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A Nonverbal Signal in Voices of Interview Partners Effectively Predicts Communication Accommodation and Social Status Perceptions

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Derivations from nonverbal communications accommodation theory are tested, and this knowledge is extended both theoretically and methodologically. Fast fourier transform and statistical analysis of a low-frequency nonverbal signal in voices from 25 dyadic interviews between a talk show host and his guests revealed voice convergence between partners. Correlation coefficients from comparisons of partners' voice spectra and factor analysis of the correlation matrix showed that lower status partners accommodated their voices to higher status partners via the nonverbal signal. Student ratings of the social status of the same talk show host and guests were correlated with factor loadings, thereby providing convergent validity of the nonverbal signal as a predictor of social status perceptions and accommodation.

Howard Giles's theories of speech convergence (Giles, 1973) and accommodation (Giles & Smith, 1979) refer, respectively, to various processes whereby people shift their speech styles to become more like those with whom they are interacting and to ways in which people adapt their speech to how they believe others in the situation may best receive it. More specifically, speech accommodation theory (Giles, 1973)—and, subsequently, communication accommodation theory (CAT; Giles, Mulac, Bradac, & Johnson, 1987)—"proposes that speech convergence reflects . . . a speaker's or a group's need (often nonconscious) for social integration or identification with another" (Giles & Coupland, 1991, pp. 71-72).

According to a variety of research directions, forms of accommodation occur on a number of levels. Investigators have studied how people become more alike in their language (Giles, Taylor, & Bourhis, 1973), pronunciation (Giles, 1973), speech rates (Webb, 1970), pause and utterance duration (Jaffe & Feldstein, 1970; Matarazzo, 1973; Woodall & Burgoon, 1983), and vocal intensities (Natale, 1975b). Conversation and interview partners have been shown to converge pitch patterns (Fernald et al., 1989; Gregory, 1983, 1990, 1994; Lieberman, 1967; Zebrowitz, Brownlow, & Olson, 1992). In addition, speech elements have been related to other social attributes such as social desirability or attractiveness (Berry, 1990, 1992; Natale, 1975a, 1975b; Zuckerman & Driver, 1989; Zuckerman, Hodgins, & Miyake, 1990; Zuckerman & Miyake, 1993), attitudes (Argyle, Alkema, & Gilmour, 1971; Woodall & Burgoon, 1983), and emotions (Burns & Beier, 1973; Helfrich & Wallbott, 1986; Trimboli & Walker, 1987).

An area of the research literature directly impinging on the present study involves connections between speech attributes and power or social status relations. In this regard, investigations have been made into nonverbal paralinguistic cues related to perceived confidence (Kimbel & Seidel, 1991; Scherer, London, & Wolff, 1973; Walker, 1977) as well as social influence (Capella & Planalp, 1981; Scherer, 1979) and dominance shown by health professionals (Korsch & Negrete, 1972; Shapiro, Najman, & Chang, 1983; Street & Buller, 1987; Street & Wiemann, 1987; West, 1984). Ryan and Giles (1982) isolated measures of status that are factorially independent from other conceptual counterparts such as competence, and Giles and Coupland's (1991) study of language in context centered on status relations demonstrated through measures of social approval.

Making use of Natale's (1975a, 1975b) connection between measures of vocal intensity and social approval, Giles and Coupland (1991, p. 73) noted that "speakers scoring higher on a trait measure of need for social approval converged more to their partner's vocal intensity and pause length than speakers who scored lower." These authors further stated that "the power variable is one that emerges a number of times in the accommodation literatures and in ways that support the model's central predictions" (Giles & Coupland, 1991, p. 73). Pittam (1994, p. 140) supported these assertions from CAT that voice convergence is, at least in part, strategically imposed and implemented through accommodation in the power or status domain.

Giles and Coupland (1991, pp. 60-64) defined the two terms from CAT, *convergence* and *accommodation*, as, respectively, "a strategy whereby individuals adapt to each other's communicative behaviors in terms of a wide range of linguistic/prosodic/non-verbal features" (p. 63) and "the general sense of adjusting our communication actions relative to those of our conversation

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partners" (p. 60). Our understanding of CAT leads us to conclude that convergence involves studying how partners merge voice elements to one another, with no specific attention devoted to their roles in producing the adaptation. On the other hand, accommodation emphasizes studying how partners perform a service or provide a convenience in the interaction. In conversation, then, partners control their acts of accommodation, and this control mechanism is closely associated with manipulation of social status perceptions by one or both partners.

Accommodation of power relations through voices of interacting partners is a means whereby power credentialing is resolved and the optimum format for ensuing communication is prepared. When the power signal is successfully accommodated, channels are open for additional productive relations between partners. As Ng and Bradac (1993, p. 12) noted, well-known leaders "exude power," and individuals interacting with them easily recognize their stature. The mutual consonance of status relations between individuals is socially useful in that it allows further orderly relations to follow. However, when status perceptions are not shared, accommodation must endure a poorly marked path toward communication convergence.

The literatures discussed thus far point to a variety of verbal and nonverbal elements associated with power or status relations between interacting partners. With the possible exception of Natale (1975a, 1975b), however, these theoretical discussions strongly imply but do not use methodologies objectively measuring participants' achievement of convergence through resolution of power relations in their interaction. Although dominance–deference relations can be managed through a number of channels, such as word use, pronunciation, accent, masking, and interruptions, many of which have been recently noted by Ng and Bradac (1993), these methods do not provide a manifold means of accurately determining power or status in interpersonal relations exclusively from the verbal signal.

In this article, a new method for analysis of status and power relations is proposed that is harmonious with past discussions of accommodation theory and, furthermore, offers a novel method for measuring these phenomena. CAT (Giles et al., 1987) infers that accommodation occurs over time and predicts that when status differences exist, they are reflected in the asymmetry of accommodation; the lower status person should accommodate the person of higher status. This asymmetry can be reflected in the amount of change in accommodation over time or in the differences in voices of interview partners as related to their status.

The method used in the present study involved spectral analysis of the low-frequency band of the voice (beneath 0.5 kHz). Although spectral analysis of this low-frequency band has been discussed in past studies (Gregory, 1990, 1994; Gregory, Webster, & Huang, 1993), its specific connection with interactional power relations has not been previously reported. The account provided here shows how analysis of this nonverbal band in voices from a data set derived from recordings of 25 dyadic interviews between talk show host Larry King and his guests (on the CNN *Larry King Live* talk show) can produce accurate discriminations between higher and lower status guests. In other words, this band is shown to serve as a communication arena wherein dyadic interview partners accommodate social status relations.

It is common knowledge that power and status identifications are communicated through the voice channel. Authoritative voices and deferent voices are easily recognized as such, but the specific facility within the voice that communicates dominance and deference and its power in generally establishing social status have not been elucidated. The format of this article presents the research as three studies, not as a single study. Therefore, the research we report shows how the lower frequency of the voice communicates social status relations between partners, a finding that has not as yet been reported in the literature on the social psychology of voice accommodation. This research enhances accommodation theory, first, by revealing one of the most basic voice channels through which interacting partners manage their status relations and, second, by providing a method for accurately measuring these levels of interpersonal power or status.

Methods Used in Previous Studies

Previous research reported on a nonverbal acoustic marker of speech convergence (Gregory, 1983, 1986a, 1986b, 1990, 1994; Gregory & Hoyt, 1982; Gregory et al., 1993). These studies showed that the signal exclusively producing the voice accommodation result is found in the fundamental frequency band of speakers' frequency spectra (beneath 0.5 kHz; Gregory, 1990). In previous studies, this low-frequency band was processed by means of fast fourier transform (FFT) analysis, an algorithm[1] that relates a specific frequency with its constituent energy level or amplitude.

FFT processing is similar to the natural treatment of sound by the ear. As a listener hears a speaker, it is assumed that he or she perceives fluctuations in frequency and that these fluctuations are averaged, in much the same way that changes in a speaker's voice are perceived over time (e.g., a speaker becomes hoarse or suffers a cold). According to a member of the Stanford University engineering faculty (Bracewell, 1989, p. 86) versed in FFT analysis,

> To calculate a transform just listen. The ear automatically performs the calculation, which the intellect can execute only after years of mathematical education. The ear formulates a transform by converting sound—the waves of pressure traveling through time and the atmosphere—into a spectrum, a description of the sound

[1] Spectral analysis makes use of an FFT algorithm. This algorithm formulates the three defining characteristics of any waveform: amplitude, wavelength, and phase angle. These waveform characteristics are used in FFT calculations to extract dominant periodic components of the waveform. More simply, FFT analysis disassembles any waveform into energy values of its constituent sine waves or, conversely, regenerates a waveform by combining its sine waves. FFT analysis creates a spectrum consisting of a set of magnitudes, represented on the y-axis, that are associated with frequencies, represented on the x-axis. The combination of sine waves for a real-world waveform is unique and can be represented only by a single combination. In the present study, the combination of sine waves for a speech sample spectrum acted as a code created by interview partners that was unique to their interaction.

as a series of values at distinct pitches. The brain turns this information into perceived sound.

FFT analysis creates a spectrum comprising a relationship between the voice's frequency on the x-axis and its amplitude at that frequency registered on the y-axis. This amplitude–frequency relation generates a curve for a particular voice sample. In past projects, these spectral curves were generated from samples of tape-recorded interview partners' speech by means of a dedicated FFT spectral analyzer (the dual channel, ZONIC + AND 3524). A number of these voice sample curves can be averaged over a period of time, and although this averaging is done for research purposes, it has a perceptual counterpart. For example, as briefly alluded to earlier, the voices of close friends are familiar, and although these voices are often changed by circumstances such as nasal congestion or a common cold, the friend's altered voice is recognized as interaction proceeds because a comparison is made between the congestion-altered voice as currently perceived and memory traces of the friend's normal voice. The memory trace is the cognitive analogue to an averaged spectrum for that friend's voice. The congestion is recognized when perception does not precisely match the memory trace.

These spectral samples, averaged for research purposes, are called long-term averaged spectra (LTAS), and they represent an extended averaged speech utterance (Pittam, 1994, pp. 52–58; Scherer, 1985, pp. 164–169). LTAS represent the more stable characteristics of a speaker's voice, independent of short-term variations (e.g., specific words and pauses) that could overly influence a result. Unique energy levels related to frequency can thus be averaged over a relatively long expanse of speech (seconds or even minutes), creating a result representing a spectral spread for the voice sample.

If two LTAS curves from two different speakers' voices are overlaid and have similarly shaped curves, then it can be said that this represents a strong match. On the other hand, if the shapes widely vary, the match is weaker. As a practical illustration of how an adaptation or accommodation match in two conversation partners' voices can be perceived by a third party, the following example is offered. It is not unusual for a third party who is overhearing one partner engaged in a telephone conversation with another to identify the absent partner solely through perception of tonal qualities in the voice of the nearby partner. These tonal qualities can also communicate status differences that can be perceived by a third party (e.g., one's roommate is overheard speaking with her supervisor, peer, or subordinate).

In previous research, comparative match values for interview partners' voices were prepared with Pearson correlation comparisons, in which high r values signified strong matches in spectral shape or curve and low values showed weak spectral relations. It is assumed, theoretically, that people who are already interacting will converge their voices, and this will be shown in a strong LTAS match. On the other hand, if people have not interacted, then their voices or LTAS will show a weak match. As a means of determining the significance or fit of a match, correlation comparisons were made between actual interview partners' matches and what were called pseudomatches. For example, say an interviewer named Cameron has interviewed 3 people: Sheila, Helen, and Phyllis. If one separates out Cameron's LTAS when he is conversing with Sheila and correlates them with Sheila's LTAS when she is conversing with him, then this would generate an actual match. On the other hand, if Cameron's LTAS from Sheila's interview are compared with those from Helen's or Phyllis's LTAS from their respective interviews with him, this would produce pseudomatches. If Cameron interviews 10 different people and the LTAS are compared through Pearson correlations, this would generate a 10×10 correlation matrix in which the diagonal shows 10 r values for actual matches and the other 90 cells show pseudovalues. A similar matrix was created and used in the present study.

The complete correlation matrix included r values for actual matches and pseudomatches. Through this technique, a comparison was made to determine whether correlations of actual matches were sufficiently robust to select them out from correlations of pseudomatches. Results from previous work revealed that actual matches were easily extracted from the mix of interviews, thus showing the convergence result. Use of this method eliminated a number of acoustic artifacts such as room and microphone effects that would confound other types of comparative research not making use of LTAS because, once again, the LTAS display relations between amplitude and frequency, and the correlation matrix thus compared the spectral curves among actual matches and pseudomatches.[2]

Relating Voice Accommodation to Social Status

In the course of examining results from an initial correlation analysis of 25 interviews in the *Larry King Live* data set, we observed that a number of pseudointerview correlations in the matrix contained generally higher values than others and found that these interviews were inclined to represent higher status guests. Another observation sparking our interest was that the pseudocorrelations were often just slightly lower than values for actual correlations. It appeared, then, that pseudomatch correlations for celebrities of high status were, as a group, relatively higher than pseudomatch correlations for lower status celebrities. It is possible that LTAS curves of higher celebrity guests produce stronger correlations because of the prominent uniformity in spectral curves among members of this group. However, among lesser celebrities, there was more diversity in the curves, thus leading to lowered correlation values for this group. These cursory observations were not made in earlier projects investigating the voice convergence phenomenon because social status differences were not so flagrantly displayed as a result of the nature of the human participants who were involved. On the other hand, Mr. King's guests are, for the most part, individuals

[2] Although women have generally higher voice pitch levels than men and some people may speak with higher levels of intensity, these variations do not affect correlations between frequency and amplitude. The higher pitch level of women's voices would be represented by a spectral curve with elevated amplitudes in the higher frequencies, but the specific combination of frequencies with amplitude shown by the matches would not be affected. Also, higher voice intensity elevates the entire curve of LTAS but does not affect the relation of frequency with amplitude as exhibited in the correlations.

with conspicuous social prominence, thus facilitating status comparisons.

Studying the Low-Frequency Band as the Residence for Social Status Accommodation

Previous voice convergence studies showed partner accommodation but not moderation of accommodation as a function of status differences (Gregory, 1994; Gregory et al., 1993). When two individuals of different status positions interact, the effectiveness of their interaction is very much a function of their abilities in terms of social status accommodation. We tested three hypotheses that specify the role of the lower frequency band in accommodating social status differences.

Hypothesis 1: Voice Convergence

We predict that interview partners will converge LTAS from the lower frequency band of their voices. This hypothesis is a replication of previous work (Gregory et al., 1993) and involves showing the significant difference between actual match and pseudomatch values of interview partners. This replication study had to be accomplished to demonstrate that voice convergence exists in the data set between Mr. King and his guests. Study 1 was performed to show this convergence of LTAS in partners' voices.

Hypothesis 2: Voice Accommodation

We predict that voice convergence and accommodation of interview partners are moderated by the partners' relative social status. More specifically, interview partners of high status are accommodated by Mr. King, whereas guests with lesser status accommodate to him. Study 2 was designed to show that the ratios of dominance to deference for the lower status partners are nearly equal to the inverse of the dominance to deference ratios of the high-status partners. When a guest is a celebrity of very high status, the chances are that Mr. King will share this perception, and he will accommodate his LTAS accordingly. However, if the partner is of lower status, the opposite will occur, and the guest will defer to Mr. King. The latter accommodation may involve competition as a result of the possible lack of mutually shared perceptions.

Also in this connection, perceptions of shared social status positioning are more likely when status differences are large than when they are small. Therefore, when Mr. King interviews a guest of very high status, we assume that accommodation is more robust than when he interviews a guest who is more his equal in status. Finally, we expect that accommodation intensifies over time for all guests no matter their status but that intensified accommodation over time is more likely between Mr. King and guests of very high status who share social status perceptions.

To test this hypothesis, we factor analyzed r values from the LTAS correlation matrix of Larry King and his guests to establish factor loadings showing dominance–deference relationships. Although this hypothesis was derived from CAT (Giles & Coupland, 1991), there is no mention in the research literature of the lower frequency band's role in establishment of social status accommodation. Thus, this hypothesis reveals a unique feature within CAT theory that has not been studied.

Hypothesis 3: Validation of the Lower Frequency Band as a Vehicle for Social Status Accommodation

We predict that orderings of loadings in the factor analysis data set from the *Larry King Live* correlation matrix will display a relationship of higher to lower social status, and this ordering will be positively related to human participants' perceptions of social status. Study 3 compared results from the factor analysis of Study 2 with perceptions of social status from a sample of student participants to determine the convergent validity of this analysis of LTAS from the lower frequency band as an actual predictor of social status perceptions.

Study 1

This study was similar to those conducted in previous investigations of convergence (Gregory, 1983; Gregory et al., 1993), and its purpose was to establish that interview partners converge LTAS from their lower frequencies. If partners are shown to converge their voices with one another, this will lend support to Hypothesis 1 and lay the groundwork for subsequent analysis in Study 2.

Lower Frequency Band Data Set

The lower frequency band data set analyzed in this research was derived from 25 interviews from the *Larry King Live* television program recorded between April 1992 and July 1993. Video interviews were recorded on a VCR, each on a single tape, and then edited as input from the VCR to an audiotape recorder. Editing during VCR output and tape-recorder input involved elimination of advertisements and channel identifications. Interview lengths ranged from 20 to 30 min. Speech samples from interview partners on audiotape were taken from direct partner interactions rather than from interviewer or interviewee interactions with outside call-in participants. Nine audio voice samples were taken from each partner (18 samples per interview), and samples were spaced apart as equally as possible over the course of the interview. Settings on both the VCR and the tape recorder were identical for all interviews. Audiotape signals were sent directly to the FFT analyzer, making use of the sampling technique derived from a previous study (Gregory, 1994).[3]

Method

A statistical routine produced a mean spectrum from LTAS samples at temporal divisions approximating the beginning, middle, and end for each interview partner; thus, the sampling was condensed to three units per partner (Time Periods 1, 2, and 3). Pearson correlation coefficients

[3] There are a number of technical details concerned with accomplishment of sampling and FFT analysis that are too numerous to mention in the confines of this article. Additional technical information can be obtained from Stanford W. Gregory, Jr.

Table 1
Results of the Actual Match–Pseudomatch Comparison

Group	*n*	*M*	*SD*	*t*(1,873)
Actual matches	75	0.77	0.13	10.82*
Pseudomatches	1,800	0.60	0.17	

* $p < .0001$.

were used to compare LTAS means for interview partners. As mentioned earlier, correlation coefficients represented a matching of spectral curves (the LTAS) from interview partners in each temporal division, which means that Mr. King's LTAS in the first interview and in the first time period were matched with those of all 25 of his guests in the first time period. Then the routine accomplished the same correlation task between Mr. King and all 25 interviews for the second and third time periods. This comparison was made (as with the example noted earlier of Cameron's interviews with Sheila, Helen, and Phyllis) for all interviews and for all time periods within them.[4]

Results

To determine relative differences between actual matches and pseudomatches, we conducted *t* tests comparing average Pearson correlations between the two groups of interviews. Significant differences were expected between actual matches and pseudomatches, and the correlations among actual matches were expected to involve higher means than those among pseudomatches. Values for actual interview Pearson correlations were compared with those from pseudointerview correlations, and results are shown in Table 1. As noted in Table 1, *t*-test results showed a significant difference between actual matches ($M = 0.77$, $SD = 0.13$) as compared with pseudomatches ($M = 0.60$, $SD = 0.17$), $t(1873) = 10.82$, $p < .0001$. This result provides strong evidence, in support of Hypothesis 1, that interview partners converge elements of their voices to one another in the course of the interview. This result is a replication of previous studies showing voice convergence and represents a first step in establishing the relevance of the lower frequency band in managing social status accommodation (if data do not show strong convergence in partners' voices, then accommodation in other social categories cannot be solidly established).

Study 2

The goal of Study 2 was to determine whether analysis of the lower frequency band data set can distinguish between social status groups in the data set and, more specifically, to determine how this form of accommodation is accomplished. In this study, the correlation matrix of pseudomatches was examined. These pseudomatches were LTAS from Mr. King's guests matched together and from Mr. King matched with himself (e.g., LTAS from Barbra Streisand were matched with LTAS from Elizabeth Taylor, and LTAS of Mr. King when interviewing Barbra Streisand were matched with LTAS from Mr. King when interviewing Elizabeth Taylor). This was done to determine whether there is a uniformity in spectra derived from higher status guests as opposed to lower status guests and to determine whether Mr. King tends to defer more to higher status guests than to lower status ones.

Method

Distinctions between specific groups in the lower frequency band data set were produced through an SPSSX factor analysis routine. Study 1 made use of correlation comparisons between actual interview and pseudointerview partners; however, Study 2 examined *r* values derived from guest–guest and Mr. King–Mr. King comparisons. The *r* values from the correlation comparison were then factor analyzed. Factor analyses were performed separately on the guest–guest and Mr. King–Mr. King correlation matrices for each of the time periods.

The varimax orthogonal rotation in the factor analysis routine enforced similarities as well as differences in the data set such that an ordered continuum from one extreme to another could be shown for the guest–guest and Mr. King–Mr. King loadings. The factor loadings produced were then compared once again by means of Pearson *r* correlations. These correlations compared factors for guests and factors for Mr. King for each temporal period and showed social status accommodation distinctions between partners.

To repeat, these pseudomatches constituted comparisons made separately between guests and then separately between Mr. King's LTAS. Factor loadings derived from the correlations involving guests and the correlations involving Mr. King were then correlated to produce a comparison of dominance and deference indicators. Also, because samples were taken over time, indications of an increased crystallization or lucidity of status positions could be ascertained as well.

Additional evidence of a more concrete nature can be marshalled to augment the preceding methods. If a partner shows abundant variation or roughness in the LTAS curve, this may reveal an attempt to achieve accommodation, a maneuver associated with a less dominant partner. On the other hand, a very smooth LTAS curve with relatively less variation means that the partner is not pursuing accommodation but is awaiting it from the other partner. The standard deviation statistic derived from the mean taken across frequencies in the LTAS offers a rough measure of this variation in a partner's voice, and comparisons of this statistic with other measures can further indicate how a partner's voice manipulation can accomplish accommodation and convergence.

Standard deviation statistics from partners' LTAS were produced by first computing a mean of all LTAS samples across the three time periods for each partner in each interview (i.e., creating one mean LTAS curve for each partner). This mean curve for each partner was then condensed further into a single mean and standard deviation of frequency values originally composing the curve. In other words, the curve was compiled into a single mean value and single standard deviation for each partner. This standard deviation statistic for Mr. King's interview data was then correlated with similar standard deviations from guests. Also, standard deviations from Mr. King were correlated with factor analysis results from respective partners.

If the Mr. King–guest standard deviations show strong correlation values, then this will supply further evidence of convergence. In addition, the statistics derived from correlations of Mr. King's standard deviations with factor analysis results (related to status positions) can bet-

[4] To delimit the number of pseudocombinations used in this comparison, we used only the pseudomatches for each temporal division (beginning, middle, and end). This means that, with 25 interviews and three temporal divisions, there were 75 actual matches and 1,800 pseudomatches (3 actual matches and 72 pseudomatches per interview) for each data set. Therefore, table values were based on sample sizes of 75 for the actual match group and 1,800 for the pseudomatch group.

ter show the direction of accommodation. If factor analysis and standard deviation results are arrayed in the manner discussed in the preceding three paragraphs, there is a strong argument in support of Hypothesis 2 (i.e., that convergence is produced through social status accommodation within the lower frequency band).

Results

Factor analyses processed LTAS independently for Mr. King and for guests in each temporal period, and factor analysis statistics are reported in Table 2. The factor analysis routine was restricted to two factors for theoretical as well as statistical reasons. Examination of factor loadings for guest and Mr. King runs led to the apparent conclusion that Factor 1 loadings for both partners designated what can be termed a dominance factor, whereas Factor 2 loadings designated what can be termed a deference factor. The foundation for this conclusion is based on the logic that strong values for obviously prominent individuals and weak values for less prominent individuals would designate a measure of dominance. Obviously prominent individuals in guests' Factor 1 were associated with much stronger loadings than the others, and guests' Factor 2 showed strong loadings for less prominent guests and weaker loadings for more prominent guests. On the other hand, Mr. King's Factor 1 showed weak loadings for the obviously prominent guests, and Factor 2 showed strong loadings for these prominent guests. Mr. King was more dominant with less prominent guests and more deferent with more prominent guests. Also, eigenvalues were generally much lower for factors after the first two. These observations led to the conclusion that Factor 1 measures dominance and Factor 2 measures deference.

As a means of saving space, Table 3 shows means for factor loadings of guests and Mr. King computed from the three temporal periods for Factor 1 and Factor 2 loadings. It is evident in Table 3 that comparisons between guests and Mr. King for both factors showed clear inverse relationships. It is remarkable that factor loadings from the LTAS of Mr. King with himself revealed such distinct differences, a further indication of the potency of voice convergence in the lower frequency band.

Correlation results of factor loadings from each period are reported in Table 4. Results showed inverse relationships that were significantly higher for Factor 1 (−.77, −.82, and −.88) than for Factor 2 (−.54, −.71, and −.60). There were four important re-

Table 2
Factor Analysis Statistics

Time period and factor	Eigenvalue	% variance
Partner: Mr. King		
1		
1. Dominance	17.51	70.0
2. Deference	2.83	11.3
2		
1. Dominance	16.19	64.8
2. Deference	3.57	14.3
3		
1. Dominance	16.80	67.2
2. Deference	2.79	11.1
Partner: Guest		
1		
1. Dominance	15.61	62.5
2. Deference	3.29	13.1
2		
1. Dominance	14.77	59.1
2. Deference	3.11	12.5
3		
1. Dominance	15.78	63.1
2. Deference	2.66	10.6

Table 3
Results of Separate Factor Analyses on Guest and Mr. King Data Sets

	Factor 1 loading		Factor 2 loading	
Name of guest	Guest	Mr. King	Guest	Mr. King
Mike Wallace	.85	.26	.28	.80
George Bush	.85	.18	.27	.89
Elizabeth Taylor	.84	.19	.16	.78
Ross Perot	.82	.18	.03	.51
Bill Clinton	.81	.35	.28	.67
Barbra Streisand	.80	.29	.07	.76
Sean Connery	.71	.56	.60	.67
Tip O'Neill	.70	.55	.44	.76
Mario Cuomo	.60	.32	.55	.77
Bill Cosby	.59	.81	.36	.38
Norman Schwarzkopf	.54	.77	.39	.46
Al Gore	.44	.55	.50	.66
Jimmy Carter	.42	.84	.50	.33
Julie Andrews	.40	.84	.47	.34
Daryl Gates	.37	.86	.41	.26
Gordon Sullivan	.33	.72	.49	.34
Lee Iacocca	.30	.81	.67	.32
George Mitchell	.29	.74	.79	.55
Henry Kissinger	.25	.74	.60	.42
Garrison Keillor	.24	.80	.74	.32
Jean Kirkpatrick	.23	.68	.32	.47
Arthur Ashe	.17	.77	.28	.42
Spike Lee	.15	.89	.80	.17
Robert Strauss	.12	.84	.83	.31
Dan Quayle	.09	.92	.83	.05

Note. Factor loadings represent a mean of the three temporal periods and are sorted from highest to lowest loadings of Factor 1 of the guest factor analysis. Loadings for guests' Factor 2 and for both of Mr. King's factors are presented in this same order.

Table 4
Correlation of Dominance and Deference Mean Factor Loadings Between Mr. King and Guests

Partners compared by correlation	Dominance factor statistic (*r*)	Deference factor statistic (*r*)
King 1 with Guest 1	−.77	−.54
King 2 with Guest 2	−.82	−.71
King 3 with Guest 3	−.88	−.60

Note. Numbers in column 1 refer to temporal periods in interviews.

sults produced from the factor analyses. First, as implied in Table 3 and reported in Table 4, Factor 1 for Mr. King was inversely related to Factor 1 for guests, and this inverse relation was shown as well for the Factor 2 comparison. Second, comparative observation of Factor 1 and Factor 2 loadings in Table 3 shows similar results across time periods. Third, Table 4 shows stronger negative r values for Factor 1 than for Factor 2. Finally, the negative r values shown in Table 4 tended to increase over time for both Factors 1 and 2; however, Factor 1 was more consistent in this regard, and amplitudes tended to be larger.

The standard deviation results computed from all LTAS for Mr. King and guests showed a very strong correlation between Mr. King's standard deviations and those from guests (.90). Also, correlation comparisons of Mr. King's standard deviations with guests' mean Factor 1 (dominance) results, as reported in Table 3, showed a strong positive result ($r = .73$) and an inverse result ($r = -.56$) when correlated with Factor 1 (dominance) values for Mr. King. These results expressly support the theoretical point from CAT that social status accommodation is incumbent on the partner with lower social status. The standard deviation evidence shows that partners modify their LTAS more when interacting with those of higher social status and less when their partner is of lower station.

Discussion

People of high status and power are more capable than others of exerting their will, and others must accommodate to these individuals so as to create and maintain convergence and an optimal communication environment. This conclusion is shown by results from Study 2. When the Factor 1 data for guests (in all three periods) are sorted by size of factor loadings, high-status guests (e.g., the current president, presidential candidates, and well-known entertainers) appear to cluster toward the top of the column. This clustering, of course, results from similarity in LTAS curves, and it is apparent that these guests' voices in the lower frequency band are different from those of guests of lesser station (refer again to Table 3).

Mr. King's Factors 1 and 2 were inversely related to guests' Factors 1 and 2, respectively. As noted earlier, we conclude that dominance and deference are measured by Factors 1 and 2, respectively. High-status guests are concentrated at the top of Factor 1 for guests because their LTAS are similar, and low-status guests are concentrated at the top of Factor 1 for Mr. King because his status exceeds theirs and he is therefore more dominant in these interviews. Factor 2 data for guests show deferential relationships in which the lower status guests display higher loadings, and, in the same manner, Factor 2 for Mr. King shows higher status guests clustered together with higher loadings because Mr. King is deferential toward these guests. In the vocabulary of CAT, these data show that Mr. King is accommodating to high-status guests and is accommodated by lower status guests. This is the means whereby voice convergence is produced, but there is additional evidence that further pins down the process of social status accommodation.

In Table 4, dominance factor correlations between guests and Mr. King are stronger than deference factor correlations, and these findings indicate the clarity in status of important celebrities and the ambiguity and possible status competition involved between celebrities of lesser stature. Observe as well in Table 4 that inverse correlation values increase over the three time periods (−.77, −.82, and −.88), but much more so for the dominant factor than for the deferent factor, which provides further evidence of clarity in high celebrity status (both dominant status and deferent status come to be even more firmly established).

Finally, the standard deviation correlation results show that partners have converged with one another; however, some asymmetries are shown in comparisons with dominance factor results. As mentioned earlier, correlations between Mr. King's standard deviations and guests' standard deviations were strongly positive (.90). Also, correlations between Mr. King's standard deviations and guests' dominance factor showed a strongly positive result (.73), but the correlations between Mr. King's standard deviation results and his own dominance factor loadings showed an inverse result (−.56).

These findings indicate that convergence is developed between partners asymmetrically. The standard deviation evidence, like the other factor analysis results discussed earlier, leads to the conclusion that Mr. King is accommodating his voice to high-status guests, whereas lower status guests accommodate to him. The evidence shows that high-status guests are not changing their voices as much relative to Mr. King as he is to them, and, similarly, low-status guests change their voices to accommodate Mr. King.

It is clear from results of Study 2 that Mr. King is accommodating to high-status guests through his deference and that lower status guests tend to accommodate to him but with less gusto. These results represent strong evidence in support of Hypothesis 2 and bring to mind the following adage: "If the mountain won't go to the prophet, the prophet must go to the mountain."

Study 3

Although it may be apparent that certain celebrities possess more celebrity status than others, status relations between these individuals depend on a variety of variables that influence perceptions of status, such as media exposure, education, and age. To verify the general status ordering as derived from the factor analysis results, it is useful to relate the findings to a measure of perceived status and thus to establish convergent validity. In establishing validity of the lower frequency band estimation of celebrity guests' social status position, judges ranked the 26 celebrities (Mr. King and his 25 guests). Convergence between judges' perceptions of the status of the celebrities would provide evidence of the validity of the factor analysis outcomes.

Method

A sample of 596 undergraduate students completed a 45-item survey. This instrument was made up in eight versions with different combinations of paired guests. Items on the questionnaire were thus displayed as paired choices from which students indicated the celebrity with the higher social status or prestige. Twenty-six celebrities generated 325 paired comparisons, and, because a standard blank 45-item computer-scannable form was used to present the paired names and record choices, it was necessary to develop eight different instruments to cover the 325 paired comparisons.

The eight instruments were randomly administered to the students in groups of approximately 75 per instrument. In this way, all 325 comparisons were made, in theory, by 75 students. In fact, only the first 5 comparisons were judged by all 596 students. This procedure was designed to reduce the response bias that may have resulted from fatigue if students were required to make all 325 comparisons and to reduce response bias in the actual instruments by providing all students with the same initial stimulus (i.e., the first 5 paired comparisons). The paired comparison data were transformed into interval-level social status scores for each celebrity through the application of Thurstone's law of comparative judgment (Thurstone, 1947). Finally, these survey data were compared with dominance factor results from guests.

Results

Results from student ratings of celebrity status were compared with factor loading results. More specifically, results from the celebrity status survey were converted into Z scores (Thurstone, 1947) ranking the 26 celebrities, including Mr. King. Mr. King's position in the Z-score ranking acted as a zero point; all other scores were adjusted in accordance with his score. For example, Mr. King's Z score was subtracted from scores above his and added to those below. These Z-score rankings were compared with the mean loadings of the three temporal periods from the dominance factor for guests. This correlation produced a test of validity and support for Hypothesis 3.

Results (see Table 5) showed a correlation of .52 for the entire data set, a relatively high value for such a broad assortment of celebrities representing strata from politics, foreign affairs, entertainment, and athletics and including an extensive set of celebrity reputations spanning, in some cases, more than half a century. Each pertinent stratum from the celebrity list, as presented in Table 5, played a role in supporting the case for convergence between these two very diverse measures. Convergence between the best-known celebrities in the United States—presiding and former presidents and vice presidents—was strong (r = .98). Although Dan Quayle may appear as an outlier (from observation of Table 3) possibly skewing the correlation statistic, the actual ordering of presidential and vice presidential celebrities in the Z score table was nearly identical to that appearing in Table 3 (George Bush was president and Bill Clinton a candidate for president at the time the pertinent *Larry King Live* broadcasts were aired; the student survey was completed after election of Bill Clinton as president). Correspondence was lessened but still strong regarding all politicians on the list who were in office at the time (r = .75). Entertainers with relatively high media exposure also showed a strong convergence (r = .77), and correlations of representatives from female and African American strata indicated very strong convergence as well (.92 and .99, respectively).

Table 5
Celebrity Status Survey Z Scores Correlated With Mean Factor Loadings From the Three Dominant Guest Factors

Comparison	*n*	*r*
Overall	25	.52
Presiding and former presidents and vice presidents of the United States	5	.98
Politicians in office on October 15, 1993	4	.75
Presidential and vice presidential candidates in November 1992	5	.84
Entertainers	6	.77
African Americans	3	.99
Women	4	.92
Men	21	.53

Discussion

Data reported in Table 5 support convergence of the factor analysis results with actual perceptions of status, thus substantiating Hypothesis 3 and validating social status accommodation as being involved with actual status positions. There are some points of interest associated with this comparison. For example, Mike Wallace did not fare well in the comparison. His interview ascended to the top of the mean factor loadings in Table 3, with a loading of .85 (George Bush was near the top with .84 and Dan Quayle was at the bottom with .09); however, Wallace declined toward the lower middle of the student survey listing, with a score of .11. (President Clinton was at the top with 1.25, and Garrison Keillor was at the bottom with −.50). We suggest that the fact that Mr. Wallace shares professions with Mr. King may have affected placement toward the top of the factor loadings and that the lack of this idiosyncratic underpinning in students' perceptions pulled this celebrity's survey score toward the middle. Mr. Wallace, very much owing to his long-time appearance on the CBS program *60 Minutes*, as well as in numerous other media capacities, has been described as the "dean" of broadcast interviewers. Therefore, this interview would obviously appear anomalous in comparison with others, because there were few guests in the sample who shared such a strong personal and professional relation with Mr. King.

In terms of further anomalies, celebrities such as Elizabeth Taylor, Barbra Streisand, and others may not be afforded the same celebrity status on the part of students as with Mr. King's own generation, whereas General Norman Schwarzkopf's celebrity is cogent because of world events (the Gulf War) occurring in close proximity with the time in which the survey was conducted. There are numerous other anomalies appearing in comparisons of the two lists that could be corrected with adjustments in the interview sample or in the sample of participants used to make the survey evaluations; even with obvious deficiencies, however, the evidence is convincingly supportive of Hypothesis 3, establishing the lower frequency band as a vehicle communicating relative social status.

General Discussion

Although there are a number of practical applications possibly served by results of this research, conclusions at this point better address the theoretical concerns about accommodation theory in relation to dominance and deference stated earlier. Giles and Coupland's (1991, p. 73) conclusion that "the greater the speaker's need to gain another's social approval, the greater the degree of convergence there will be" has been substantiated with some qualification. We have shown that deferent partners accommodate their dominant partner but that this con-

vergence, as measured within the lower frequency band in Study 1, does not increase over time. As shown in Study 2, however, the amount of accommodation input by lower status partners does tend to increase over time.

Partners develop ways to converge their voices in terms of how they will best be received. In this research, we have conformed in some measure to Giles and Smith's (1979, p. 65) suggestion to develop "a more systematic theory of speech accommodation." In linking interpersonal accommodation to social status relations between individuals, as expressed via the nonverbal, low-frequency channel, we hope to encourage more research to determine exactly how potent the dominance–deference relation is in establishing parity between interactants and leading to an optimal communication environment. It is quite obvious that the lower frequency signal of the human voice communicates much more than just pitch.

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