TEMPORAL DIMENSIONS OF CONVERSATIONAL INTERACTION
The Role of Response Latencies and Pauses in Social Impression Formation

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Four experiments examined whether variations in response latencies to a speaker's query can be used to infer certain characteristics of a respondent. Across all experiments, participants listened to a set of monologues that varied in their underlying speech act (honesty, confidence, certainty, compliance). In Experiment 1, participants were asked to produce a designated one-word response to each monologue with the latency that conveyed either the most favorable or unfavorable impression. Experiment 2 relied on a perceptual rating task and confirmed that those latencies produced to express the most positive and negative impressions were in fact perceived as such by an independent group of participants. More important, the acceptance range of response latency behavior varied with different speech acts and evaluative dimensions. Experiments 3 and 4 extended these findings by revealing that the duration of inter-sentence pauses of a speaker's monologue appears to be the primary determinant of response timing behavior. As a set, these results suggest that people adopt different criteria when judging different types of potential deception and this in turn can be facilitated by processes related to speaker accommodation.

Keywords: *response latency; social impression formation; timing behavior; deception*

The study of time estimation behavior has long been of interest to psychology and investigated for its psychophysical laws (e.g., Grondin, 2001), underlying cognitive (e.g., Block, 1990) and neurological mechanisms (Meck, 2003), and use as a diagnostic tool for psychopathology (Melges, 1982). However, one of the more interesting contexts in which temporal behavior occurs is that of conversational interaction. The production of speech is a very rhythmical one that unfolds

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with a given rate and temporal patterning, and thereby facilitates turn-taking behavior and the processes of accommodation and interactional synchrony—all of which display higher-order levels of temporal organization themselves. In addition, the temporal dimensions of speech, including response latency, the frequency and duration of pauses, and articulation rate, provide a paralinguistic basis in which to make inferences about people's behavior (see Feldstein & Welkowitz, 1987; Siegman, 1978, for reviews).

The purpose of the present research is to assess the role that response latencies may play in social impression formation. Response latency refers to the time interval between a speaker's query and a listener's response and can depend upon a number of different factors. However, the hypothesis investigated here is that latency values may also vary due to certain individual characteristics. For example, in a courtroom setting, a defendant may be asked, "Did you kill your wife?", to which the response is, "No." The question is, is there an optimal latency of this response that conveys maximal credibility such that latencies longer or shorter than this value imply that the defendant is lying? Is it the case that a similar process occurs when judging the perceived confidence, certainty, and compliance of an individual? If so, then this leads to a third question, namely, what factors determine those latency values that result in the most positive impressions, and do these vary with different evaluative dimensions?

NONVERBAL BEHAVIOR AND PERSON PERCEPTION

These questions relate to larger issues of person perception and impression formation, and those processes by which people are assigned to different trait categories. Although several factors contribute to this categorization process (see Gilbert, 1998; Macrae & Bodenhausen, 2000, for reviews), one is an individual's nonverbal behavior. Facial expressions, body movements, eye gaze, proximity, and vocal cues all provide insight into a person's disposition and relationships with others (see DePaulo & Friedman, 1998, for a review).

One primary source of information for impression formation comes from conversational interaction in which a person's behavior is evaluated relative to certain cultural norms for its degree of social desirability. Some norms involve the quantity, quality, relation, and manner of speech that is expected to occur among conversational participants (Grice, 1989). Others include certain nonverbal displays that not only are expected to appear, but with a given frequency and magnitude. Due to inter- and intra-individual differences, the magnitude of a given behavior will vary across a range of acceptable values (termed "the acceptance range") but those within this region are apt to result in

favorable evaluations of an individual, whereas those outside are more likely to result in negative impressions (e.g., Cappella, 1981; Giles, 1980; Street & Giles, 1982). Speech rate, for example, varies across different individuals but those who speak very quickly or very slowly (i.e., above or below a threshold criterion) are more apt to be perceived in a negative fashion. As one might predict, the acceptance range for a given behavior is not static but varies across different contexts. In general, the range tends to be broader and more relaxed for speech occurring in informal versus formal settings, speakers with a higher reward value, certain topics of conversation, and the evaluative dimension being assessed. One illustration of these various ideas is a study by Street and Brady (1982) that examined the acceptance range for speech rate. When this systematically varied between the values of 140 to 376 syllables per minute (spm), it was found that both the perceived competence and social attractiveness of an individual markedly increased with faster rates of speech, but leveled off at a shorter latency for competence (253 spm) than for social attractiveness (324 spm). In addition, the range for both evaluative dimensions was more restricted for speech within an interview context versus one of casual conversation.

Burgoon and her colleagues (e.g., Burgoon, 1993; Burgoon & Hale, 1988) have extended the notion of an acceptance range into a more formal theory of nonverbal expectancy violations. According to this view, behavior outside the expected range of variability heightens an observer's attention and leads to an assessment of the situation. Expectancy violations not only can be negative, as previously assumed, but also positive in their valence. This depends on the context in which the interaction occurs, the characteristics of the communicators, and their interrelationships. In general, positive violations that exceed our expectations yield more desired outcomes than negative violations, which in turn yield less desired outcomes than expectancy confirmations. This overall model has accrued much empirical support and been successfully applied to a number of contexts, including those of sexual harassment, doctor-patient interaction, and close relationships (see Burgoon 1993; Burgoon & Hale, 1988 for a review).

Response Latency. The nonverbal behavior of interest to the present research is response latency. In contrast to a speaker's "switching pause" at points of turn-taking exchanges within an ongoing conversation (Jaffe & Feldstein, 1970), response latency typically arises in interview situations and characterizes the temporal behavior of a respondent. It refers to the latency, or time delay, at which a respondent answers a question posed by another individual (Feldstein & Welkowitz, 1987). Response latency is a conversational duration to which people appear particularly attuned in that it is one of the first dimensions on which communicators converge (Feldstein &

Welkowitz, 1987; Street & Giles, 1982) and the extent to which this does or does not occur has a greater impact on impression formation than many other vocal dimensions such as speech rate or utterance length (Street, 1982).

The past literature reveals that response latency is influenced by a number of factors, including a conversation's level of intimacy and ambiguity (Siegman, 1978), and the amount of cognitive effort required (Goldman-Eisler, 1961, 1968). In addition, it can also vary with an individual's situational and dispositional traits. For example, Siegman and Pope (1965) presented participants with questions that had been predetermined as either neutral or anxiety-producing in their content (i.e., relating to school experiences vs. family issues). The results indicated that relative to the former, the latter questions led to shorter response times. Others have extended these findings by showing that although moderate levels of anxiety decrease response latencies, higher levels significantly increase their value (e.g., Fenz & Epstein, 1962).

In addition to anxiety, a second characteristic influenced by response latencies is the perceived confidence of an individual. In one study by Kimble and Seidel (1991), participants were asked to vocalize their responses to a series of multiple-choice trivia questions and after each, to rate the confidence of their response. Those responses rated the most confidently produced the shortest latencies and loudest amplitudes, a finding corroborated by Scherer, London, and Wolf (1973).

A third factor that varies with response timing is lying and deceptive behavior. Here, the typical strategy is to ask participants to role-play a job interviewee (Kraut, 1978) or clinical patient (Heilveil & Muehleman, 1981) when responding to questions posed by the experimenter. On some trials, they are signaled (by a flashing light) to respond truthfully but on other questions, to lie. Acoustical analyses reveal that in addition to a shorter response length and a greater incidence of speech errors, deception is strongly associated with a longer pause between the interviewers' questions and the participants' responses.

In sum, these studies suggest that response latency is indicative of different speaker characteristics. However, it is important to consider some of the potential limitations of the traditional methodology. In most studies, response latency is treated as the dependent variable whereas speaker qualities are manipulated as the independent variables. Although this is certainly a legitimate strategy, the problem is that the construct validity of the independent variable is rarely assessed. That is, speakers are either assumed to vary on a given behavioral dimension or asked to simulate different characteristics. Yet, the validity of these behaviors is rarely confirmed through independent rating studies to ensure that speakers are in fact

differentially judged for their degree of honesty, confidence, and so on. Hence, the produced behavior may not be representative of everyday person perception. To address this issue, additional studies are needed in which response latency is systematically manipulated as the independent variable and perceptual ratings are treated as the dependent variable. This would provide a set of converging operations and allow one to determine whether latencies produced to convey positive or negative impressions are in fact perceived as such by others.

To date, very few studies have systematically manipulated response latencies to assess effects on person perception. An exception is a study by Baskett and Freedle (1974) that investigated judged honesty as a function of latency variations. Participants were presented with a set of vocalized adjectives followed by one of 9 delay times, and then a true/false response that presumably indicated whether this adjective applied to the speaker. The task was to rate the respondent as "truthful" or "lying." Results showed that latencies intermediate in duration (between .27 and .90 s) led to truthful attributions but latencies greater or less than these values were judged as lies. These findings, then, are consistent with those of both Kraut (1978) and Heilveil and Muehleman (1981) but, unlike those studies, suggest that effects of response latency on perceived honesty assume a U-shaped function. On a more global level, the observed effects suggest there is optimal range of latencies resulting in the most positive impressions of an individual and latencies falling outside of this range yielding more negative impressions.

GOALS OF THE PRESENT RESEARCH

The purpose of the present research was to extend this literature by more closely examining the role of response latencies in impression formation. It was designed with three goals in mind. The first was to consider whether evaluative dimensions other than confidence and honesty are also inferred from response timing. Although there are several potential speech acts of relevance, one is the perceived compliance of an individual. For example, if one responds "Sure" to the question, "Could you pick up my shirts from the dry cleaners this afternoon?" the latency of this response may reflect the overall willingness of the individual. A second characteristic is the perceived certainty of a response, which is defined here as the extent to which an individual appears committed to a speaker's invitation. For example, suppose one is asked, "Would you like to join us for dinner tonight?" to which the response is, "Sure." Again, there may be a particular range of latencies that convey maximal certainty and others that imply doubt or reluctance. In sum, to determine the overall generality of speech timing effects, it is useful to consider a broad range of behaviors.

This manipulation, in turn, leads to a second overall goal, which is to compare the acceptance range associated with each of the four speech acts investigated here. Does the range vary as a function of these different evaluative dimensions and if so, why? Although the previous literature does not provide a clear-cut answer, it does offer some insight. At the most general level, all four dimensions contribute to the broad trait category of social desirability in that each is considered a socially attractive characteristic (Hampson, Goldberg, & John, 1987; Norman, 1967). However, people can and do present themselves as being certain, confident, compliant, and honest when in fact they are not. As such, these different speech acts also represent different types of potential deception.

As noted by Buller and Burgoon (1996), people deceive at least 25% of the time during a conversation and do so for different reasons. These include motivations instrumental to self-gain (e.g., avoiding disapproval or punishment; protecting or acquiring resources), preserving valued relationships (e.g., protecting others from hurt or worry; avoiding interpersonal conflict), or promoting one's self-identity (e.g., projecting a more favorable image; avoiding shame or embarrassment). A number of diary studies (e.g., DePaulo & Kashy, 1998; DePaulo, Kashy, Kirkendol, Wyer, & Epstein, 1996) have revealed that some motivations are considered more acceptable than others. Deception most frequently occurs to avoid either hurting another individual or experiencing relationship difficulties, and to protect one's self-image. In these cases, deceivers claim to experience less guilt or anxiety about their actions because they are deemed well-justified. Instrumental motivations, on the other hand, are judged more harshly. These types of deception violate the social and linguistic norm that Grice (1989) has termed the *truth-quality maxim*, the implicit contract between communicators that they should be honest and able to trust one another. Unsurprisingly, such behaviors markedly decrease the perceived social attractiveness of an individual, and degrade the quality of future interactions.

One way in which these ideas may be reflected is through a differential acceptance range of response latencies for different evaluative dimensions. Of the four investigated here, certainty and compliance may yield the broadest and most relaxed regions. Short latencies are predicted to yield the most positive evaluations, and although increased latencies at some point should convey perceived reluctance, this upper value may be a very high one for at least two reasons. First, these two speech acts involve relationships with others and greater variation may be accepted to avoid conflict and preserve harmony. In addition, listeners may expect longer latencies for responses of certainty and compliance because each can require cognitive effort, a factor reliably found to increase response times (Friedman & Tucker, 1990; Zuckerman, DePaulo, & Rosenthal, 1981). Before agreeing to

commit to or aid another, one often has to evaluate whether this action is possible. Relative to these two speech acts, confidence may yield a more restricted range. As previously reported by Kimble and Seidel (1991) and Scherer et al. (1973), short latencies are associated with high confidence. However, a U-shaped function may emerge in which very short and long latencies communicate the negative qualities of conceit and underconfidence, respectively—both threats to a respondent's self-image. Last, honesty is predicted to display the most restricted range of all. Because this establishes a foundation of trust between communicators, violations of this speech act have the most serious repercussions. Hence, response times that are more fixed and less variable would be useful to unambiguously communicate and reinforce a sense of truthfulness to one's words. This prediction is consistent with the previous results from Baskett and Freedle (1974), who found that honesty is associated with latencies of an intermediate duration whereas short and long latencies are perceived as dishonest. This effect has been explained by others (see DePaulo et al., 2003, for a very thorough review) by noting that short latencies typically emerge from prepared lies whereas longer latencies arise from spontaneous lies that are anxiety-producing and require more cognitive effort (e.g., Cody & O'Hair, 1983; O'Hair, Cody, & McLaughlin, 1981).

These various ideas are investigated in Experiments 1 and 2. Experiments 3 and 4 address the third question posed in this research and that is, what linguistic variables determine the most acceptable latencies for a given speech act? Are these latency values lawfully related to other temporal qualities of the ongoing speech and if so, does this serve a larger communicative function?

EXPERIMENT 1

Experiments 1 and 2 relied on a production and perception task, respectively, to act as converging operations to one another. In both, participants listened to a set of monologues that each consisted of three declarative sentences followed by a question. These were designed to reflect a respondent's degree of compliance, honesty, confidence, and certainty. In Experiment 1, participants were asked to produce a designated one-word response that was the same for all instances of a given speech act (i.e., "yes"). One group was asked to time their response with the latency that would result in the most positive impression whereas, in a second group, the most negative impression. Although this linguistic context is a very simplistic one, it does occur in everyday interaction and allows for rigorous experimental control. As also noted by DePaulo et al. (2003), nonverbal cues for deception are apparent even in the most elementary lies, namely, those requiring yes/no responses.

Although speech act was the primary variable of interest, two additional manipulations were introduced to assess any potential gender differences. Previous research has shown that in an interview situation, females respond more quickly than males when both the interviewer and interviewee share the same gender. In addition, females tend to increase their response latency in the presence of the opposite sex whereas males decrease their latency (Siegman, 1978). To assess whether similar findings arise here, both the gender of the speaker and the respondent (i.e., experimental participant) were varied. A final purpose of Experiment 1 was to provide a set of normative data for Experiment 2. This second study will rely on a perceptual rating task to determine whether those latencies produced to convey the most positive and negative impressions for a given speech act are in fact perceived as such by an independent sample of participants.

METHOD

Design and participants. The design was a $4 \times 2 \times 2 \times 2$ mixed factorial. All participants listened to a set of prerecorded monologues that varied in terms of their underlying speech act (Honesty, H; Compliance, CP; Certainty, CT; and Confidence, CF) and the speaker's gender. The two between-subjects variables were the participants' gender and the valence of the social impression they were asked to convey (positive, negative).

A total of 128 subjects, 64 males and 64 females, from the bicampus community of Haverford and Bryn Mawr Colleges participated in the experiment for credit in an introductory psychology course. Each had normal hearing abilities and was a native speaker of the English language

Stimulus materials. A set of 32 monologues was constructed by the author to reflect four different speech acts: *Honesty*, the respondent's apparent truthfulness to a speaker's query; *Compliance*, the respondent's apparent willingness to carry out a speaker's request; *Certainty*, the extent to which an individual appears committed to a speaker's invitation; and *Confidence*, the respondent's apparent belief in his/her ability to perform a given task. There were eight instances within each of the four categories and the content of these were designed to be representative of speech that might occur among college students. Exemplar instances of each are shown in Table 1.

As can be seen, each monologue consisted of three declarative sentences followed by a question that in turn required a one-word response ("yes") that was the same for all instances of a given speech act. Four speakers, 2 males and 2 females, who were all 19 years of age and nonstudents, were asked to read the entire set of monologues and these were digitized onto a computer. Each of the 4 speakers was born

Table 1
An Exemplar Set of Monologue Instances from the Four Speech Acts Used in All Experiments

Speech Act	Exemplar Monologue
Honesty	"If you don't start going to class, you're going to flunk our math course. You did pretty bad on the first two exams and there's only one more before the end of the semester. I was sitting in the middle of class today but didn't see you. Were you there?"
	"You're always covering for Michael when he gets into trouble. I saw someone trying to sneak into the administration building last night and I'm sure it was him. When I confronted him, he said he was at your place all evening. Is that true?"
	"Your mom phoned yesterday and says she really misses you. She doesn't understand why you don't respond to all of the messages she's left. You were supposed to call her last night. Did you?"
Compliance	"I have a Macintosh computer in my room. Something seems to be wrong with it. Every time I try to save a file I get an error message. Would you be willing to take a look at it?"
	"I need to take these sweaters to the cleaners today. The problem is that my schedule is really busy with all sorts of meetings. I probably won't get home until late tonight. Would you be willing to drop them off for me?"
	"My car won't start this morning. When I turn the ignition key, all I hear is a click. The train won't get me to work on time. Would you drive me in today?"
Certainty	"My friend from Seattle is visiting this weekend. I think you two would really like one another. We're going out for dinner Friday night. Would you like to join us?"
	"I have a cabin up in the Poconos. It's in a beautiful location near a lake. I was thinking of going up there this weekend. Would you like to come?"
	"A group of us are going to catch a movie tonight. It's gotten really good reviews and should be great. We'll probably hang out afterwards. Would you like to come with us?"
Confidence	"That's one of the hardest exams I've ever taken. The third question took forever to answer. I had no idea what he was looking for on the other questions. Do you think you passed?"
	"The violinist for tonight's concert had to cancel. She's home in bed with the flu. I'm sorry to ask you at the last minute. Do you think you know the music well enough to fill in for her?"
	"I know getting to Julie's house is complicated. I'm sorry I can't leave when you do. Just follow the directions on the map we've drawn for you. Are you sure you'll be able to get there?"

Note. Honesty was defined as a respondent's apparent truthfulness to a speaker's query; *Compliance* as a respondent's apparent willingness to comply with or carry out a speaker's request; *Certainty* as the extent to which an individual appears committed to their response to a speaker's invitation; and *Confidence* as a respondent's apparent belief in their ability to perform a given task. For each speech act, the response to the speaker's query was "yes."

and raised on the east coast of the United States and displayed similar temporal qualities in their speech. Across all speakers, the mean articulation rate (i.e., average syllabic duration) ranged between 158 and 174 ms, and the average intersentence pause duration between 617 and 722 ms.

For presentation purposes, the monologues were arranged into two different sets (A, B). In both, the 32 monologues were blocked by speech act and within each block, two of the eight instances were articulated by one of the four speakers. Those instances read by a female in Set A were read by a male in Set B and vice versa. In addition, the four blocks of speech acts were also arranged into two different counterbalance orders. In the first, the blocks were presented in the order of CF, CP, H, CT and in the second, the order of CT, H, CP, CF.

Apparatus. All speech monologues were initially recorded with a Realistic 33-992C microphone and a Technics RS 917 KM cassette tape deck interfaced with a Sherwood S-2750CP receiver. They were then digitized onto a Macintosh Quadra 700 computer with the SoundEdit 16 software system (manufactured by Macromedia, San Francisco, CA 94103) and adjusted so that they were equivalent in amplitude. During an experimental session, participants heard a given counterbalance order of the speech monologues from the computer and their response latency data were recorded by a voice-key through the PsyScope software program (Cohen, MacWhinney, Flatt, & Provost, 1993).

Procedure. All participants were individually tested and randomly assigned to one of the two sets and counterbalance orders such that there were an equal number of males and females in each. The instructions for the experiment were presented on the computer and stated that the purpose of the study was to investigate conversational behavior. Before the presentation of a given block of trials, the definition of the corresponding speech act was provided and an exemplar monologue (that did not appear in the actual experiment) was given.

On each trial, a 1-s warning tone occurred, followed by a given monologue presented three times in succession. All participants were instructed to simply listen to the first presentation but after its two repetitions, to vocalize a "yes" response. One group was asked to time their response to convey the most positive impression of a given speech act whereas in a second group, the most negative impression for that particular speech act. Three seconds after their response was produced, the warning tone recurred to signal the onset of the next trial. The duration of an entire experimental session was approximately 1 hour, and participants were given a brief 3-minute rest break after the presentation of the first two speech acts.

RESULTS AND DISCUSSION

For each subject, the two produced latencies on a given trial were averaged together and treated as the raw data for an overall analysis of variance. The primary finding was a significant interaction between impression valence and the different speech acts, $F(3, 336) = 37.4$, $p < .001$, which is shown in Table 2.

In the positive impression condition, a set of Tukey HSD tests (p set to .05) revealed that those latencies intended to convey maximal honesty were significantly longer than those intended to convey maximal compliance, confidence, and certainty. The means for these latter three conditions were comparable and did not significantly vary from one another. This overall effect was a very robust one that applied to all 64 participants. In addition, notice that the degree of variability for both honesty (162 ms) and confidence (403 ms) was markedly lower than that for either certainty (1433 ms) or compliance (1,267 ms). In contrast, the negative impression conditions revealed a different pattern of results. Overall, these means were significantly longer than in the positive impression condition, $F(2, 336) = 72.5$, $p < .001$. In addition, latencies intended to convey dishonesty were significantly shorter than all of the remaining speech acts, and those used to express negative impressions of confidence were significantly shorter than those for either compliance or certainty, which did not vary from one another. Table 2 also reveals that the degree of variability for confidence was relatively low (383 ms), somewhat higher for certainty and compliance (601 and 567 ms, respectively), and extremely high for (dis)honesty (1600 ms). To better understand this latter source of variation, a split mean analysis was conducted in which participants' produced latencies for dishonesty were categorized into one of two groups, those that were less than and those greater than the overall mean of 1,654 ms. The results showed that 39 of the 64 participants (61%) produced short latencies (M = 384 ms), whereas the remaining 39% produced much longer latencies (M = 2,925 ms). An item analysis revealed that the particular response bias adopted by a given participant was consistent and applied to all monologue instances.

Last, the overall ANOVA indicated that the effects of impression valence and speech act generalized to both genders. There were no significant effects of these variables.

To determine the overall generality of these results, a second analysis of variance was conducted that added the variable of monologue instance to the initial statistical design. The results revealed no significant effects of this factor, indicating that the various instances of each speech act yielded a comparable set of findings.

In sum, these results suggest that the acceptance range of response latencies varies with the speech act and evaluative dimension of interest. Of the four dimensions, certainty (CT) and compliance (CP) yielded

Table 2
Mean-Produced Latencies (ms) in Experiment 1 As a Function of Speech Act and Impression Valence

Speech Act	Impression Valence			
	Positive		Negative	
Honesty	713	(162)	1,654	(1,600)
Confidence	412	(403)	2,003	(383)
Certainty	475	(1,433)	2,780	(601)
Compliance	456	(1,267)	2,737	(567)

Note. Standard deviations are shown in parentheses.

the broadest ranges. Positive impressions were conveyed through short but highly variable latencies that grant a large region of latitude, and negative impressions were communicated through the longest latencies of all. Contrary to predictions, confidence did not produce a U-shaped function wherein positive impressions were associated with intermediate latencies and negative impressions with both short and long latencies. Instead, positive impressions were expressed through short latencies whose mean value was comparable to those for both CT and CP. In addition, negative impressions were conveyed through long latencies alone, which were shorter than those for CT or CP and less variable. These findings suggest that participants were not concerned with potential conceit but only a lack of confidence when projecting a negative image. Last, honesty yielded the most restricted range that was U-shaped in its function. Truthfulness was communicated through response times of an intermediate duration that varied little across different participants, whereas dishonesty was conveyed through latencies that were significantly shorter or longer. Before considering the implications of these findings and their underlying mechanisms, it is first necessary to confirm their validity through a converging operation that relies on a different task.

EXPERIMENT 2

In contrast to the production study of Experiment 1, Experiment 2 relied on a perceptual rating task. Participants were presented with the same set of monologues used in Experiment 1 followed by a digitized "yes" response on the computer that was always articulated by the same male respondent to hold pitch qualities constant. However, across different instances of a given speech act, response latency was systematically manipulated to correspond to one of seven values: the mean latency produced in the first experiment to convey the most favorable (i.e., optimal) social impression, three latencies longer than the optimal, and three shorter than the optimal. The participant's task

on each trial was to rate the respondent on a 7-point scale for the perceived degree of honesty, certainty, confidence, or compliance. This design allows one to determine whether those latencies produced in Experiment 1 to convey the most positive and negative impressions are perceived as such by an independent sample of participants.

A final issue reconsidered here is the potential impact of gender differences. Although this variable exerted no effects in the previous experiment, it may emerge in a perceptual rating task in which one is evaluating the behavior of others.

METHOD

Design and participants. The design was a $4 \times 2 \times 7 \times 2$ mixed factorial. All participants listened to a set of monologues that varied in their underlying speech act (Honesty, Compliance, Certainty, and Confidence), the speaker's gender, and the timing of the ensuing response (optimal, three values shorter and longer than optimal). The between-subjects variable was the participant's gender.

A total 64 participants, 32 males and 32 females, were recruited from the bicampus community of Haverford and Bryn Mawr Colleges and satisfied the same set of criteria as in Experiment 1.

Stimulus materials. The same set of 32 monologues from Experiment 1 was used here and arranged within the same speaker sets (A, B) and counterbalance orders (1, 2). However, the "yes" response to a given monologue was always articulated by the same male respondent. This individual produced a series of "yes" utterances, and an independent panel of six judges selected the one instance that appeared the most neutral in affect. The amplitude of this response was adjusted to match that of all monologues.

The "yes" response to each monologue was then digitized onto the computer such that it followed a question by one of seven delay times. One, termed the *optimal* latency, was identical to the mean value produced in the positive impression condition of Experiment 1 for a particular monologue articulated by a particular speaker. The remaining delay times were 2, 4, and 6 times shorter and longer than this value.[1]

For each of the two speaker sets (A, B), the latencies assigned to a particular monologue instance were distributed across four different presentation sets (I, II, III, IV). Within each, two of the eight monologues for a given speech act were followed by an optimally timed response, three by a response shorter than optimal, and three by a response longer than optimal. Across the different presentation sets, each monologue was paired with a response that was optimally timed, two shorter than optimal, and two longer. Those short and long values that were not associated with a given monologue in Speaker Set A were so in Speaker Set B.

Apparatus. Using the SoundEdit 16 software system, the "yes" response to each monologue was digitized onto a Macintosh Quadra 700 computer after one of seven delay times. All stimuli were then transferred to the PsyScope software program, which ensures a precisely timed sequence of events within a set of experimental trials. Blocks of randomized trials were recorded onto cassette tape with a JVC TD-V621 recorder and Kenwood KR-4010 amplifier-receiver, and subsequently presented to participants through Koss Pro AAA Plus headphones at a comfortable listening level (i.e., 60 dB).

Procedure. Participants were randomly assigned to a given order, speaker, and presentation set such that there were an equal number of males and females within each. Recorded instructions informed participants of the experimental procedure and task requirements. They were told the purpose of the experiment was to investigate social judgment processes within conversational interaction and they would be asked to rate the listener's response to a series of questions on four different dimensions. They were also told that each question would be followed by a "yes" response articulated by the same male respondent throughout. The set of instructions for each individual task was administered before the presentation of a block of eight trials and in all tasks, participants' ratings were indicated on a 7-point scale.

On each trial, a 1-s warning tone preceded a monologue by 2-s and during a 5-s response period that followed, participants were asked to provide a rating judgment. For certainty, they were told that a speaker would invite the listener to participate in some sort of activity and their task was to decide whether the listener seemed very certain (rating of 1) or very uncertain of his response. In the set of honesty judgments, participants heard a speaker asking the listener if he had performed a given act and participants were asked to rate the apparent truthfulness of his response (1 = very honest). The set of compliance ratings required judging whether the respondent seemed very willing (value of 1) or unwilling to carry out a speaker's request. Last, in judgments of confidence, a speaker asked the listener whether he was able to perform a given activity and the respondent was then rated on whether he seemed very positive (rating of 1) or negative in the confidence of his abilities.

Participants were tested in small groups of 2 to 4 individuals and the duration of an experimental session was approximately 45 min.

RESULTS

The overall ANOVA indicated that the most important finding was a significant two-way interaction between speech act and response latency, $F(12, 576) = 77.02$, $p < .001$, which is shown in Table 3.

For three of the speech acts, namely, certainty, confidence, and compliance, the most positive impressions are associated with the optimal latency as well as all latencies shorter than this value. A set of Tukey post hoc comparisons (p set at $< .05$) revealed there was no significant difference between these four levels. The perceived certainty and compliance level of an individual remain equally positive when latencies are two times longer than the optimal value, significantly increase at a 1:4 ratio, but it is not until a 1:6 ratio that judgments become highly negative ($p < .01$). Perceived confidence, on the other hand, was rated significantly more negative when latencies displayed a 1:2 ratio ($p < .01$) and increasingly more so with both a 1:4 and 1:6 ratio ($p < .01$). Last, the perceived honesty of an individual yields a very different pattern of results. Here, the perceived credibility of a respondent is highest at an intermediate (the optimal) value, whereas shorter and longer latencies all yield significantly higher ratings associated with lying. A set of Tukey HSD tests (p set at $< .05$) showed there were no significant differences among the six levels that varied from the optimal value.

This overall pattern of results is a very robust one that applied to all participants and all eight instances of a given speech act. These effects also generalize across the different speaker sets, counterbalance orders, and presentation sets in that none of these variables exerted significant effects in the overall ANOVA.

Last, the results also reveal null gender effects. Ratings were not influenced by either the gender of the speaker or participant, or their interrelationship.

DISCUSSION

The results from this second experiment converge with the first in that latencies produced to convey the most positive and negative impressions were perceived as such by others. In the positive impression condition of Experiment 1, certainty, compliance, and confidence produced short latencies whose variability spanned a range incorporating not only the optimal value of the present study, but also all of the short latency values, and for certainty and compliance, those that were twice as long as the optimal. The perceptual ratings mirrored these results in that these conditions all displayed highly positive ratings that did not vary from one another. Similarly, negative evaluations emerged when latencies were 6 times longer than the optimal and for confidence, those that were also 4 times longer—which again reflects the range of produced latencies from Experiment 1. The remaining levels, namely the 1:4 ratio for certainty and compliance and the 1:2 ratio for confidence, represent values that only slightly exceeded the acceptance range and as one might expect, these yielded perceptual ratings at the midpoint of the scale. Finally, the honesty dimension also produced convergent results in that positive impressions were solely

Table 3
Mean Perceptual Ratings in Experiment 2 As a Function of Speech Act and Response Latency

	Response Latency						
Speech Act	6:1	4:1	2:1	Optimal	1:2	1:4	1:6
Honesty	6.90 (0.33)	6.83 (0.47)	6.00 (0.30)	1.50 (0.20)	6.25 (0.22)	6.75 (0.23)	6.87 (0.10)
Confidence	1.83 (0.45)	1.83 (0.30)	1.67 (0.27)	1.67 (0.17)	3.87 (0.53)	5.76 (0.20)	6.90 (0.16)
Certainty	1.25 (0.20)	1.25 (0.25)	1.33 (0.33)	1.75 (0.30)	1.83 (0.37)	3.50 (0.40)	6.75 (0.20)
Compliance	1.17 (0.30)	1.25 (0.30)	1.25 (0.27)	1.75 (0.22)	1.83 (0.35)	3.67 (0.37)	6.83 (0.20)

Note. Standard deviations are shown in parentheses.

associated with the optimal duration alone that corresponded to the more narrow acceptance range of Experiment 1. Latencies shorter or longer than optimal, produced to convey dishonesty in Experiment 1, were rated as such.

One finding that initially appears somewhat discrepant is that in Experiment 1, dishonesty was more frequently conveyed through shorter response times than longer ones but in Experiment 2 was associated with both types of latencies in a comparable fashion. Several individuals (e.g., Cody & O'Hair, 1983; O'Hair et al., 1981) have found that short latencies are more apt to emerge with lies that have been prepared in advance whereas long latencies are typically observed with spontaneous lies that require more cognitive effort. The methodological context of the first experiment is one that promoted prepared lies because participants were explicitly instructed to produce latencies that conveyed dishonesty—hence, it is unsurprising that short latencies more frequently occurred. However, Experiment 2 relied on a methodology in which response times could be construed as either prepared or spontaneous lies and the data indicate that listeners were attuned to latencies that specify both.

The primary issue to consider is why the acceptance range of response latencies varies with different speech acts and evaluative dimensions. Several factors may be at play but one is that the speech acts investigated here represent different motivations for deception (Buller & Burgoon, 1996). Certainty and compliance, which yielded the broadest ranges of positive evaluations, both involve relationships with others in that responses to these types of questions determine whether subsequent activities will be jointly performed by the two conversational participants. It may be the case that relational speech acts are inherently granted a more relaxed acceptance range such that one is more tolerant of behavioral deviations. A greater latitude of variation not only provides a tacit means for acknowledging the value of a relationship but perhaps more important, for preserving and maintaining it in that a higher threshold must be exceeded for negative evaluations to occur. In effect, a greater tolerance to variable latencies decreases the likelihood that conflict and interpersonal tension will arise. Although such a norm would be socially adaptive, it should be noted that certainty and compliance involve other factors that contribute to a larger acceptance region, and which may or may not apply to other relational speech acts. First, negative evaluations are associated with very long latencies alone and not very short ones. Second, certainty and compliance require the coordination of activities between individuals and as such, necessitate cognitive effort for a respondent to determine if he/she is able to do this activity.

In contrast, the expressed confidence in one's abilities reflects an individual's self-image, which is an important concern to most people. In general, humans are motivated to project positive impressions

toward others in order to acquire and maintain respect. Given this, a more restricted range than that for certainty and compliance was predicted and to some extent this was found. In Experiment 1, produced latencies for confidence were much less variable for both positive and negative impressions and in the latter condition, yielded a shorter threshold value. Similarly, the perception data of Experiment 2 reflected an acceptance region that ranged from very fast to the "optimal" value, versus a boundary of 2 times longer for certainty and compliance. Street and his colleagues (e.g., Street, 1982, 1984; Street & Brady, 1982; Street, Brady, & Putman, 1983) found similar results when investigating the effects of speech rate and response latency on perceived competence (i.e., intelligence, status, expertise)—another dimension related to self-image and abilities. Competence was rated highest when speech rate and response times ranged from very fast to fast and as was true of confidence. The cutoff value for negative impressions was less than that for other evaluative dimensions, such as social attractiveness (i.e., kind, pleasant, likeable, friendly). Hence, a more critical standard seems to be adopted when judging the projected image of others, which is, in fact, useful for improving the accuracy of person perception and inferring which traits apply to a given individual. Although it was predicted that negative evaluations would also arise at very short latencies (i.e., perceived conceit), this did not occur. Even latencies 6 times shorter than the optimal value were as favorably evaluated, suggesting that the attribution of conceit involves the mediation of additional factors such as one's prior knowledge of an individual.

The final speech act of honesty represents the most serious type of transgression, namely, deception about one's actions motivated by self-gain. Dishonesty violates the implicit contract of trust between individuals (Grice, 1989) and leads one to question the credibility of this person in future interactions. Perhaps because it is a serious social violation, people adopt stricter criteria for judging the honesty of others that in the case of response latencies, means a more restricted range. People are aware of this range because as the results illustrate, those latency values perceived as the most honest are the same used to produce this impression. Given this, one should expect liars to deliberately adjust their latencies to fall within the acceptance range when trying to convince others of their truthfulness. The most successful deceivers may be able to do this but as the present results showed, dishonesty was associated with latency values shorter and longer than the acceptance range. So why this discrepancy? As noted in their review of the literature (DePaulo et al., 2003), liars who deliberately manage their self-presentation often feel guilt and anxiety about their deceptive behavior. Their performance therefore suffers and in ways to which people are attuned. Relative to prepared lies, spontaneous, unplanned fabrications are assumed to be more anxiety-producing. Given that

they also require cognitive effort to both plan a response and how to best present this, this in turn results in longer response latencies. Prepared lies, on the other hand, are anticipated and often result in an over-attempt to control one's behavior such that very short latencies occur.

In sum, then, variations in the acceptance range of response latencies may reflect the extent to which people are tolerant of different types of deception. In general, those lies considered more justified and socially acceptable are those that yield a broader range, whereas more serious transgressions produce a more restricted region.

The final finding of note is the lack of gender differences observed in both Experiments 1 and 2. Although Siegman (1978) has reported that response times vary with same versus opposite gender dyads, no such effects were observed here. At least two possibilities may be at play. One is that Siegman relied on an experimental context in which participants engaged in face-to-face interaction in the roles of interviewers versus interviewees. In contrast, the present study required participants to respond to monologues digitized onto a computer. Perhaps gender differences are less apt to occur in this less naturalistic situation in which social interaction is lacking. A second possibility is that the effects of response latency on impression formation are mediated by a common set of mechanisms that apply to both genders. The next two studies consider what these mechanisms might be. Given the null effects of gender observed thus far, it will no longer be a variable of interest.

EXPERIMENT 3

The lawful pattern of data observed thus far leads one to ask, how do people "know" what latency values are most (un)acceptable for a given evaluative dimension, and what source of information are they relying upon? From a cognitive perspective, it seems unlikely that people have mathematical values stored in long-term memory for each individual speech act. Such representations not only would be taxing to learn but subject to interference effects that could lead to social perception errors. A more effective strategy would be to rely on the speech stream itself and the immediate context of the conversation. In particular, people may selectively attend to the temporal qualities of a conversation, and then use this information to both time one's response to a speaker's query and judge the social meaning of others' latencies. The previous literature suggests at least two processes that may mediate this behavior. One is speaker accommodation and the other is expectancy generation.

SPEAKER ACCOMMODATION

Speaker accommodation refers to the idea that over the course of a conversation, people tend to adopt similar speaking styles to become more like those with whom they are interacting (see Feldstein & Welkowitz, 1987; Giles, Coupland, & Coupland, 1991; Giles & Smith, 1979, for reviews). This can occur on a variety of dimensions, including speech rate, vocal intensity, utterance length, response latency, pause duration, and pronunciation. Speaker accommodation facilitates communication by reducing the perceived discrepancies among participants and thereby rendering a greater sense of rapport and intelligibility to the conversation. This idea is supported by research showing that participants rate one another as more similar, persuasive, better informed, and more enjoyable to interact with when accommodation occurs (see Giles et al., 1991, for a review).

Some studies have investigated which acoustical qualities are converged upon before others during the course of an ongoing conversation. In general, these tend to be the temporal parameters of speech in that response latencies, pauses, and speech rate are among the first dimensions to be mutually shared (e.g., Feldstein & Welkowitz, 1987; Natale, 1975; Street & Giles, 1982). In addition, these various temporal parameters are often lawfully related to one another. Jaffe and Feldstein (1970), for example, found that the duration of interssentence pauses and response latencies often converge to ensure a smooth exchange of speaking roles. In addition, analyses of spontaneous speech reveal that the ratio of the average intersentence pause duration to mean articulation rate tends to be an invariant one on the order of 4:1 (Goldman-Eisler, 1968, 1972; Jaffe & Feldstein, 1970). Given this, these two temporal parameters may act as significant predictors of response latency values and the valence of social impression. Such a process varies from the traditional definition of speaker accommodation in that in lieu of sharing a common speech parameter, people are adjusting one speech dimension (i.e., response latency) on the basis of others (i.e., speech rate and/or pause duration). Nonetheless, it does represent a type of interspeaker convergence.

EXPECTANCY GENERATION

A second process that may be at play is expectancy generation. This notion is not incompatible with that of speaker accommodation but instead refines those mechanisms that may be involved in adopting similar temporal parameters as other conversational participants.

Expectancy generation is a phenomenon assumed to arise from events that are highly rhythmic in nature and has perhaps been most extensively investigated in music cognition. When listening to musical stimuli, it has been well documented that people are able to lock into

the unfolding temporal context of a melody to anticipate not only what set of upcoming pitch relations will occur but *when* in time these will appear (see Boltz, 1993; Jones, 1981, 1990; Schmuckler, 1989, for reviews of the literature). This temporal extrapolation process can occur at many different levels of a melody's structure (Jones, 1981; Narmour, 1989) and include both the underlying beat of a tune for more local expectancies, or the pattern of rhythmic accent structure for more global expectancies that span over a longer time period.

Music and speech display a structural arrangement that is remarkably similar to one another (e.g., Handel, 1989; Jackendoff, 1989; Jackendoff & Lerdahl, 1982; Prince, 1989) and so it is unsurprising that a similar process occurs within speech perception. Just as music contains a background beat that arises from meter, the same can be said of speech and phonological production (Jackendoff, 1989). In addition, many languages, including English, are stress-timed in which accented syllables regularly recur at equidistant intervals. Listeners in fact perceive these to be isochronously timed and generate expectancies about their future occurrence (Martin, 1986; Shields, McHugh, & Martin, 1974; Sturgis & Martin, 1974). At this point, however, the analysis of speech becomes more difficult because even though isochrony occurs on a perceptual level, it does not appear on a physical one (e.g., Allen, 1973, 1975; Handel, 1989). That is, there are no corresponding acoustical parameters that recur with a fixed periodicity. However, even though the physical basis of speech accents is difficult to identify, it is nonetheless possible that conversational participants become mutually entrained to the underlying rhythmicity of a speaker's utterance, which in turn allows them to adopt similar rates of speech, pause durations, and so on. In other words, expectancy generation may facilitate accommodation. From this perspective, then, one might argue that listeners are extrapolating the preceding temporal context of a speaker's utterance to time their own responses accordingly.

Experiment 3 was designed to test these ideas by investigating whether a speaker's mean articulation rate and intersentence pause duration act as determinants of response latencies. In particular, it examined whether these two variables exert an independent or joint influence upon behavior.

As noted by Goldman-Eisler (1968, 1972), Jaffe and Feldstein (1970), and others, articulation rate and pause duration typically display a positive correlation in which faster speakers produce shorter pauses and slower speakers produce longer ones. From a methodological standpoint, this is problematic because listeners could rely on *either* speech rate or pause duration for response timing purposes. However, individuals do vary and some display a negative correlation such that fast speakers produce long pauses and slow speakers produce short ones. Together, these four conditions allow one to examine whether one linguistic variable has priority over the other. Suppose

that listeners primarily attend to a speaker's articulation rate and ignore pause duration when timing their responses. Latencies, then, would always be shorter for a fast speaker, regardless if pause durations were short or long. Effectively, this would mean that the underlying beat periodicity (i.e., meter) of an utterance is the primary determinant of response latencies, and that listeners are extrapolating this over a duration appropriate to the given speech act. A second possibility is that mean pause length alone is the relevant determinant such that shorter pauses always yield shorter latencies, regardless of the corresponding articulation rate. In this case, listeners are primarily attending to the more global level of speech rhythm, and are then reproducing this pause duration to time one's response. The final possibility is that speech rate and pause duration do not exert an independent effect but a joint influence on response latency values. If so, then latencies for a given pause duration will vary with the accompanying speech rate. In other words, listeners are attending to both variables of a speaker's monologue and adjusting their latency values relative to the preceding beat periodicity of a pause duration.

A second goal of Experiment 3 was to examine whether the temporal parameters of speech are a better predictor for some speech acts than others. Street and his colleagues (Street, 1982, 1984; Street & Brady, 1982; Street et al., 1983) have found that accommodation can vary with the behavioral trait of interest. In their research, participants were presented with a set of monologues that varied in speech rate and were asked to rate the speakers for their degree of competence and social attractiveness, and how similar their speech rate was to their own. The results showed that both evaluative dimensions became more positive as speech rate increased. However, participants also judged a speaker the most attractive when their speech rate was similar to their own and less attractive when they spoke faster or slower than oneself. On the other hand, perceived competence was highest when speakers spoke faster than oneself. These findings, then, suggest that speech similarity is more important for some traits (i.e., social attractiveness) and that others are more influenced by speech stereotypes (i.e., more competent people speak faster).

A related set of findings may emerge here. Given that honesty yields the most restricted acceptance range, it may display the strongest relationship to speech rate and/or intersentence pauses within a monologue's preceding context. Such a relationship would provide useful paralinguistic evidence in which to judge a respondent's truthfulness, and any deviations from this type of accommodation would provide compelling cues to deception. Confidence, on the other, may be akin to the competence dimension within Street's research. Both contribute to a positive self-image and although confidence does not necessarily reflect one's actual abilities, it does reveal one's perceived abilities. Hence, latencies for this dimension may be governed by speech stereo-

types wherein response times faster than the referent are judged more positively. Last, certainty and compliance may display the weakest relationship to the temporal parameters of the preceding context. Like confidence, they too may be influenced by speech stereotypes such that faster latencies are considered more favorable. However, these dimensions also involve relationships with others as well as cognitive effort that thereby grants greater variability to their acceptance ranges.

These different issues are examined in the present experiment by varying both the articulation rate (fast, slow) and pause duration (short, long) of speakers in a factorial design. The monologues are the same as before and represent the speech acts of honesty, certainty, confidence, and compliance. The participants' task on each trial is to produce a "yes" response with the latency that conveys the most favorable impression. Unlike Experiment 1, the valence of social impressions will not be manipulated here. The first two experiments have already established that negative impressions are conveyed by latencies beyond the optimal one and so the primary focus of the present study will be on the determinants of those latencies conveying positive impressions.

METHOD

Design and participants. The design was a $4 \times 2 \times 2$ repeated measures factorial. All participants listened to a set of monologues that varied in their underlying speech act, overall articulation rate (fast, slow), and the duration of intersentence pauses (short, long).

A total of 96 subjects, 46 males and 50 females, participated in the experiment and satisfied the same criteria as in the preceding experiments.

Stimulus materials. The same set of monologues from Experiment 1 was used and arranged within the same counterbalance orders of speech act presentation (1, 2). These monologues, however, were read by a different set of speakers who varied in their individual speaking rates and pause durations. Two, a male and female, were relatively fast speakers who displayed a mean articulation rate across all monologues of 140 and 142 ms, respectively. These values were determined by dividing the total number of syllables within a given monologue instance into the total time span of articulated speech, and then averaging across the different instances to obtain the overall mean articulation rate. These 2 speakers also produced relatively short pause durations between the four sentences of a given monologue instance that, on average, were 518 and 540 ms, respectively. The 2 remaining speakers were also a male and female who had a characteristically slower rate of speech (mean articulation rate = 206 and 221 ms) accompanied by relatively long pauses (846 and 862 ms, respectively). For all

4 speakers, the ratio of mean pause duration to mean articulation rate approximated a value of 4 to 1.

The set of 32 monologues for each speaker was digitized onto the computer and a second version for each was created in which the pause duration between each sentence of a monologue was altered. Using the SoundEdit software program, the intersentence pause durations within each monologue instance of the 2 fast speakers was lengthened such that it equaled the mean intersentence pause duration of the 2 slow speakers (M = 854 ms). Similarly, the intersentence pause durations of the 2 slow speakers were shortened such that they now equaled the mean value of the two fast speakers (M = 529 ms). This type of methodological procedure ensured that mean pause duration remained constant across the two articulation rates and vice versa. In contrast to the 4:1 ratio within the original versions, the ratio of mean pause duration to mean articulation rate was 6:1 in the fast speech-long pause condition, and 2.5:1 in the slow speech-short pause condition.

These monologues were then arranged into two different sets (A, B) where in each, the 32 monologues were blocked by speech act. Within a given block, two of the eight instances were articulated by each of the four speakers. There was also an equal incidence of short and long pause durations, and the pause value assigned to a given speaker was constant both within and between blocks. Across the two sets (A, B), those speakers who displayed a short pause in Set A displayed a long pause in Set B, and vice versa.

The apparatus and procedure were identical to that of Experiment 1.

RESULTS

The two produced latencies on a given trial were averaged together and analyzed by an overall ANOVA. As in Experiment 1, a main effect for speech act, $F(3, 285) = 24.3, p < .001$ emerged in which latencies conveying maximal honesty were significantly longer (M = 696 ms) than those of confidence (M = 431 ms), certainty (M = 424 ms), and compliance (M = 433 ms). This was confirmed by a Tukey HSD test ($p < .01$), which also showed that the latter three values did not vary from one another. Once again, the degree of variability for honesty (130 ms) and confidence (392 ms) was lower than that for certainty (1,188 ms) and compliance (1,192 ms).

The more interesting finding is a main effect for a speaker's pause duration, $F(1, 95) = 51.8, p < .001$, which is shown in Table 4. Notice that for both speech rates, shorter pauses always yield shorter latencies whereas longer pauses always yield longer latencies. This is a very reliable finding that applied to all participants, all four speech acts,

Table 4
Mean Produced Latencies (ms) in Experiment 3 As a Function of Speech Act, Articulation Rate, and Pause Duration

Speech Act	Articulation Rate			
	Fast Rate		Slow Rate	
Short pause durations				
Honesty	532	(101)	523	(123)
Confidence	341	(327)	368	(350)
Certainty	310	(908)	352	(894)
Compliance	333	(927)	371	(916)
Mean	379		403	
Long pause durations				
Honesty	858	(144)	872	(153)
Confidence	497	(403)	518	(487)
Certainty	512	(1,489)	523	(1,462)
Compliance	508	(1,473)	519	(1,453)
Mean	594		608	

Note. Standard deviations are shown in parentheses.

and all eight instances of a given speech act. A speaker's articulation rate exerted no significant effects upon behavior.

To obtain greater insight into the relationship between produced latencies and a speaker's pause duration for the different speech acts, a second analysis was performed. For each individual participant, a set of difference scores was obtained by subtracting the mean pause duration for each monologue instance from its produced latency. When these were evaluated through an overall ANOVA, the primary finding was a main effect for speech act, $F(3, 285) = 18.7$, $p < .001$. A set of Tukey HSD tests showed that honesty yielded the smallest difference ($M = 5.5$ ms), which did not significantly vary from zero. In effect, these produced latencies were equivalent to the mean pause duration of a speaker's monologue. In contrast, the differences scores for the remaining speech acts of compliance ($M = –258.5$ ms), confidence ($M = –260.5$ ms), and certainty ($M = –267.5$ ms) were significantly different from both the honesty scores as well as a value of zero ($p < .01$). Given the negative sign of these means, this finding indicates that these latencies were relatively shorter than the mean pause duration within the preceding speaker's monologue.

DISCUSSION

These results both replicate and extend the findings of Experiment 1. The range of acceptable latencies once again varied with speech act such that honesty yielded the most restricted region, followed by confidence, and both certainty and compliance producing the broadest ranges of all. As before, these differences are consistent with people

adopting different criteria when conveying different types of motivated impressions.

The more important finding of this experiment concerns the structural referent for response timing. At least for social impression purposes, attending appears to be primarily focused on the average duration of a speaker's intersentence pauses. This value, or any systematic deviation from it, is then used to communicate different meanings, depending on the evaluative dimension of interest. The referent for honesty is the most unambiguous in that maximal credibility is associated with a response latency that directly matches the pause duration itself. In this sense then, a type of accommodation occurs in which the timing behavior of a respondent converges with that of a speaker, albeit on different temporal dimensions. For the remaining speech acts, a different criterion is used—one in which positive impressions are primarily communicated by latencies shorter than the speaker's average pause duration.

Although articulation rate produced no significant effects, this does not necessarily mean that it exerted no influence on behavior. The ratio of mean articulation rate to mean pause duration could vary across speakers and approximate a value of 4:1, 2.5:1, or 6:1, but *within* a given speaker, always remained invariant. Articulation rate thereby provided a constant beat periodicity that persisted during intersentence pauses. Hence, when timing one's latency to a particular speech act, respondents could have extrapolated the appropriate number of missing beats that filled the pauses within the preceding context of a monologue. In other words, expectancies generated from the underlying beat periodicity may help one to learn and later reproduce a speaker's pause duration that is then used as the referent for behavior. Such a strategy, in fact, would be a very effective one.

Articulation rate may exert another potential influence that the present research was unable to assess. The current set of studies all relied on a one-word response to achieve rigorous experimental control. However, if participants had the opportunity to produce longer utterances consisting of multiple words, a respondent's speech rate may be very similar to that of the preceding speaker—thereby illustrating another form of accommodation. Future research could determine if such a process occurs and whether it, too, varies with different speech acts.

Before concluding that a speaker's pause duration acts as the referent for response timing behavior, one must first demonstrate that the social perception of those latencies produced in the presence of varying articulation rates and pause durations are shared by both the respondent and other individuals. Experiment 4 is designed to assess this hypothesis by relying on the same manipulations as in the preceding experiment but using perceptual rating judgments as the dependent variable. Participants are presented with the same set of monologue

instances followed by their "yes" response whose latency is either identical to that produced in Experiment 3 to convey the most favorable impression, or a latency significantly shorter or longer than this value. Their task is to rate the respondent for the perceived degree of honesty, compliance, certainty, or confidence.

EXPERIMENT 4

METHOD

Design and participants. The design is a $4 \times 2 \times 2 \times 7$ repeated-measures factorial. All participants listened to a set of speaker monologues that varied in their underlying speech act, overall articulation rate (fast, slow), the duration of intersentence pauses (short, long), and the timing of the ensuing response (optimal, three values shorter and longer than optimal).

There were 64 participants in the experiment, 24 males and 40 females, who satisfied the same criteria as in the preceding experiments.

The preparation of stimulus materials, the apparatus, and procedure were all identical to that of Experiment 2. As before, the latency manipulation was achieved by using the mean value produced in the preceding study for each monologue instance (in the presence of its respective pause duration and articulation rate) as the "optimal" latency. The remaining delay times were 2, 4, and 6 times shorter and longer than this value.

RESULTS

In the preceding experiment, produced latencies varied as a function of speakers' pause durations. Given that the "optimal" latencies of the present study correspond to those values produced in the presence of this effect, one should find a null effect for pause duration if the set of perceptual ratings converge. Ratings should simply vary as a function of the latency manipulation. The results indicate this was the case.

The overall analysis of variance revealed only one significant effect, namely an interaction between speech act and response latency, $F(12, 576) = 49.02$, $p < .001$. It is shown in Table 5.

For honesty, the maximal credibility of a respondent is associated with the optimal latency produced in Experiment 3. A set of Tukey HSD tests ($p < .01$) reveals that shorter and longer response times yield significantly higher ratings that are all comparable to one another and associated with perceptions of lying. In the remaining speech acts, the most positive impressions are observed for the optimal

latency and values within the range of variability found in Experiment 3. Ratings of confidence, certainty, and compliance are highly positive and comparably so for latencies ranging from 6:1 through the optimal level and for certainty and compliance, beyond to the 1:2 level. A set of Tukey tests confirms there are null differences among these different levels. The immediately ensuing level yields more negative ratings ($p < .05$) that approximate the midpoint of the rating scale, whereas increasingly longer latencies lead to increasingly more negative ratings ($p < .05$). These effects are very robust ones that generalize to all participants and all instances of a given speech act.

DISCUSSION

These overall results converge with Experiment 3 by indicating that a speaker's pause duration acts as the referent for response-timing behavior and those social impressions that arise. Given that the latency manipulation of this study was based on values produced in Experiment 3, the different latency levels participants encountered inherently reflect variations due to pause duration. In effect, the latency levels have been normalized and so no additional effects of pausing or articulation rate should emerge. This, in fact, was found, and consistent with the results of Experiment 2, positive ratings were associated with values within the acceptance range and more negative impressions emerged as latencies exceeded this range.

The second major finding concerns the effect of speech act. As before, the acceptance range varied such that it was the most restricted for honesty, somewhat less so for confidence, and the most relaxed for certainty and compliance. However, given that each respective range was defined relative to latencies inherently adjusted for a speaker's pause duration, this in turn suggests that the use of pause duration as a referent varies with different evaluative dimensions. For honesty, the apparent truthfulness of an individual can be determined by simply matching a respondent's latency to the average pause duration of the preceding speaker. Any latency greater or less than this value is perceived as a dishonest response. The referent for confidence, on the other hand, is one in which latencies equal to or less than the average pause duration are associated with the most favorable impressions, but latencies greater than the referent are perceived more negatively. Last, certainty and compliance are judged most favorably when latencies are equal to, less than, or no more than 2 times longer than the average pause duration. Hence, different criteria are applied to different speech acts but in each case, a speaker's pause duration provides a stable and reliable referent in which to judge a respondent's behavior as acceptable or unacceptable.

Table 5
Mean Perceptual Ratings in Experiment 4 As a Function of Speech Act and Response Latency

	Response Latency						
Speech Act	6:1	4:1	2:1	Optimal	1:2	1:4	1:6
Honesty	6.75 (0.17)	6.67 (0.30)	6.87 (0.23)	1.33 (0.17)	6.50 (0.27)	6.67 (0.20)	6.90 (0.17)
Confidence	1.25 (0.50)	1.17 (0.25)	1.25 (0.22)	1.67 (0.25)	4.00 (0.42)	6.17 (0.25)	6.83 (0.20)
Certainty	1.33 (0.20)	1.25 (0.33)	1.25 (0.33)	1.50 (0.30)	1.75 (0.26)	3.83 (0.33)	6.67 (0.23)
Compliance	1.25 (0.27)	1.25 (0.20)	1.33 (0.31)	1.67 (0.32)	1.83 (0.20)	3.75 (0.33)	6.75 (0.25)

Note. Standard deviations are shown in parentheses.

GENERAL DISCUSSION

As a set, the results of the four experiments reported here indicate that response-latency behavior contributes to person perception and those characteristics ascribed to a given individual. Such findings have been reported in the past literature, but the present research indicates that in addition to confidence (Kimble & Seidel, 1991; Scherer et al., 1973) and honesty (Baskett & Freedle, 1974; Heilveil & Muehleman, 1981; Kraut, 1978), an individual's level of certainty and compliance can also be inferred from response timing. The more interesting finding, however, is that the range of acceptable latencies varies with different evaluative dimensions. Moreover, each respective range is defined relative to temporal properties within the preceding speaking context, namely, the average duration of intersentence pauses. Honesty yielded the most restricted region that was defined by the pause duration itself, and any latencies shorter or longer than this value were perceived as dishonest. Confidence, on the other hand, was associated with latencies equal to or less than the average pause duration, whereas certainty and compliance were granted the greatest latitude of all. Here, latencies could be equal to, less than, or twice as long as the pause referent and still yield positive impressions.

These findings have been suggested to stem from a differential tolerance to different kinds of deception. The experimental context used here is one that promoted this type of mental set because in the presence of a "yes" response that always remained constant, participants were asked to produce or perceive positive impressions as well as negative ones in which a respondent was misrepresenting oneself. Hence, both tasks required one to discriminate deception from nondeception. And overall, the results suggest that the width of any given acceptance region is associated with the motivation underlying the potential deception. Honesty judgments, fundamental to establishing trust in another's words and actions, are subject to the most stringent criteria followed by the self-presentation of one's abilities (i.e., confidence). Certainty and compliance both involve relationships with others and the broader acceptance ranges granted to these speech acts help one to avoid interpersonal conflict.

There is an alternative interpretation of these data that involves a more general view of person perception and those processes by which people are assigned to different trait categories. One dominant theory is the "cue-diagnosticity approach" (Skowronski & Carlston, 1987) in which certain behavioral cues are associated with certain traits in a probabilistic fashion. Those cues that strongly suggest a given trait category are said to be diagnostic and are therefore weighted more heavily in impression formation. One finding relevant to the present research is that the diagnostic cues for honesty and morality judgments are quite different than those for abilities (Skowronski &

Carlston, 1987). In the former, negative behaviors (i.e., lying) are deemed more diagnostic of a person's true disposition than are positive behaviors. The opposite pattern of results, however, applies to abilities in which positive behaviors are weighted more heavily than negative ones.

This differential relationship may help to explain why the width of the acceptance range varies with different evaluative dimensions. Confidence is clearly subsumed within the ability category and although certainty and compliance primarily involve one's willingness to commit to or help another, both may be considered a type of interpersonal ability. Across all four experiments reported here, a positivity bias was observed for these three speech acts in that the range of latencies conveying positive impressions was a very broad one and less restricted than that for negative impressions—the latter only emerged at latencies longer than the pause duration. Honesty, on the other hand, reflected a negativity bias in that a broader range of latencies was associated with negative impressions than for positive ones (i.e., latencies longer or shorter than the pause duration versus the pause duration itself). This in turn suggests that for a given trait, the valence of diagnostic information may influence the width of the acceptance region and the range of behavior that is therefore weighted during impression formation. This view is not necessarily inconsistent with effects due to motivated deception but instead, relates a complementary process that may operate in parallel.

The second major finding of note is the use of a speaker's mean pause duration as the referent for response timing. These two temporal parameters were more apt to converge for honesty than the remaining speech acts and thereby illustrate a type of accommodation. In this sense, these results are consistent with those of Street and his colleagues (Street, 1982, 1984; Street & Brady, 1982; Street et al., 1983) who found that similar speech rates were more apt to occur for dimensions of social attractiveness (i.e., honesty, likeability, friendliness) than competence (i.e., confidence, intelligence, ambition). In the latter, positive impressions were primarily based on speech stereotypes and rates faster than one's own. As Street points out, accommodation is particularly important for social attractiveness in that individuals who speak in a similar fashion are perceived to be more likeable, trustworthy, warm, and friendly. Accommodation elicits these types of positive responses because it reflects social affiliation and reduces any perceived discrepancies between individuals.

The present research extends these findings by illustrating that respondents who adjust their latencies to match a speaker's pause duration are also perceived as more honest. Such a strategy is in fact a very useful one for both the respondent and perceiver. To communicate effectively, conversational participants must be able to trust one another and assume that others are being truthful—an implicit

contract that Grice (1989) has termed the *truth-quality maxim*. One way in which a respondent can quickly establish this foundation of trust is to adopt a temporal parameter from the immediately preceding context of another's speech. Pause duration is a very salient parameter (Feldstein & Welkowitz, 1987; Street, 1982) that provides a single, unambiguous value that is readily apparent to others. Given that a perceiver simply has to match this referent to a response latency, this in turn not only provides a very rapid means in which to assess one's honesty, but also increases the accuracy of this judgment so that errors are less apt to occur.

Although accommodation was not observed for the remaining speech acts, the produced and perceived latencies in these conditions did vary with a speaker's pause duration—indicating that people were attending to this temporal dimension and adjusting their latency behavior accordingly. In contrast to honesty, an individual's confidence, certainty, and level of compliance seem subject to speech stereotypes (faster is better) as was true of the competence dimension within Street's work. Nonetheless, a referent is still required to determine if a stereotype is applicable (i.e., a latency shorter or longer than what?), and in these cases, any latency equal to, less than, or, for certainty and compliance, twice the value of the pause duration all result in positive judgments. Hence, the same referent is used for different evaluative dimensions but subject to different criteria.

One final issue to consider is the overall generality of the present results. To achieve methodological rigor, the one-word "yes" response to a speaker's query was always kept constant across all speech acts and all monologue instances. This not only provided a constant sensitivity for the voice key used to measure produced latencies but also a constant comprehension time for participants. In addition, all monologue instances were digitized onto a computer as were the one-word responses in Experiments 2 and 4 to ensure that the acoustical characteristics of these utterances were the same for all participants. Although DePaulo et al. (2003) argue that deception cues are available even in this very simplistic context, greater external validity is needed. There are at least three avenues for future research. First, a greater range of evaluative dimensions is needed to more rigorously assess effects due to the valence of diagnostic cues versus different motivations for deception. The relative influence of each theoretical construct should not only be manifested in response timing behavior but other nonverbal indices as well. Second, it would be useful to conduct more naturalistic studies that rely on face-to-face interaction or at the very least, audio input that is more representative of everyday speech. The effects of response latencies upon evaluative judgments are of relevance to interview situations, courtroom behavior, doctor-patient interactions, the presentation of political candidates—all of which offer exemplar contexts that could be assessed in future investigations.

This in turn leads to a final issue concerning the role of expectancies in person perception. The present experimental context was useful in that it allowed one to assess the relative width of the acceptance region for different evaluative dimensions and the temporal parameters that influence this width. However, as Burgoon and others have demonstrated (see Burgoon, 1993, for a review), the expected range of a given behavior depends on a number of factors that were ill-defined here. These include characteristics of the communicator (e.g., one's age, vocation, physical appearance), the relationship between conversational participants (e.g., one's status and reward value, degree of familiarity and intimacy), and the context in which the conversation occurs (e.g., formal vs. informal settings). It is very likely that such factors are at play when relying on response timing behavior for social impression formation. For example, as noted earlier, one's prior knowledge of an individual may yield a more restricted range for confidence because very short latencies are negatively perceived as conceited. Similarly, very short latencies for either certainty or compliance may be negatively perceived as an overeagerness depending on one's relationship to the respondent. These two examples highlight the necessity for more naturalistic studies that would allow such factors to be investigated for their relative impact on person perception.

NOTE

1. The goal of this manipulation was to determine whether perceptual ratings correspond to those latencies produced in both the positive and negative impression conditions of Experiment 1. To include these latter values, the relationship between the optimal value and the negative impression latencies (including the long latency in the honesty condition from the split-mean analysis) was determined for each monologue instance articulated by a given speaker. In all cases, this relationship was found to be a ratio ranging from 4 to 6 times longer than the optimal value. Hence, the 1:6 and 1:4 ratios constituted two levels of the latency manipulation and, to obtain the remaining levels, the ratio relationships were extrapolated to include 2:1, 1:2, 4:1, and 6:1 as well. This procedure was the only way to ensure that the range of shorter and longer latencies were all related to the optimal value in a lawful fashion and in a way that could be applied to all speech acts in a comparable fashion. Recall that the honesty condition of Experiment 1 yielded both shorter and longer values than the optimal one to convey negative impressions. For all instances, the shorter latency was approximately 2 times shorter than the optimal one.

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