology. The funding for the data collection phase of this project was provided by a grant to Janet Pierrehumbert (Department of Linguistics, Northwestern University) and J. Michael Bailey from the Northwestern University Office of the Vice President for Research. The data collection protocol was designed by Jessi Pierrehumbert, Benjamin Munson, and Kaila K. McGregor (Department of Speech-Language Pathology and Audiology, University of Iowa). Data collection was supervised by Ken Zucker (Clark Institute for Mental Heath, Toronto, Ontario). The acoustic analysis protocol was developed by Benjamin Munson and Janet Pierrehumbert. The perceptual analysis protocol was developed by Benjamin Munson. All of the acoustic and perceptual analysis described herein were conducted at the University of Minnesota. The authors of the poster take sole responsibility for the interpretations that are presented herein, and acknowledge that the different collaborators on this project might interpret these same findings differently.

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