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Thin slices of negotiation:

Predicting outcomes from conversational dynamics within the first five minutes

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Abstract

In this research we examine whether conversational dynamics occurring within the first five minutes of a negotiation can predict negotiated outcomes. In a simulated employment negotiation, micro-coding conducted by a computer showed that prosodic emphasis, mirroring, conversational turn-taking, and activity level predicted 30% of the variance in individual outcomes. The conversational dynamics associated with success among high-status parties were different from those associated with success among low-status parties. Results are interpreted in light of theory and research exploring the predictive power of "thin slices" of expressive behavior (Ambadi & Rosenthal, 1992). Implications include the development of new technology to diagnose and improve negotiation processes.

Key words: Negotiation, thin slices, conversational dynamics, speech features, artificial intelligence, prosodic emphasis, mirroring, conversational turn-taking, activity level.

Thin slices of negotiation:

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Malcolm Gladwell's popular book, *Blink*, describes the surprising power of "thin-slicing," defined as "the ability of our unconscious to find patterns in situations and people based on very narrow 'slices' of experience" (2005, P. 23). Gladwell writes, "Snap judgments and first impressions matter as much as they do because there are…lots of situations where careful attention to the details of a very thin slice, even for no more than a second or two, can tell us an awful lot" (P. 47).

Gladwell's observations reflect decades of research in social psychology, and the term "thin slice" comes from a frequently cited study by Ambady and Rosenthal (1993; see also Allport, 1937; Funder & Colvin, 1988; Goffman, 1979). Ambady and Rosenthal had female college students evaluate 30-second silent video clips of college instructors teaching a class, and found remarkably high correlations between those evaluations and the end-of-semester ratings of those same instructors by their respective students (r = .76). This result was replicated with high school teachers and using even thinner "slices" of video (as short as six seconds for each instructor).

The current research explores the degree to which thin slices of *negotiation* behavior predict outcomes of a dyadic negotiation. More specifically, our study demonstrates the degree to which four conversational dynamics, occurring during the first five minutes of a simulated employment negotiation, predict the outcomes of that negotiation. We also explore how the status of a negotiator might influence *which* conversational dynamics are most predictive of individual outcomes.

This study extends research and theory in a number of important ways. First, whereas the majority of research demonstrating the thin slices phenomenon applies to impression formation and person perception, the present research applies the thin slices phenomenon to a *behavioral* outcome—i.e., the outcome of a transactional negotiation. Second, whereas most thin slices research to date has tended to focus on the accuracy of intuition or snap judgments that may take many factors into account, the present research is based on micro-analysis of several very specific factors. Third, whereas past research has demonstrated the predictive validity of *human* observers (or judges) examining thin slices of expressive behavior, the present research utilizes exclusively *computer* algorithms to parse conversational dynamics and to isolate particular speech features which are shown to have predictive validity for negotiation outcomes. Fourth, the present research provides preliminary evidence that conversational dynamics might play a critical role in negotiation, a role that appears to differ as a function of one's relative status in an organizational hierarchy. Finally, by using computer algorithms to explore the operation of thin slices phenomena within a negotiation context, we are developing a technology for predicting interpersonal negotiation outcomes quickly and accurately, thereby providing a mechanism for real-time feedback.

Thin Slices Research

Thin slices of behavioral data have been shown to be remarkably predictive of a diverse set of consequences, including therapist competency ratings (Blanck, Rosenthal, Vannicelli, & Lee, 1986), personalities of strangers (Borkenau, Mauer, Riemann, Spinath, & Angleitner, 2004), and even courtroom judges' expectations for trial outcomes (Blanck, Rosenthal, & Cordell, 1985). (For reviews, see Ambady, Bernieri, & Richeson, 2000; Ambady & Rosenthal, 1992.)

One of the most impressive examples of thin slices of data predicting important, long-term consequences is marital research conducted by Gottman and his colleagues (for a review, see Gottman & Notarius, 2000). For example, Gottman and Levenson (1992) carried out one of the first longitudinal studies predicting divorce among married couples based solely on the interaction of the couple during a dispute and their associated physiological responses. Even more striking, Carrère and Gottman (1999) were able to predict marital outcomes over a six year period based on human micro-coding of positive and negative affect over just the first 3 minutes of a marital conflict (i.e., a "thinner" slice of expressive behavior). In particular, the very *beginning* of the marital discussion (i.e., the "startup" phase) appears to have the most predictive power (Gottman, 1979).

Across a wide range of studies, Ambady and Rosenthal (1992) found that observations lasting less than five minutes in duration predicted their criterion for accuracy with an average effect size of $r = .39$. This effect size corresponds to 70% accuracy in a binary decision task (Rosenthal & Rubin, 1982). It is astounding that observation of such a "thin slice" of behavior can predict important behavioral outcomes such as professional competence, criminal conviction, and divorce, when the predicted outcome is sometimes months or years in the future. The key to success lies is in understanding social signaling. We turn next to a brief review of that literature.

Social Signaling and Conversational Dynamics

Animals communicate and negotiate their position within a social hierarchy in many ways, including dominance displays, relative positioning, and access to resources. Humans add to that repertoire a wide variety of cultural mechanisms such as clothing, seating arrangements,

and name-dropping (Dunbar, 1998). Most of these culture-specific social communications are conscious and are often manipulated.

However, in many situations, non-linguistic social signals (e.g., body language, facial expressions, and tone of voice) are as important as linguistic content in predicting behavioral outcomes (Ambady & Rosenthal, 1992; Nass & Brave, 2004). Indeed, some have argued that such vocal signaling originally evolved as grooming and dominance displays, and continues to exist today as a complement to human language (Dunbar, 1998; Provine, 2001). Below, we review briefly four general types of conversational dynamics that were measured in our study and, for each dynamic, we discuss its potential for impacting negotiation.

Conversational Turn-Taking

Conversational turn-taking is a particularly familiar part of human behavior. For instance, we speak of someone "taking charge" of a conversation, "driving" a conversation or "setting the tone" for a conversation. Such dominance of the conversational dynamics is popularly associated with higher social status or a leadership role (Dunbar, 1998). Similarly, some people seem skilled at establishing a "friendly" interaction. The ability to set conversational tone in this manner is popularly associated with good social skills, and is typical of skilled salespeople and social "connectors" (Gladwell, 2000). In the domain of negotiation, we predict that influence over conversational turn-taking would be associated with dominance and leadership, and thus should be correlated with success in negotiation, particularly for high-status parties.

Mirroring

Mirroring behavior, in which the body language of one participant is "mirrored" by another, is considered to signal empathy, and has been shown to positively influence the smoothness of an interaction as well as mutual liking (Chartrand & Bargh, 1999). Thus, in the domain of negotiation, we predict that vocal mirroring behavior should be helpful in increasing compliance from the other side.

Prosodic Emphasis

Prosody refers to speech features that are longer than one phonetic segment and are perceived as stress, accentuation, or rhythm (Werner & Keller, 1994). The concept of prosodic emphasis has appeared in research on child development. For example, Fernald and Mazzie (1991) argued that mothers' use of exaggerated pitch peaks to mark focused words may aid infants in their speech processing. Tone of voice and prosodic style are among the most powerful of social signals, even though (and perhaps because) people are usually unaware of them (Nass & Brave, 2004). Stress in one's tone of voice could be purposeful (e.g., prosodic emphasis) or unintentional (e.g., physiological stress caused by discomfort). Correspondingly, in the domain of negotiation, vocal stress could be either an asset or a liability; higher prosodic emphasis, when brought about consciously, could signify more forceful or dynamic speech, whereas a tremor or jitter in the voice could be a physiological reaction to psychological anxiety and hence perceived as a sign of weakness. Thus, we had two possible predictions regarding vocal stress and negotiation outcomes—one prediction that they would be positively correlated and another prediction that they would be negatively correlated.

Activity Level

Perhaps the simplest social signal is activity level. Percentage of speaking time, for example, is known to be correlated with interest level (Dunbar, 1998) and extraversion (Nass & Brave, 2004). In the domain of negotiation, Barry and Friedman (1998) found a trend (albeit not statistically significant) whereby extraversion correlated positively with individual negotiation outcomes in an integrative bargaining task similar to the one we used in the present study. Consequently, we predict that high levels of activity as measured by speaking time should correlate with success in negotiation.

Method

Overview

Participants assigned the role of *Middle Manager* or *Vice President* engaged in a scored, multi-item employment negotiation task featuring a mix of issues. All negotiations were digitally recorded, with conversational speech features extracted using a computer from the first five minutes of dialogue. Primary dependent variables were the number of points earned by each participant and the sum of points earned by both participants.

Participants

One hundred and twelve graduate students enrolled in a required MBA course on organizational behavior participated in the research study on a volunteer basis.[1] Participants were randomly formed into 56 same-sex dyads for an integrative bargaining negotiation simulation. Twenty-two dyads (39%) were female.[2]

Procedure

One week prior to the negotiation, each participant received a set of written confidential instructions describing his or her role, the relevant issues, and point totals reflecting the priority they should attach to each issue. During the negotiation, participants were free to offer whatever information, arguments, and proposals they wished to offer, but prohibited from physically exchanging their confidential instructions. All negotiations were digitally recorded for subsequent analysis. Dyads were given approximately 45 minutes to negotiate.

Negotiation Task

The participants' task was based on a standard negotiation exercise called "The New Recruit" (Pinkley, Neale, & Bennett, 1994), an 8-issue employment negotiation between a candidate (who was in this case a Middle Manager) and a recruiter (in this case a Vice President) concerning the candidate's compensation package. Each of the eight issues offered five possible options for resolution, and each of those options was associated with a specific number of "points" (see Table 1). Two of the eight issues (starting date and salary) were *distributive* or "fixed-sum" issues such that the parties' interests were diametrically opposed. Two of the issues (job assignment and company car) were *compatible* issues such that both parties received the same number of points for a given option, and thus the parties' interests were best served by the same option (Thompson & Hrebec, 1996). The remaining four issues (signing bonus, vacation days, moving expense reimbursement, and insurance provider) were *integrative* or potential logrolling issues such that the differences in point totals among options for a given issue enabled potential trade-offs which would increase the joint value of the agreement for both parties (Pruitt, 1983). All participants were instructed that their goal was to maximize their own personal gain—i.e., to "reach an agreement with the other person on all eight issues that is best

for you. The more points you earn, the better for you." To provide an incentive for maximizing individual performance, participants were informed that one dyad would be selected at random and its members would receive payment in accord with the individual point totals they had earned in the negotiation.

Negotiation Outcomes

Three dependent variables were created to assess negotiation outcomes. *Middle Manager Points* was the number of points earned by the Middle Manager; *Vice President Points* was the number of points earned by the Vice President; and *Joint Points* was the sum of points earned by the Middle Manager and the Vice President, thereby providing an overall measure of the success of the two participants in efficiently capturing the value creation opportunities afforded by compatible and integrative issues.

Measurement of Speech Features

Four conversational speech features were extracted from the first five minutes of each negotiation recording. Following a procedure undertaken in previous research (Pentland, 2004), we constructed measures for four types of vocal social signaling, which roughly map onto the four conversational dynamics discussed above. Each measure is described briefly below:

Engagement. Engagement was measured by the standardized influence each person had on the other's turn-talking. When two people are interacting, their individual turn-taking dynamics influences each other and can be modeled as a Markov process (Jaffe, Beebe, Feldstein, Crown, & Jasnow, 2001). By quantifying the influence each participant had on the other, we obtained a measure of their engagement, or the degree to which they were "driving the conversation." More specifically, we modeled individual turn-taking by a Hidden Markov

Model and measured the coupling of these two dynamic systems to estimate the influence each party had on the other party's turn-taking dynamics (Choudhury & Pentland, 2004).[3]

Mirroring. In our study, the distribution of utterance length was bimodal. Sentences and sentence fragments typically occurred at several-second and longer time scales. At time scales less than one second, there are short interjections (e.g., "uh-huh"), but also back-and-forth exchanges typically consisting of single words (e.g., "OK?", "OK!", "done?", "yup."). To measure mirroring, we used the *Z*-scored frequency of sub-one-second utterances within any reciprocated exchange.

Stress. Stress was measured by the variation in prosodic emphasis (Handel, 1989). For each voiced segment, we extracted the mean frequency of the fundamental format, as well as the spectral entropy. Averaging over longer time periods provided estimates of the mean-scaled standard deviation of the formant frequency and spectral entropy. The *Z*-scored sum of these standard deviations was taken as a measure of speaker stress.

Activity. Calculation of the activity measure began by using a two-level Hidden Markov Model to segment the speech stream of each party into voiced and non-voiced segments, and then grouping the voiced segments into speaking versus non-speaking (Basu, 2002). Conversational activity level was measured by the *Z*-scored percentage of speaking time.

Results

Sex Differences

To check for sex differences, all negotiation outcome measures were subjected to two-sample *t*-tests, assuming unequal variances. Sex differences were not found in any of the negotiation outcome measures, all *t*s < 1.85, *p*s > .05.[4]

Speech Features and Negotiation Outcomes

Eight dyads were dropped from the analysis because they made mistakes in calculating and/or reporting their scores. In addition, two dyads were dropped from the analysis due to problems with the recording quality. The remaining 92 participants comprising 46 dyads were retained for the analyses that follow.

Table 2 presents descriptive statistics and the inter-correlations between all speech features. Inter-correlations within role were relatively low, ranging from $r = -.35$ to $r = .28$. Only the correlations between the *engagement* feature and the *mirroring* feature were statistically significant (for MM: $r = -.32$, $p < 0.05$; for VP: $r = -.35$, $p < 0.05$). In contrast, however, all inter-correlations between Middle Manager's and Vice President's use of the same feature were quite high (all *r*s ≥ .50, *p*s <.001), particularly for the *Mirroring* feature ($r = .96$, $p < 0.001$).

The amount of multicollinearity among our predictor variables suggested that a multiple regression in which all variables were entered simultaneously would not be appropriate. Thus, we conducted three stepwise linear regressions to ascertain the combinations of speech features that, taken together, would predict the maximum amount of variance in negotiation outcomes. In all three stepwise regressions, alpha-to-enter was set at .05 and alpha-to-remove was set at .10. The results of these stepwise regressions are presented in Table 3.

The three stepwise regressions demonstrated that measures of all four speech features, occurring during the first five minutes of the negotiation, predicted the outcome of the negotiation. The first regression predicted a total of 30% of the variance in Middle Manager Points, $F = 5.86$, $p < .01$. Middle Manager Points was positively associated with Middle Manager's *mirroring* ($\beta = .40$, $p < .01$), negatively associated with Middle Manager's *stress* ($\beta = -.38$, $p < .05$), and positively associated with Vice President's *stress* ($\beta = .40$, $p < .05$). The second regression predicted a total of 27% of the variance in Vice President Points, $F = 3.79$, $p < .05$. Vice President Points was positively associated with Vice President's *activity* ($\beta = .47$, $p < .05$), positively associated with Middle Manager's *activity* ($\beta = .56$, $p < .01$), and positively associated with Middle Manager's *stress* ($\beta = .36$, $p < .05$). Moreover, a marginally significant effect suggested that Vice President Points also was positively associated with Vice President's *engagement* ($\beta = .31$, $p = .054$). Finally, the third regression predicted a total of 9% of the variance in Joint Points, $F = 4.26$, $p < .05$. Joint Points was positively correlated with the Vice President's *mirroring* ($\beta = .30$, $p < .05$).

Discussion

As hypothesized, four conversational dynamics occurring within the first five minutes of a negotiation were highly predictive of individual outcomes. In fact, whereas the average effect size in past thin slices research is $r = .39$ (Ambady & Rosenthal, 1992), our effect size was $r = .54$ for Middle Manager Points and $r = .52$ for Vice President Points. This effect is comparable in magnitude to the predictive power of negotiator aspiration levels, a factor generally considered to be a powerful determinant of negotiated outcomes (cf. Barry & Friedman, 1998; for reviews, see Hamner, 1980, and Pruitt, 1981).

The most consistent predictor of negotiation outcomes across both roles was prosodic emphasis. At the outset, we were uncertain as to whether our measure of prosodic emphasis (*stress*) would tap dynamic speech fluctuations intended to connote emphasis or unintentional jitter in the voice as a reaction to psychological anxiety. While we do not have the data to be certain, our results suggest that the latter is true. In our study, vocal stress during the first five minutes of a negotiation appeared to be a liability—particularly for Middle Managers.

We modeled our measure of mirroring after the mimicry behavior described by Chartrand and Bargh (1999), but our measure pertained to speech patterns rather than body language. Nevertheless, as predicted, *mirroring* in our study appeared to have a positive effect on negotiation. It is noteworthy that *mirroring* in our study was predictive of individual outcomes only among *low*-status parties. Chartrand and Bargh found that mimicry tended to occur more among individuals with dispositionally greater perceptual activity directed at others. Since low-power parties tend to pay more attention to high-power parties (Keltner & Robinson, 1997), it is not surprising that low-power mimicry of high-power parties would be more common and thus more normative than the reverse. Furthermore, if mirroring is a consequence of perspective-taking, then the fact that *mirroring* by Vice Presidents predicted Joint Points would suggest that perspective-taking is beneficial for integrative bargaining, a controversial issue in the negotiation field (Drolet, Larrick, & Morris, 1998).

As we predicted, activity level was positively associated with negotiation outcomes, but this effect was apparent only among the Vice Presidents. Higher activity among Middle Managers correlated positively with points earned by the Vice President. Future research will be necessary to explore this effect and the mechanism behind it, but we have observed cases where

Vice Presidents "took charge" of the negotiation and began by questioning the Middle Manager with the result that Middle Managers also displayed high activity levels.

Finally the marginally significant positive association between influence on conversational turn-taking and negotiated outcomes for Vice Presidents, as predicted, is consistent with Dunbar's (1998) assertion that dominance of the conversational dynamics is popularly associated with higher status. Additionally, Vice Presidents who "took charge" of the conversation probably also controlled the agenda for the negotiation which, in turn, might have led to a strategic advantage (Pendergast, 1990).

One potential limitation of the current study was the lack of an attitudinal or perceptual measure to gauge social psychological outcomes in addition to instrumental outcomes of the negotiation (Thompson, 1990). Research by Curhan, Elfenbein, and Xu (2005) demonstrated that, while financial or quantitative outcomes tend to be most salient in people's minds, negotiators value subjective outcomes at least as highly as instrumental outcomes, and subjective value can matter more than instrumental outcomes in determining desire for future interaction. Future research will need to incorporate the use of validated social psychological measures, such as the Subjective Value Inventory, for this purpose (Curhan et al., 2005). Additionally, because the present study was conducted in a simulated negotiation setting, it will be necessary to replicate these results in a situation involving real-life negotiations.

One advantage of our methodology, alluded to earlier, is the fact that all micro-coding of speech features was conducted by a computer. Thus, similar algorithms could be used to provide negotiators with real-time feedback so as to diagnose and improve their negotiation skills. Of course, one would need to ascertain first whether manipulating speech features would result in improved negotiation outcomes. Additionally, future research would need to determine whether

negotiators could alter their own speech features consciously. Because social signaling is largely unconscious, it has proven relatively difficult to train people to change their signaling. The one technique that does appear promising is rather like method acting: you ask students to pretend to be a different person, one who is more dominating and focused (for the Vice President role) or one who is more friendly and extroverted (for the Middle Manager role). This approach is founded on the idea that personality drives social signaling, and that it is relatively difficult to alter through conscious manipulation.

Finally, our research also has implications for the Artificial Intelligence research community. The Artificial Intelligence community has studied human communication at many levels, such as phonemes, words, phrases, and dialogs. While semantic structure and prosodic structure have been analyzed, the sort of longer-term, multi-utterance structure associated with social signaling has received relatively little attention (Handel, 1989). The present investigation suggests that such systematic analysis of social signaling, even when applied to a "thin slice" of behavior, can lead to remarkable predictive validity.

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Footnotes

[1] Out of 200 students randomly selected to be eligible to participate, 56% volunteered to do so.

[2] Same-sex pairings were undertaken so as to control for any potential confounds arising from sex differences.

[3] Our method is similar to the classic method of Jaffe et al. (2001), but with a simpler parameterization that permits the direction of influence to be calculated and permits analysis of conversations involving more than two participants.

[4] Sex differences were found in two of the independent variables (i.e., speech features), collapsing across role. Specifically, male-male dyads used mirroring more than female-female dyads, $t < 2.45$, $p > 0.05$, and female-female dyads had lower stress values than male-male dyads, $t < 7.98$, $p > .001$. No other sex differences were found among the speech features, all ts $< .8$, all ps $> .4$.

Table 1
Points Schedule for the Negotiation Simulation

Issues and Potential Options	Points: Vice President (Recruiter)	Points: Middle Manager (Candidate)	Issues and Potential Options	Points: Vice President (Recruiter)	Points: Middle Manager (Candidate)
Signing Bonus			Moving Expenses Reimb.		
10%	0	4,000	100%	0	3,200
8%	400	3,000	90%	200	2,400
6%	800	2,000	80%	400	1,600
4%	1,200	1,000	70%	600	800
2%	1,600	0	60%	800	0
Job Assignment			Insurance Provider		
Division A	0	0	Allen Ins.	0	800
Division B	-600	-600	ABC Ins.	800	600
Division C	-1,200	-1,200	Good Health	1,600	400
Division D	-1,800	-1,800	Best Ins. Co.	2,400	200
Division E	-2,400	-2,400	Insure Alba	3,200	0
Vacation Days			Salary		
30 days	0	1,600	$90,000	-6,000	0
25 days	1,000	1,200	$88,000	-4,500	-1,500
20 days	2,000	800	$86,000	-3,000	-3,000
15 days	3,000	400	$84,000	-1,500	-4,500
10 days	4,000	0	$82,000	0	-6,000
Starting Date			Company Car		
June 1	0	2,400	LUX EX2	1200	1200
June 15	600	1,800	MOD 250	900	900
July 1	1,200	1,200	RAND XTR	600	600
July 15	1,800	600	DE PAS 450	300	300
Aug 1	2,400	0	PALO LSR	0	0

Note. Participants saw only their own points schedule.

Table 2:
Means, Standard Deviations, and Pearson Correlations Between Speech Features of Middle Manager and Vice President

	Middle Manger Features				Vice President Features			
Variable	1	2	3	4	5	6	7	8
Middle Manager								
1. Influence on Turn-taking	---	-.32*	-.08	-.26	.69***	-.31*	.22	-.05
2. Mirroring		---	.10	-.20	-.38**	.96***	.08	.21
3. Prosodic Emphasis			---	-.28	-.18	.10	.56***	-.23
4. Activity Level				---	-.28	-.23	-.16	-.50***
Vice President								
5. Influence on Turn-taking					---	-.35*	.12	-.19
6. Mirroring						---	.05	.18
7. Prosodic Emphasis							---	-.05
8. Activity Level								---
M	0.06	7.43	0.80	0.44	0.06	7.58	0.81	0.44
SD	0.03	4.32	0.13	0.11	0.03	4.73	0.14	0.09
Minimum	0.00	0.00	0.53	0.25	0.00	0.00	0.60	0.25
Maximum	0.16	20.0	1.04	0.84	0.13	22.0	1.11	0.61

* p<.05, ** p<.01, *** p<.001.

Table 3:
Stepwise Regressions of Instrumental Outcomes on Speech Features Occurring Within the First Five Minutes of Negotiation

	Middle Manager Points			Vice President Points			Joint Points		
Predictor Variable	*B*	*SE B*	β	*B*	*SE B*	B	*B*	*SE B*	B
Middle Manager									
Engagement									
Mirroring	959	309	.40**						
Stress	-5989	2463	-.38*	5393	2118	.36*			
Activity				9542	2942	.56**			
Vice President									
Engagement				19593	9886	.31			
Mirroring							4710	2283	.30*
Stress	6011	2325	.40*						
Activity				10155	3828	.47*			
Total Variance Accounted For (R^2)			30%**			27%**			9%*

Note. This table summarizes the results of three stepwise linear regressions with a *p*in of .05 and a *p*out of .10. Independent variables that entered and were not removed are indicated by the presence of their coefficients. Total variance accounted for by each model is indicated in the last row.
* p<.05, ** p<.01, *** p<.001.