Research Article

IS INFANT-DIRECTED SPEECH PROSODY A RESULT OF THE VOCAL EXPRESSION OF EMOTION?

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Abstract—*Many studies have found that infant-directed (ID) speech has higher pitch, has more exaggerated pitch contours, has a larger pitch range, has a slower tempo, and is more rhythmic than typical adult-directed (AD) speech. We show that the ID speech style reflects free vocal expression of emotion to infants, in comparison with more inhibited expression of emotion in typical AD speech. When AD speech does express emotion, the same acoustic features are used as in ID speech. We recorded ID and AD samples of speech expressing love-comfort, fear, and surprise. The emotions were equally discriminable in the ID and AD samples. Acoustic analyses showed few differences between the ID and AD samples, but robust differences across the emotions. We conclude that ID prosody itself is not special. What is special is the widespread expression of emotion to infants in comparison with the more inhibited expression of emotion in typical adult interactions.*

It is interesting that adults talk to young infants even though the infants do not understand the words. Infant-directed (ID) speech is often referred to as musical speech (Fernald, 1989; Trainor, Clark, Huntley, & Adams, 1997) because its exaggerated prosody gives it a sing-song quality. Many studies have shown that ID speech has higher pitch, has more exaggerated pitch contours, has a larger pitch range, has slower tempo, and is more rhythmic than typical adult-directed (AD) speech (e.g., Ferguson, 1964; Fernald, 1991; Katz, Cohen, & Moore, 1996; Papoušek, 1992; Stern, Spieker, & MacKain, 1982; Trehub, Trainor, & Unyk, 1993). Although there are some cross-cultural differences in degree, the same basic acoustic features are found in ID speech across languages and cultures (Fernald et al., 1989; Grieser & Kuhl, 1988; Papoušek & Hwang, 1991; Papoušek, Papoušek, & Symmes, 1991; Werker, Pegg, & McLeod, 1994). Even children, fathers, and other adults who have had no experience with infants naturally produce ID speech when interacting with an infant (e.g., Dunn & Kendrick, 1982; Fernald et al., 1989; Trehub et al., 1993). On the other side of the communication, infants from a few days to several months of age prefer ID over AD speech (e.g., Cooper & Aslin, 1990; Fernald, 1991, 1993; Werker & McLeod, 1989).

What is the function of the seemingly unique prosody of ID speech? One possibility is that it might be used to obtain or maintain infants' attention (e.g., Fernald, 1991; Werker & McLeod, 1989). A second possibility is that ID speech aids language learning by exaggerating lexical and grammatical structure (e.g., Fernald & Mazzie, 1991; Kemler Nelson, Hirsh-Pasek, Jusczyk, & Wright Cassidy, 1989; Shatz, 1982; Snow & Ferguson, 1977). A third possibility is that the prosodic features somehow communicate information to the infant (e.g., Fernald, 1991; Papoušek, 1992; Stern et al., 1982). ID prosody changes with context (Fernald, 1989; Papoušek, Bornstein, Nuzzo, Papoušek, & Symmes, 1990), and adults are better able to judge the context in which a phrase was uttered when it is infant directed than when it is adult directed (Fernald, 1989). In ID speech, expressing approval and eliciting attention are associated with large bell-shaped (up-down) pitch contours, encouraging turn taking is associated with rising contours, soothing is associated with lower-pitched, falling contours, and prohibiting a behavior is associated with short, lower-pitched, flat contours (Fernald, 1989, 1991; Katz et al., 1996; Papoušek et al., 1991). Given the melodic quality of ID speech, it is interesting that different types or styles of ID singing are also used in different contexts, such as playing or promoting sleep (Trainor, 1996; Trainor et al., 1997), and that infants respond differently to them (Rock, Trainor, & Addison, 1999).

We suggest that perhaps the most important function of ID speech is to help create and maintain an emotional bond between caregiver and prelinguistic infant—a bond without which the very survival of the infant is at risk (e.g., Drotar & Sturm, 1988; Spitz, 1950). In other words, we suggest that the information being expressed to infants through ID prosody is emotional. A finding that supports this idea is that infants prefer to listen to ID speech expressing positive (approval) affect over ID speech expressing negative (prohibition) affect (Fernald, 1993; Papoušek et al., 1990). There is even evidence that ID speech is accompanied by exaggerated facial expressions of emotion (Shi, Werker, & Harado, 1997), again suggesting the primacy of the emotional content.

In the present article, we explore the determinants of ID prosody. We hypothesize that the documented differences between ID and AD speech prosody arise because ID speech is typically emotionally expressive and AD speech is typically emotionally constrained. Why might this be so? Adults understand words, so they need not rely exclusively on prosody to convey their message. In fact, social conventions often dictate the restraint of prosodic expressions of emotion (e.g., Saarni, 1998), perhaps in order to allow more cognitive, reflective reaction to prevail over immediate emotional actions. Moreover, much AD speech takes place with acquaintances rather than in the context of intimate relationships. In most studies comparing ID and AD speech, the AD speech was directed to a relative stranger. It is interesting to speculate as to whether the vocal expression of emotion in the speech of new lovers differs substantially from that exhibited in ID speech.

Can the hypothesis that ID speech prosody results largely from the vocal expression of emotion explain the universality of ID speech across languages, cultures, and the age and experience of speakers? Given that the vocal expression of emotion is similar across languages and cultures (Darwin, 1872/1965; Frick, 1985; Murray & Arnott, 1993; Scherer, 1986), and if one assumes that infants naturally elicit emotions in children and adults, a universal ID speech style would in fact be expected. Indeed, the small but significant cross-cultural differences in ID speech that exist appear to map onto cultural differences in the acceptability of open emotional expression (e.g., Fernald et al., 1989).

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If we are correct that the well-documented prosodic modifications of ID speech are due mainly to ubiquitous vocal expression of emotion to infants in contrast to more constrained vocal expression of emotion to adults, then the prosody of emotional AD and ID speech should be similar—assuming, of course, that similar prosodic devices are used to convey emotion in ID and AD speech. We tested this hypothesis by directly comparing samples of emotional ID and emotional AD speech on the five acoustic features (pitch, pitch contour, pitch range, tempo, and rhythmic contour) that are used to define the ID speech style. We focused on four emotions, love, comfort, surprise, and fear, because these are emotions that caregivers are likely to express to infants. Because there is limited research on the vocal expression of emotion in general, and on the secondary emotions of love, comfort, and surprise in particular, this study provides new data on the vocal expression of these emotions.

Fear, as a primary emotion, has been studied more extensively than the other emotions in our study. It is generally agreed that fear is expressed through an increase in pitch and tempo (see Murray & Arnott, 1993; Scherer, 1986), but it has been reported to have an increased pitch range (Scherer, 1986) as well as a decreased pitch range (Fónagy, 1978). Although acoustic features have not been measured systematically for love and comfort in AD speech, love might share some features with happiness, whereas comfort might share some with sadness. Both happiness and sadness are expressed with low pitch and slow tempo (note that happiness is differentiated from joy, which has high pitch and fast tempo; Scherer, 1986). In ID speech, comfort is associated with low pitch, decreased pitch range, and descending pitch contours (Fernald, 1989; Papoušek et al., 1991). Although there are virtually no acoustic analyses of AD surprise, mothers attempting to get their infants' attention use a slow tempo and large pitch range (Fernald, 1989; Papoušek et al., 1991).

Prosodic contours, that is, changes in pitch, tempo, and loudness over time, are important in the vocal expression of emotion (e.g., Frick, 1985), as evidenced by the difficulty of identifying emotions in speech presented backward (Knower, 1941). However, emotional prosodic contours are difficult to study, in part because they interact with the phonetic and grammatical structure of utterances. In the present study, we were particularly interested in pitch and duration contours because they are central to the definition of ID speech. To facilitate the comparison of prosodic contours across emotions and ID versus AD contexts, we recorded mothers acting each emotion to their infants and to the experimenter while uttering the same phrase, "Hey, honey, come over here," in each case.

In summary, we expected to find robust differences in pitch, pitch contour, pitch range, tempo, and rhythmic contour across the emotions expressed in our sample of utterances. We also expected, in contrast to studies comparing unemotional AD and ID speech, to find few differences between the emotional AD and ID utterances in our sample.

METHOD

Participants

The speech of 23 mothers with infants (mean age of infants = 8.6 months; range: 7.8–9.0 months; 10 male, 13 female) was recorded. All infants were healthy, were born at term, and had had fewer than three ear infections according to parental report. The mothers were also healthy, and there was no history of hearing impairment in their families. The recorded samples were rated by six students and researchers, all of whom had some knowledge of acoustics and ID speech.

Table 1. *Emotional scenarios participants imagined while being recorded*

Infant-directed emotional scenarios

Love. You have the most wonderful baby in the world.
Comfort. The experimenter holds your baby. You comfort your baby when she is returned to you.
Surprise. Play a game of peek-a-boo with your child.
Fear. Your baby has wandered near an electrical outlet. You fear for your child's safety.

Adult-directed emotional scenarios

Love. You have the most wonderful companion in the whole world.
Comfort. Your mother has come to your front door in the rain. She enters and you attempt to make her comfortable on the couch.
Surprise. You thought your best friend was out of town for the week. Then they suddenly walk through the door.
Fear. Your best friend flew out from the airport early this morning. You hear on the radio that there was a plane crash. You don't know if that was the plane that your friend was on.

Recording Apparatus

The recordings were made in the laboratory in a quiet, comfortable room with an omnidirectional video-production microphone. The microphone was connected through Tucker Davis equipment to a Comptech computer running Computer Speech Research Environment (CSRE) software in an adjacent room.

Recording Procedure

Mothers were asked to say, "Hey, honey, come over here," while imagining the scenario printed on each of eight cards and expressing the indicated emotion in their voice (see Table 1). There were four emotions, love, comfort, surprise, and fear, and each was elicited with both an ID and an AD scenario. Each mother acted the ID versions to her infant and the AD versions to the experimenter while her infant was not present. Half the mothers completed the four ID versions first and half completed the four AD versions first.

Rating Procedure

The raters listened to all the recordings of "Hey, honey, come over here" (played directly from the computer in random order) and indicated whether they thought each expressed comfort, surprise, love, or fear, as well as whether it was infant directed or adult directed.

Acoustic Analyses

Five acoustic features were of interest because, in addition to being important in the vocal expression of emotion, these are the character-

Table 2. *Confusion matrix for emotion identification*

	Emotion identified							
	Infant-directed samples				Adult-directed samples			
Emotion expressed	Love	Comfort	Fear	Surprise	Love	Comfort	Fear	Surprise
Love	**.55**	.33	.05	.07	**.24**	.58	.12	.07
Comfort	.55	**.32**	.07	.07	.17	**.47**	.28	.08
Fear	.02	.01	**.80**	.17	.03	.06	**.71**	.20
Surprise	.31	.04	.09	**.55**	.00	.02	.10	**.88**

Note. The diagonals (in boldface) show the proportion correct for each emotion.

istics that have been used to define ID speech. Specifically, we measured mean pitch, pitch contour, pitch range, tempo, and rhythmic contour. We segmented the utterance "Hey, honey, come over here" into eight segments that roughly corresponded to syllables: *hey*, *hon-*, *ey*, *come*, *o-*, *ver*, *he-*, *re*. In order to measure each of the five features, we first extracted the pitch of the vowel in each segment and the duration of each segment using Signalyze 3.12 software on a Macintosh 7300/180.

RESULTS

Ratings

Of the 184 potential recordings of "Hey, honey, come over here," 8 were not recorded because of computer error. An additional 11 were eliminated because they contained infant vocalizations or the mother did not say the phrase correctly. Thus, the final sample consisted of 165 samples, 81 infant directed and 84 adult directed.

For each of the 165 samples, the average accuracy of identification across the six raters was calculated and used as the dependent measure in the following analyses. In both the ID and the AD samples, the correct emotion was identified significantly more often than the chance level of .25, $t(83) = 8.91$, $p < .0001$, and $t(80) = 8.27$, $p < .0001$, respectively; there was no difference between the accuracy of identification of the emotion in ID versus AD samples, with mean proportions correctly identified of .56 ($SE = .035$) and .57 ($SE = .039$), respectively. The confusion matrix (Table 2) shows that for both ID and AD samples, love and comfort were highly confused, with raters tending to choose love for ID samples and comfort for AD samples. One interpretation of this confusion is that the actual emotions elicited by the particular scenarios used for comfort and love were not very different. Because the two classes were not readily distinguishable, we collapsed across the comfort and love categories before performing the acoustic analyses. As shown in the collapsed confusion matrix in Table 3, all emotions were well identified, although ID surprise was sometimes confused with ID love.

The raters were able to tell whether the samples were infant directed or adult directed above the chance level of .5, $t(164) = 28.42$, $p < .0001$. However, performance, at 78% correct ($SE = 1.90\%$), was far from ceiling, even with this group of experienced raters, all of whom were familiar with acoustic analysis and ID speech.

Acoustic Analyses

The eight best-identified samples in each of the six categories (3 emotions × 2 audiences) were chosen for the acoustic analyses. Analyses of variance (ANOVAs) were used to test whether each acoustic feature (mean pitch, pitch contour, pitch range, tempo, and rhythm) distinguished the audience (infants and adults) and the emotion (love-comfort, surprise, and fear), and whether the pattern of features across emotions was the same for the two audiences.

The analyses of the pitch-based features (mean pitch, pitch contour, pitch range) used the measured pitch of the vowel in each segment to derive the dependent variable. Very often the fourth segment, *come*, and the sixth segment, *ver*, were not clearly articulated and the pitch could not be measured, so these segments were not used in the statistical analyses for pitch. Mean pitch (the average of the pitches across the segments) and pitch contour (the pattern of pitches across the segments) were examined in a single ANOVA with segment (pitch of the vowel across the six segments *hey*, *hon-*, *ey*, *o-*, *he-*, *re*) as a

Table 3. *Confusion matrix for emotion identification with love and comfort combined*

	Emotion identified					
	Infant-directed speech			Adult-directed speech		
Emotion expressed	Love-comfort	Fear	Surprise	Love-comfort	Fear	Surprise
Love-comfort	**.88**	.06	.07	**.72**	.20	.08
Fear	.02	**.80**	.18	.09	**.71**	.20
Surprise	.36	.09	**.55**	.02	.10	**.88**

Note. The diagonals (in boldface) show the proportion correct for each emotion.

repeated measure, and audience (infant, adult) and emotion (love-comfort, surprise, fear) as between-subjects variables. Note that in this analysis, differences in pitch contour across the emotions would generate an interaction between emotion and segment, and differences in pitch contour between ID and AD samples across the emotions would generate an interaction among audience, emotion, and segment.

The pitch range was obtained for each utterance by subtracting the pitch of the lowest segment from the pitch of the highest segment. Pitch range was subjected to a second ANOVA with audience and emotion as between-subjects variables.

Analyses of tempo and rhythmic contour were based on the duration of the eight segments. Tempo is the mean segment duration, and rhythmic contour is the pattern of segment durations across the utterance. Much as in the analyses of pitch and pitch contour, tempo and rhythmic pattern were examined in a single ANOVA with segment (duration across the eight segments *hey*, *hon-*, *ey*, *come*, *o-*, *ver*, *he-*, *re*) as a repeated measure and audience and emotion as between-subjects variables. In this analysis, differences in rhythmic contour across the emotions would generate an emotion-by-segment interaction, and differences in rhythmic contour between ID and AD samples across the emotions would generate an interaction among audience, emotion, and segment.

Mean pitch

There was only one effect of audience in the pitch analyses: Overall, the pitch was higher in the ID than in the AD versions, $F(1, 42) = 9.56$, $p < .004$. The mean pitch also differed across the emotions, $F(2, 42) = 20.42$, $p < .0001$ (Fig. 1), but there was no interaction between audience and emotion. Tukey HSD tests revealed that the pitch of the love-comfort samples was significantly lower than the

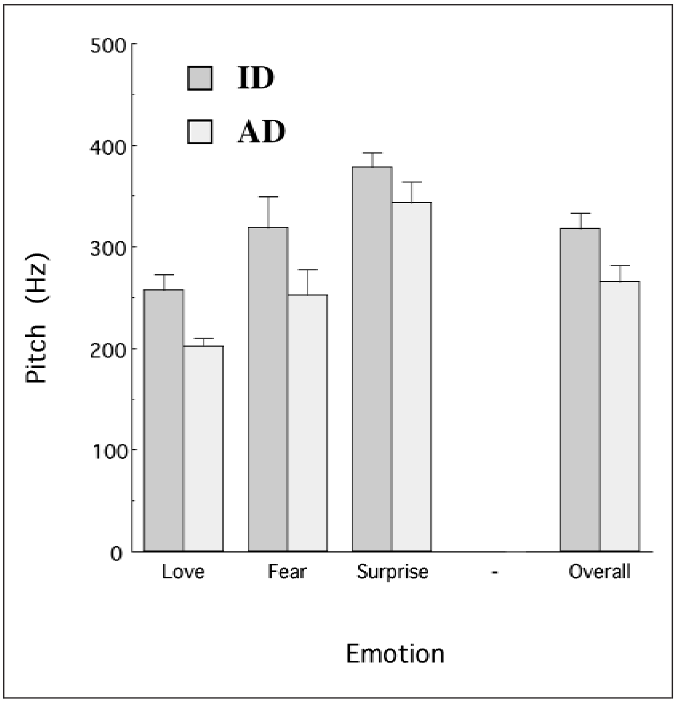

Fig. 1. Mean pitch (and *SE*) for infant-directed (ID) and adult-directed (AD) speech samples expressing love-comfort, fear, and surprise.

pitch of the fear samples ($p < .03$), and that the pitch of the fear samples was significantly lower than that of the surprise samples ($p < .003$). Thus, the relation between mean pitch and emotion appears to be similar for ID and AD vocal expressions of emotion.

Pitch contour

ID and AD samples did not differ in pitch contour (i.e., there were no interactions involving audience). There was a main effect of segment, $F(5, 210) = 18.42$, $p < .0001$, indicating that the pitch of the vowel was higher in some segments than in others, that is, that the pitch contour overall was not flat. More interestingly, there was an interaction between segment and emotion, $F(10, 210) = 3.8$, $p < .0001$, indicating that the pitch contour differed across the three emotions (Fig. 2). Trend analyses revealed that the pitch contours of all three emotions were distinct. Love-comfort and surprise both had significant linear trends ($F[1, 210] = 14.38$, $p < .001$, and $F[1, 210] = 7.34$, $p < .01$, respectively), nonsignificant quadratic trends, and significant cubic trends ($F[1, 210] = 7.64$, $p < .01$, and $F[1, 210] = 66.49$, $p < .0001$, respectively), but the cubic trend was greater in surprise than in love-comfort, $F(1, 210) = 14.53$, $p < .001$. Fear differed from love-comfort and surprise in that it had significant linear ($F[1, 210] = 4.99$, $p < .05$) and quadratic ($F[1, 210] = 4.28$, $p < .05$), but not cubic, trends. As can be seen in Figure 2, in love-comfort, the two phrases "Hey, honey" and "come over here" both have downward pitch contours; in fear, the contour is quite flat; in surprise, the first phrase has a downward contour but the second has a large bell-shaped contour. These results suggest that pitch contours distinguish different emotions, but are identical in ID and AD emotional speech.

Pitch range

There were no differences in pitch range between ID and AD samples: no overall effect of audience and no interaction between audience and emotion. However, the pitch range differed across emotions, $F(2, 42) = 20.93$, $p < .0001$ (see Fig. 3). Tukey HSD tests revealed that love-comfort and fear did not differ in pitch range ($p > .9$), but surprise had a larger pitch range than either love-comfort ($p < .0002$) or fear ($p < .0002$). Thus, the pitch range does not differ between ID and AD emotional speech, but differs clearly across emotions.

Tempo

There was no main effect of audience, indicating that, overall, the ID and AD samples did not differ in tempo. There was, however, a main effect of emotion, $F(2, 42) = 15.47$, $p < .0001$, as well as an interaction between audience and emotion, $F(2, 42) = 7.93$, $p < .002$ (see Fig. 4). Tukey HSD tests revealed that ID and AD tempo did not differ for either fear or surprise, but ID love-comfort samples were slower than AD love-comfort samples ($p < .01$). Fear tended to be fastest for both ID and AD samples. ID fear samples were faster than both ID love-comfort ($p < .0001$) and ID surprise ($p < .03$) samples. AD fear samples were faster than AD surprise samples ($p < .002$) and approached being faster than AD love-comfort samples ($p < .11$). In summary, tempo differentiated the emotions, and a second difference between the ID and AD samples was revealed: ID love-comfort was slower than AD love-comfort.

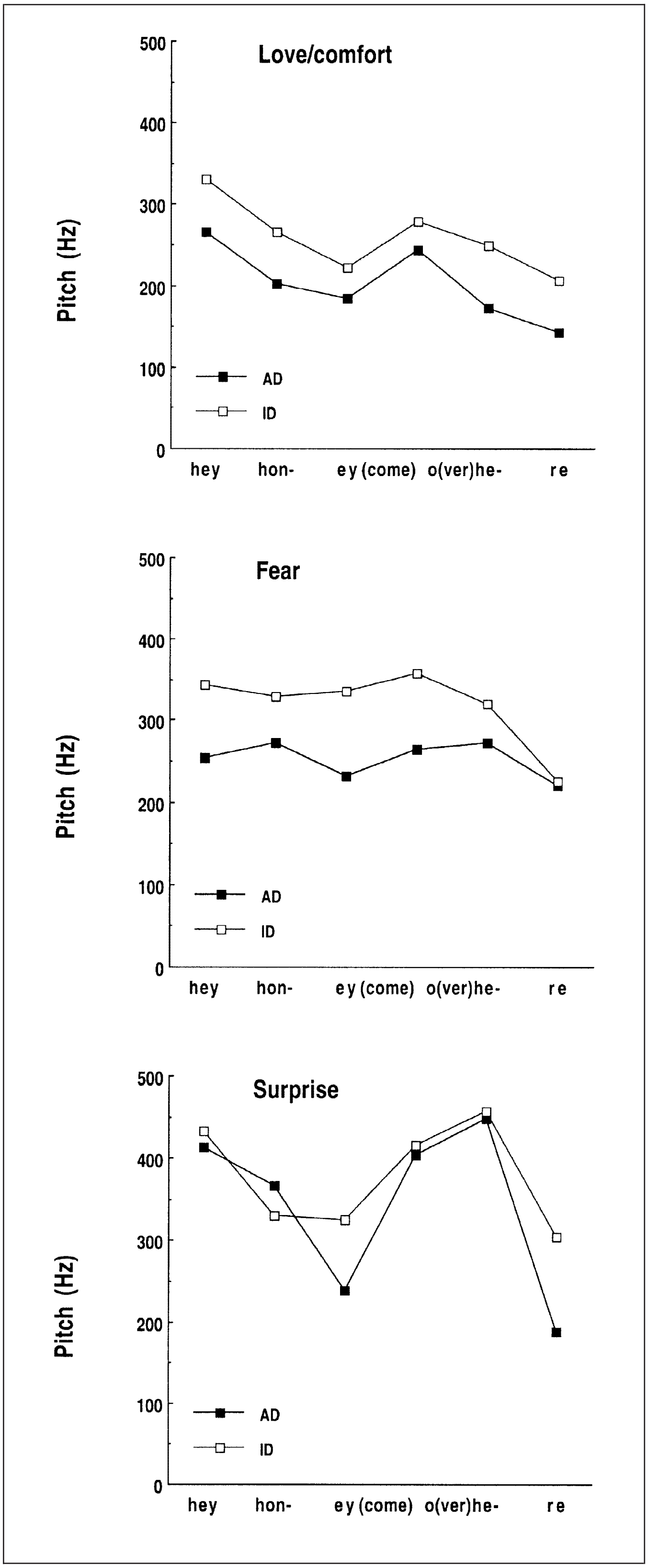

Fig. 2. Pitch contours across segments for infant-directed (ID) and adult-directed (AD) speech samples expressing love-comfort, fear, and surprise.

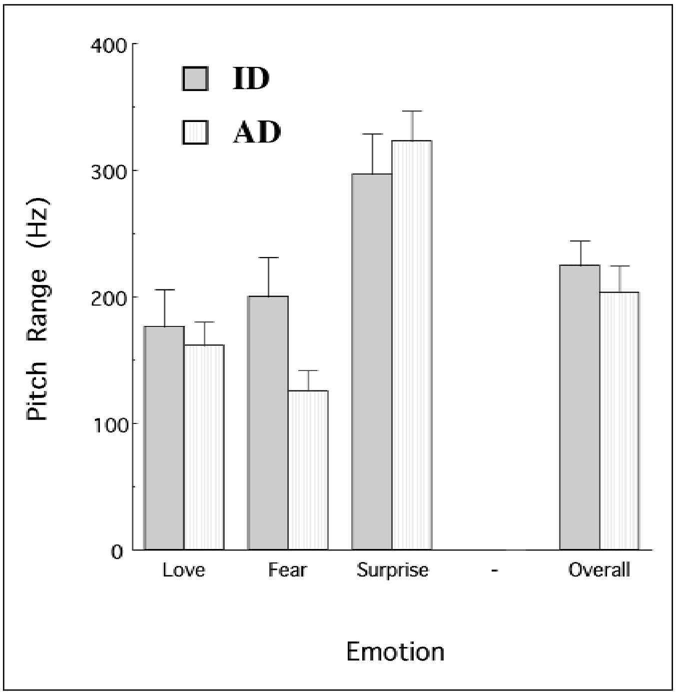

Fig. 3. Mean pitch range (and *SE*) for infant-directed (ID) and adult-directed (AD) speech samples expressing love-comfort, fear, and surprise.

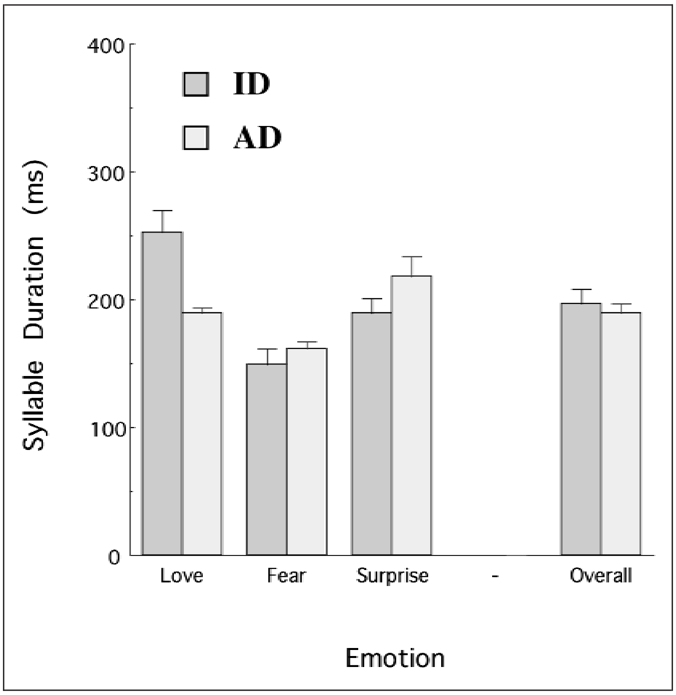

Fig. 4. Mean syllable duration (and *SE*) for infant-directed (ID) and adult-directed (AD) speech samples expressing love-comfort, fear, and surprise.

Rhythmic contour

ID and AD samples did not differ in rhythmic contour: There was no main effect of audience and no interactions involving audience. However, rhythmic contour differed across the emotions. There was a main effect of segment, $F(7, 294) = 24.16$, $p < .0001$, indicating that overall some segments were shorter than others. More interestingly, there was an interaction between segment and emotion, $F(14, 294) = 2.34$, $p < .005$, indicating that the rhythmic contour differed across the emotions (Fig. 5). Trend analyses revealed that all three emotions had distinct rhythmic contours. Surprise and fear had significant linear trends ($F[1, 294] = 8.88$, $p < .005$, and $F[1, 294] = 4.14$, $p < .05$, respectively), but love-comfort did not. All three had significant quadratic trends ($F[1, 294] = 32.78$, $p < .0001$, for love-comfort; $F[1, 294] = 9.42$, $p < .005$, for fear; $F[1, 294] = 95.81$, $p < .0001$, for surprise), but the quadratic trend was greater for surprise than for fear ($F[1, 294] = 69.5$, $p < .0001$). Figure 5 shows that in love-comfort, the utterances speed up in the middle and slow down at the end; in surprise, the same pattern is evident, but it is more exaggerated than in love-comfort; in fear, the tempo is more constant. In summary, rhythmic contour distinguishes among emotions, but not between ID and AD samples of emotional speech.

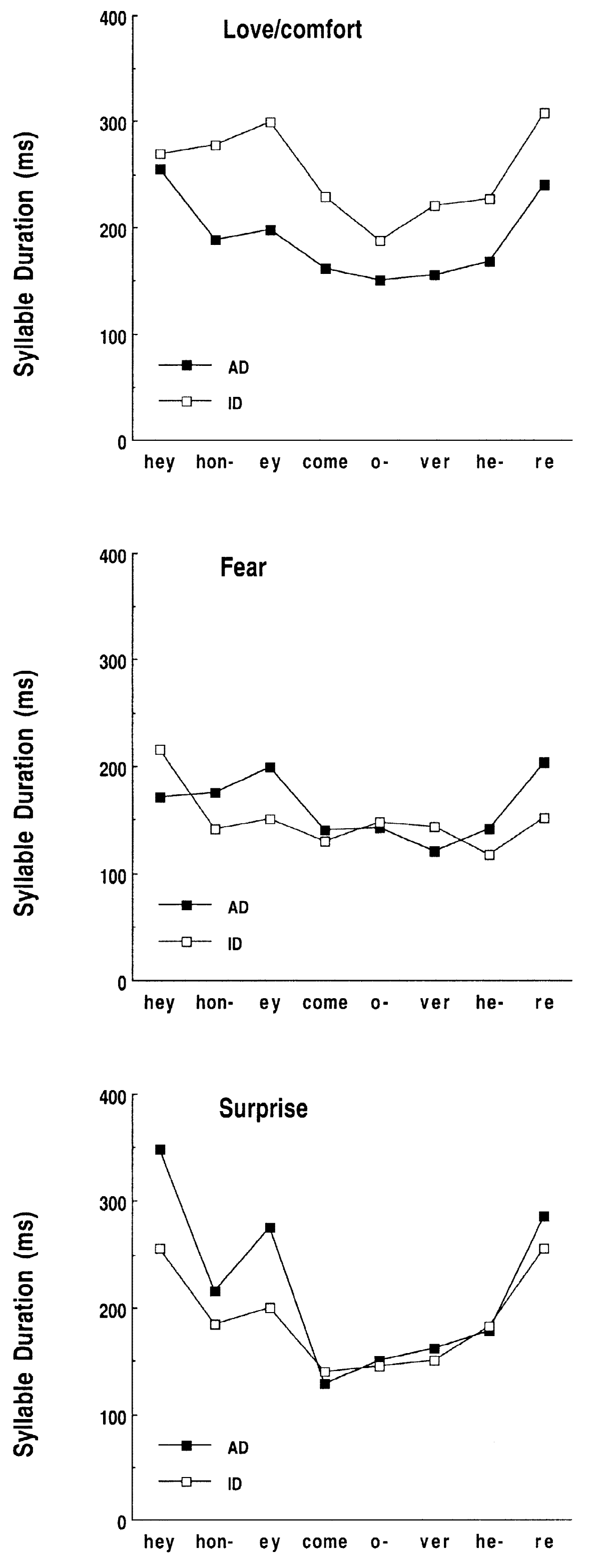

Fig. 5. Syllable duration across segments (rhythmic contour) for infant-directed (ID) and adult-directed (AD) speech samples expressing love-comfort, fear, and surprise.

DISCUSSION

As predicted, we found few acoustic differences between our ID and AD samples of emotional speech, even though we chose to examine acoustic parameters that are used to define the ID speech register. Only two acoustic differences between the ID and AD speech samples emerged. First, ID love-comfort samples were slower than AD love-comfort samples. Interestingly, slower tempo has been associated with benevolence (Brown, Strong, & Rencher, 1973), which might be an emotion adults feel more strongly when loving and comforting an infant than another adult. The second acoustic difference was that overall the ID samples were higher in pitch than the AD samples, although for both audiences love-comfort was lowest in pitch, fear next, and surprise highest. This finding is particularly interesting because infants show a preference for high-pitched speech (Patterson, Muir, & Hains, 1997) and singing (Trainor & Zacharias, 1998) in the absence of other differences. Morton (1977) has argued that across species, high-pitched sounds are used in nonaggressive appeasement, submission, and friendliness. It is possible that because infants and adults are different, some aspects of the emotions speakers feel toward them, and therefore express to them, can never be entirely equated. Perhaps there is always a greater element of nonaggression when interacting with an infant compared with an adult, resulting in the use of higher pitch with infants.

The fact that we observed few differences between ID and AD samples is in sharp contrast to the results of studies comparing ID speech with unemotional AD speech (e.g., Ferguson, 1964; Fernald, 1991; Katz et al., 1996; Stern et al., 1982). The relative lack of acoustic ID-AD differences was mirrored in raters' equal ease of emotion identification in the ID and AD samples. Again, this is in contrast to a previous study, in which raters were better able to identify the context of utterances for ID than for AD samples (Fernald, 1989). Our results suggest that previous findings of ID-AD differences are, at least in part, a result of more constrained emotional expression in typical AD speech compared with typical ID speech, although future studies should test whether this conclusion is valid for longer, more diverse utterances.

Although the ID and AD samples exhibited few differences in the five acoustic features examined, these features clearly differentiated the emotions across the ID and AD samples. Love-comfort was lowest in pitch, fear next, and surprise highest in pitch. Love-comfort samples contained two descending pitch contours, fear samples were relatively flat, and surprise samples had large bell-shaped contours. Love-comfort and fear had relatively narrow pitch ranges compared with surprise. Fear samples were faster than love-comfort and surprise samples. The samples also showed distinct rhythmic contours. Love-comfort speeded up somewhat in the middle and slowed at the end; surprise showed the same pattern but in a more exaggerated form; and fear showed a relatively constant rhythmic contour.

We argue that ID speech arises from the vocal expression of emotion. Other potential functions of ID speech, such as attracting and maintaining infants' attention and exaggerating lexical and grammatical structure for language acquisition, may take advantage of emotional prosody. But the similarity of emotional expression in ID and AD speech suggests that emotional expression is the primary determinant of ID speech. Why might the vocal expression of emotion be so pervasive in ID speech? First, because infants cannot understand the words, the prosody becomes vitally important for communication. Second, much research indicates that strong emotional ties to caring adults are vital in the infancy period not only for emotional development, but also for physical and intellectual development (e.g., Ainsworth & Bell, 1970; Drotar & Sturm, 1988; Spitz, 1950). Because the auditory system matures earlier than the visual system (Gottlieb, 1971), and because language is primarily based in the auditory modality, the vocal expression of emotion likely plays a major role in early emotional development. This role should be explored in future studies, beginning with infants' reactions to emotions in speech.

It is also informative to consider ID singing in this regard, as similarities in pitch and tempo characteristics between ID speech and singing have been noted by a number of researchers (Fernald, 1989; Papoušek et al., 1991; Trainor et al., 1997; Trehub et al., 1993), and singing to infants also appears to be universal across cultures (Trehub et al., 1993). Interestingly, the specific acoustic features that define the ID speech register can be thought of as musical features: Pitch and rhythmic structure are the two main dimensions of musical structure. Because the emotions music conveys to, and induces in, listeners constitute the meaning of music (Meyer, 1956), speech that adopts musical features might also be expected to be good at communicating emotional information.

We conclude that emotional expression is very similar in ID and AD speech and that previously reported differences between ID and AD speech are in large part the result of comparing emotional ID speech with less emotional AD speech. In other words, ID prosody is not what is special. What is special is the widespread expression of emotion to infants in comparison to the more inhibited expression of emotion in typical adult interactions.

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