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What's New, Pussycat? On Talking to Babies and Animals

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When talking to babies, adults invariably use a special speech register characterized by elevated fundamental frequency (pitch), exaggerated intonation contours, and high affect (*1*, *2*). It has also been found that mothers hyperarticulate vowels when addressing their infants but not when speaking to other adults (*3*). This phenomenon is ubiquitous, occurring across various languages—English, Russian, Swedish, and Japanese (*3*, *4*)—and is thought to facilitate infants' linguistic development by amplifying the phonetic characteristics of native language vowels (*3*). However, the very ubiquity of this speech style means that it is practically impossible to obtain direct evidence of its function as a language-teaching device; clearly, we cannot ask caregivers not to use baby-talk with infants, as it appears to be elicited automatically. So, as the nature of the speech input cannot be changed, we decided to approach this issue from another angle—by experimentally manipulating the nature of the recipients.

The uncanny similarity of pet- to infant-directed speech has been noted previously (*5*), although no objective comparison of either pitch or affective speech components has been attempted. Does this similarity between pet- and infant-directed speech imply that vowel hyperarticulation also occurs when we talk to our pets? Are we (perhaps unconsciously) trying to teach our animals how to speak or at least understand our language? Or maybe vowel hyperarticulation is simply a by-product of the highly emotional speech we use to both our infants and pets.

To resolve this issue, we made objective comparisons of 12 mothers' speech to their infant, their pet, and another adult in three domains: (i) pitch, which is the psychological correlate of fundamental frequency; (ii) affect, which is measured by ratings of low-pass–filtered speech, in which the intonation and rhythm can be heard but the words cannot be understood; and (iii) vowel hyperarticulation, which is objectified by plotting first and second formant (F_1 and F_2) values of the "corner" vowels, /i/, /u/, and /a/, and comparing the resultant vowel triangles (*3*).

Speech samples of the mothers, all monolingual native speakers of Australian English, were recorded on a portable Professional Walkman (Sony) with lapel microphone left with the mothers in their homes. To obtain the requisite corner vowel information, we asked mothers to play with and name three provided toys, a "sheep," a "shoe," and a "shark," in naturalistic 10- to 15-min interactions with each recipient. Mothers made separate recordings in their own time talking to their 6-month-old infant, to their pet cat or dog, and to another adult (see supplementary text and table S1).

Analyses of variance were conducted for pitch, affect, and vowel triangles to test differences in infant-, pet-, and adult-directed speech (no differences were found in speech to the five cats and seven dogs). For pitch (Fig. 1A), infant- and pet-directed speech was statistically equivalent [$F(1,11) = 0.03$, $P > 0.05$], but pitch in speech to both infants [$F(1,11) = 6.58$, $P < 0.05$] and pets [$F(1,11) = 36.52$, $P < 0.001$] was significantly higher than pitch in speech to adults.

Ratings of low-pass–filtered speech (see Audio S1, S2, and S3) on five scales were factor analyzed, and scores from the resultant affect factor were derived. Affect was greater in infant- than in pet-directed speech [$F(1,11) = 10.76$, $P < 0.01$], but affect in both infant- [$F(1,11) = 94.34$, $P < 0.001$] and pet-directed speech [$F(1,11) = 54.44$, $P < 0.001$] was higher than in adult-directed speech (Fig. 1B).

Vowels for infant-, pet-, and adult-directed speech are plotted in F_1-F_2 space in Fig. 1C. Mothers' vowel triangle areas in infant-directed speech were significantly larger than in both adult- [$F(1,10) = 7.63$, $P < 0.005$] and pet-directed speech [$F(1,10) = 10.98$, $P < 0.001$] but did not differ between pet- and adult-directed speech [$F(1,10) = 0.19$, $P > 0.05$] (see supplementary text).

These results show that infant- and pet-directed speech are similar and distinctly different from adult-directed speech in terms of heightened pitch and affect. Interestingly, only infant-directed speech contains hyperarticulated vowels. Thus, vowel hyperarticulation does not accompany special registers simply because they differ from adult speech in pitch and affect. Rather, it seems to be a didactic device: Mothers exaggerate their vowels for their infants but not for their pets.

Evidently, speakers are sensitive to their audience, both in regard to acoustic preferences and emotional needs, and in terms of potential linguistic ability. We might predict that foreigner-directed speech would have hyperarticulated vowels but little elevation of emotional aspects. We might also predict differences within speech registers; there may be vowel hyperarticulation in parrot-directed speech.

In conclusion, we propose that (i) special speech registers differ in their mix of acoustic, affective, and vowel hyperarticulation components and (ii) speakers intuitively perceive the emotional and linguistic needs of their audience and automatically adjust their mix of speech components accordingly.

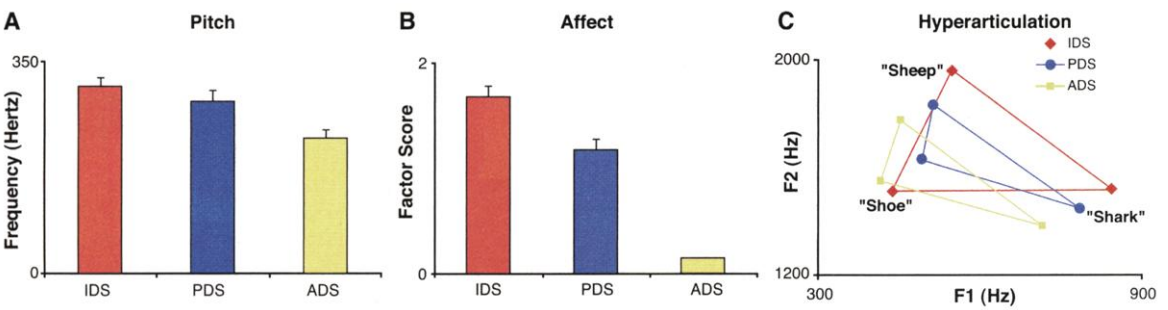

Fig. 1. (**A**) Pitch (fundamental frequency in hertz), (**B**) rated affect, and (**C**) vowel hyperarticulation (in F_1-F_2 vowel space) in infant-, pet-, and adult-directed speech (IDS, PDS, and ADS, respectively).

References and Notes

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Supporting Online Material

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Materials and Methods
table S1
Audio clips (Audio 1, Audio 2, and Audio 3)

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