Abstract for "The Prosody of Algebra Meets the Algebra of Prosody
in Mathematically Experienced and Inexperienced Speakers"

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Read mathematical formulae (MF) provide an ideal and little-studied (O'Malley et al., 1976; Streeter, 1978; Wagner & Crivellaro, 2010) window into how familiarity with a particular type of syntactic ambiguity affects speakers' ability to use prosody to disambiguate an utterance. Fluent speakers are familiar with ambiguous sentences like (1) in non-mathematical language, and use prosodic manipulations to disambiguate them (Lehiste, 1973; Speer et al., 2011). However, because speakers in the same speech community have varying levels of mathematical expertise, they have varying familiarity with MF whose read form contains syntactic ambiguities, as in (2).

(1)   a.   Sam or Steve and Bob
       b. $[[\text{Sam}_{NP} \text{ or Steve}_{NP}]_{NP} \text{ and Bob}_{NP}]_{NP}$
       c. $[\text{Sam}_{NP} \text{ or } [\text{Steve}_{NP} \text{ and Bob}_{NP}]_{NP}]_{NP}$

(2)   a.   Twenty divided by A plus five
       b. $\dfrac{20}{A}+5$
       c. $\dfrac{20}{A+5}$

A production experiment investigated how speakers of varying mathematical skill use prosody to disambiguate utterances like (2a) when they intended either (2b) or (2c). English sentences describing MF had ambiguities caused by complex NP arguments of one- and two-place mathematical operators. Subjects read aloud MF like those in (2b) and were then given a value for the variable and asked to evaluate the formula. Mathematical ability was measured using a multiple choice test administered during the experiment. Recordings were analyzed within the autosegmental-metrical prosodic framework (Pierrehumbert, 1980), then classified as having either "left-branching", "right-branching", or "flat" prosody according to the relative strength of the break following the variable A. This allowed comparisons to similar work done by Wagner (2009).

Results indicate that speakers regularly use prosodic breaks to disambiguate read MF. Larger break indices between terms of the formula indicated greater distance between terms in constituent structure, consistent with previous work on non-mathematical stimuli. Contrary to previous work, subjects also used flat prosodic break structures with either intended reading. Surprisingly, mathematical skill did not significantly influence either the use or type of disambiguating prosody except on the very hardest subset of problems.

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