

# Action and Reaction: Computer-Mediated Dialogues As a Model for Natural Interfaces

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## Abstract

*We describe a study which examined the relationship between certain textual/discursive cues during computer-mediated dialogues and correlations of these cues with two measures of impression formation: 1. A Global Positivity of Impressions questionnaire, and 2. Perceptions of six personality dimensions. This study also examined discourse phenomena emergent in the conversations. Undergraduate participants in same and mixed-sex dyadic, forced turn, computer-mediated dialogues and were asked to report impression of their conversational partners. Results indicated that relative amounts of words-per-turn, negative disclosure, and evaluative disclosure have significant effects on impression formation. Results also suggest that number of words-per-turn, number of questions and evaluative disclosure are emergent in the discourse, and naturally equalize between partners. No gender differences were detected. These findings suggest a new methodology for examining online interaction and concomitant impression formation. Suggestions are made for how this new methodology might be incorporated into autonomous conversational systems.*

## 1. Introduction and Background

Computer-mediated communication (CMC) is a relatively recent phenomenon in the evolution of human discourse. It is a largely untapped and potentially rich source of investigation for psychology, anthropology, sociology and other humanistic disciplines, and is also of great interest to researchers who seek to understand the dynamics of human interactions. Computer technology is beginning to represent an increasingly large force in both the interpersonal and business spheres, and it is well-advised for those studying human interaction to investigate how it differs from, as well as provides insight into more traditional modes of exchange. For social psychologists, the medium raises several pertinent and fascinating questions.

## 1.1 Social Psychology and CMC

There has been relatively little work exploring the social psychological phenomena of CMC. Much of the work has explained the nature of different types of interactive media, attempting to relate CMC to other types of communication (i.e. telephone, letter writing, or videoconferencing). Short, et al [13] defined *Social Presence* as the level of joint involvement of the participants in communicative interaction, where each interactant perceives the other (or others) as being more or less "present". For example, a face-to-face (FtF) interaction will be high in social presence, due to the fact that it includes verbal and all available nonverbal channels. Computer-mediated communication is thought to be relatively low in social presence, and messages communicated through this medium are presumed to be more impersonal in nature. According to theory, the amount of attention paid to others' presence (as opposed to the attention paid to one's own actions and reactions) depends upon the number of communicative channels available. Additionally, as social presence declines, messages are perceived to become more impersonal.

Media richness theory [16] describes interactive media in a similar fashion, placing the different types along a "Richness Continuum". Communication options are therefore hypothesized to contain more or less "richness" according to their placement along the continuum. CMC, according to this theory, lies somewhere between formal letters (such as thank-you notes or invitations) and types of interactive media that include one or more nonverbal channels.

Sproull & Kiesler [14] suggest that the critical difference between CMC and FtF is the absence of "social context cues". This absence creates four distinguishing features of CMC as compared to FtF communication [11]:

### 1. Absence of Regulating Feedback

During ordinary conversation, nonverbal cues such as nods, smiles, tone of voice and eye contact are employed by conversants in order to provide information to the speaker regarding the reception of his or her message. For example, a listener will typically convey the fact that he already has adequate knowledge of what the speaker is saying through body language such as nodding and smiling. CMC is proposed to be inefficient at communicating such cues; in this case, the listener would have to explicitly state that he or she had heard the speaker's message at a previous time.

### 2. Dramaturgical Weakness

Often, we attempt to influence others via deliberate use of nonverbal signals. These include the same behaviors employed to provide regulating feedback, such as winking or smiling to encourage a speaker to continue, but also include feedback not consciously intended as regulatory such as the listener's spontaneous emotional response to the message, or the speaker's facial expression/voice tone. This aspect of communication is weakened by the lack of nonverbal cues in CMC, and is theorized to have led to the development of "emoticons", the stylized use of punctuation symbols to denote facial expressions (i.e. ":)") to denote a smiling face and ":(" to denote a frown).

### 3. Few Status and Position Cues

The software used in CMC is blind with respect to vertical hierarchies in social relationships and organizations. Normally, one would look for clues to status in clothing, gaze or posture. CMC has the effect of equalizing individuals of differing status and even conversants who are aware of the status of one another may interact on a more equal level in the absence of obvious cues.

### 4. Social Anonymity

Individualizing features, unless they are communicated verbally, tend to disappear. For example, an individual who smiles a lot may be interpreted as having a friendly personality. This inference will not occur in CMC unless the same individual types a smiling emoticon, or the words, "I am smiling". Kiesler, et al [11] also hypothesize that this anonymity may lead to an increase in uninhibited verbal behavior during CMC as compared to FtF.

One of the areas in which CMC can inform our understanding of social psychological phenomena is impression formation. Researchers have long studied the ways in which people form impressions of one another, both during face-to-face encounters and through reading descriptive material. The study of impression formation through CMC can be viewed as an amalgamation of the two. In FtF conversation, partners develop initial impressions primarily based on information provided by appearance (including facial characteristics and gait), voice quality and behavior

[21]. In the case of CMC many researchers ascribe to "cues-filtered-out" theories, which point out that such information is neither apparent nor available, and its lack contributes to a socially impoverished environment [17]. Janney [9] points out that the ASCII code itself is only capable of low (small letters) and high (capital letters) emotive intent, and that it provides "very limited ways of suggesting variations in voice quality, intonation, stress, speech rhythm, speech rate...and there are no replacements for the various facial expressions, gazes postures, gestures and so forth that help us interpret the emotive significance of utterances in everyday speech."

However, the cues-filtered-out theories neglect the possibility that linguistically borne cues are highly capable of conveying personality and attitude characteristics. While the absence of nonverbal cues should dampen impression development, language cues may compensate [18]. To this end, researchers have investigated the effects on perceived competence, character, socioeconomic status, anxiety, similarity, and affect impressions resulting from variations in language intensity, verbal immediacy, and lexical diversity. By extension, the formation of initial impressions through these and other cues in CMC seems likely when users provide a sufficient number of message exchanges.

Walther's [17] social information processing approach suggests that the mechanisms of impression formation which are employed during CMC and FtF communication may be similar, but that they will operate at different rates. While in FtF communication, nonverbal cues are used to develop initial impressions, textual cues will substitute during CMC, and thus impressions will develop more slowly. His results showed that CMC may take interactants longer, but eventually enables them to form the same strength of impressions as FtF interactants. Additionally, verbal indicators have been shown to replace nonverbal expressions during CMC, although not at quite the same level of accuracy. Janney [9] also suggests that the broadly experienced phenomenon of "e-mail intimacy", may owe part of its existence to the fact that online interactants compensate for the lack of context cues by "trying harder". We suggest this behavior may further amplify the effect of verbal cues in CMC.

Thus, if we assume that textual cues will substitute for nonverbal cues in impression formation during CMC, it becomes possible to apply data gathered from CMC transcripts to existing impression formation theories in order to gain insight into some of their basic mechanisms.

What are the types of cues that exist in CMC? First of all, there are the same types of variables commonly employed by linguists in content analysis of transcribed conversation (i.e. the semantic and discursive cues imbedded in the text: deictic expressions, politeness

behavior, reference). Additionally, it is possible to quantify non-content text variables, such as length or relative amount of utterances. Then there are cues unique to online communication such as the deliberate use of punctuation symbols, ellipses and capital letters to convey specific information. These devices have developed out of an apparent need in this mode of communication to convey affect through the manipulation of common grammatical symbols. By examining this type of data we can begin to explore how CMC might inform our understanding of impression formation theory.

## 1.2 Discourse and Personality Characteristics

As well as considering the "textual persona", it is crucial to understand linguistic and semantic contributions to impression formation. Some evidence exists which links particular linguistic behavior to social psychological phenomena. Although encompassing a paucity of data, this evidence does suggest a relationship between individual manipulation of discourse variables and personality dimensions. As a rule few personality theorists attempt to provide a link between individual differences in personality and use of language. We suggest that certain personality variables lend themselves to analysis in terms of linguistics more than others; in particular, the dimensions most related to social interaction dynamics.

Of the existing measures of personality, the most extensively studied with regard to linguistics has been introversion vs. extroversion. Furnham [4] describes an experiment by Thorne [15], in which introverts and extroverts participated in mixed and matched dyads, and through analysis of focused problem talk and topic variation was able to extract several linguistic variables as predictive of classification on this continuum. Introverts were found to use relatively more nouns, adjectives, and prepositions; spoke at a slower rate, and exhibited relatively fewer dysfluencies in use of paralinguistic behavior. Extroverts, on the other hand used more verbs, adverbs and pronouns, spoke more quickly, and exhibited more disfluency in paralinguistic behavior. Such differences were invariant over numerous instances of differing conversational content and style.

Wojtkowski [20] examined introverts and extroverts in monologic situations, and analyzed the transcripts for characteristic syntactic expressional styles. He found that introverts used more intransitive verbs, 'it' subjects (It was John who killed him) affected subject, (The door opened), and passive voice. Extroverts were found to be more talkative and to use more object complements. The speech of extroverts also tends to contain fewer unfilled pauses (suggesting more use of backchannels).

Another area of study has focused on the relationship of linguistic behavior to psychopathology. Jenneau and Armelius [10] examined word choices in subjects diagnosed as neurotic, borderline or psychotic personality style. They hypothesized that there are typical linguistic patterns, or fingerprints, for different levels of personality organization. They found that relatively frequent use of the following features predicted neurotic (or most healthy) classification: conjunctions, relative adverb and pronouns, "adverbs of time and space" (now, here, then; i.e. time deictics), personal possessive and reflexive pronouns (I, me, mine, myself) as a sign of identity integration, and adjectives, nouns and verbs with positive meanings. Findings showed that individuals with identity disturbances tended to refer more often to objects or positions outside themselves, while healthier subjects referred more often to themselves in the appropriate time and place, and used more deictic expressions.

## 1.3 Discourse and Impression Formation

As well as correlating linguistic variables with such stable characteristics as personality traits and psychopathology, researchers have attempted to demonstrate the relationship between linguistic behavior and impression formation. There is a stereotypical perception of male and female speech: female-register behaviors include more politeness, nonverbal expressivity and verbosity, while males evidence more use of status-marked language strategies and vocal loudness. Bradac [1] also remarks on the similarities between impressions of powerlessness and female-stereotypes.

These examples demonstrate that analysis of verbal behavior at the level of linguistic variables can provide evidence that discursive "style" has a role in expressing personal characteristics of the speaker and aids the hearer in forming an impression of the speaker. Additionally, specific discourse entities are particularly suited for aiding the conversational pair in deriving information about one another.

Holtgraves [7] suggests that Brown and Levinson's theory of face threatening [2] should hold true for any verbal act with interpersonal implications. Most research in this area has focused on face management in the context of request behavior. Holtgraves defines several other areas that might be examined in terms of how linguistic behaviors may affect person perception, including the phenomenon of self-disclosure.

## 1.4 Self-Disclosure

Self-disclosure is defined as "the verbal communication of personal information about oneself" [3]. The disclosure of information usually restricted to

oneself may involve face management: in disclosing negative information, speakers threaten their own positive face. The listener, in turn, may have his negative face threatened by being placed in the position of helping to manage the speaker's now tarnished identity (usually by means of reciprocal disclosure, which threatens hearer's own positive face). Disclosure reciprocity is a well-documented event. Additionally, a disclosure may be "managed" (similarly to politeness strategies) by disclosing indirectly (e.g. "I thought that was difficult exam", as opposed to "I did badly on that exam"), by coupling positive to negative information, or by including affective information such as laughter or a "cheerful tone" of voice. Negative self-disclosures may also activate positive face concerns. Holtgraves [7] suggests that power, distance and imposition variables will act additively in the domain of self-disclosure (similarly to request behaviors) to predict the weightiness of a face-threatening act.

Thus, we define self-disclosure as a speech act mediated by politeness theory. How do listeners then form impressions of speakers with regard to their disclosure behaviors? Chelune [3] viewed disclosure as a multidimensional concept within the context of conversation, and outlined several basic dimensions of self-disclosing behaviors. These include the relative amount of disclosure, level of intimacy, duration, and affective manner of presentation. Any of these variables could affect impressions. By using an "offset the record" strategy [3], one can disclose pride, for example, by stating "I won the tennis match!" instead of "I am proud of myself!". As another example, disclosure intimacy within a turn can be distinguished by the use of descriptive (the revealing of facts about oneself) vs. evaluative (the disclosure of an internal state such as an emotion, opinion, etc.) terminology.

Several other means of classifying disclosure variables have been identified [3]. One is the timing of the disclosure: does it occur near the beginning or the end of the text? Additionally, the context of the disclosure may be important. On the dimension of intimacy, the same disclosure may be perceived more intimate if it occurs between strangers than between intimates, or during business than informal conversations. The *precontext* of the disclosure may be a salient variable as well. One precontext includes an obligation to disclose --- a direct elicitation of disclosure in the form of a request. Alternatively, the disclosure may be textually motivated; the development of a conversation makes the disclosure relevant. In this view, disclosure is an emergent phenomenon in the discourse rather than a function of individual tendency or personality. Thirdly, a disclosure can be "discloser-determined", or having no precontext, as is the case when a disclosure is made "out of the blue". This may be mediated by valence information: positive

disclosures have been shown to increase positive impressions when motivated by requests or when textually determined, but not when "out of the blue".

Our experiment derives from such impression formation theories, and assumes that the impressions formed from a computer-mediated conversation will be based on the ensemble of textual characteristics in an individual's on-line persona.

## 1.5 Types of CMC

Before describing the experiment further, it is useful at this point to review the several different types of CMC currently available and being utilized by individuals possessing the appropriate technology.

### 1. *Email*

Email consists of single messages composed by the sender and sent, via computer, to one or more recipients. It is the electronic equivalent of a letter. Email is asynchronous (meaning that individuals compose and read messages in a time-lapsed fashion) and is the most widely used of the CMC technologies currently available.

### 2. *Bulletin Boards*

Bulletin boards are used mainly by institutions and organizations and also comprise the technology utilized in the widely popular USENET newsgroups. The fundamental unit of a bulletin board is the "posting". Anyone with access to the network housing a bulletin board can send out a specific signed, electronic message to the board. At the receiving end, individuals with access may read, respond to, and/or ignore any of the messages "posted" by anyone else. Bulletin board systems are also asynchronous.

### 3. *Computer Conferencing, "Chat Rooms" and IRC*

Computer conferencing allows two or more users to communicate in real time. Most UNIX systems have a "talk" feature that enables conversants to send instantaneous messages to one another through the use of a split-screen. Both members of the conversation simultaneously read and send messages, and all messages are viewed as they are composed (errors are visible). Chat rooms and IRC (Internet Relay Chat) are multi-user, synchronous communication programs that allow any number of users to log onto a central computer (or server) at one time in order to engage in online discussion. This type of communication is often used as a way for geographically distant colleagues to engage in informal discussion. It is also used for recreational purposes.

### 4. *MUDs and MOOs*

MUDs (Multi-User Dimensions), and their counterparts, MOOs (MUDs, Object-Oriented) are a form of CMC which allows users not only to communicate in real time, but to create permanent virtual spaces and objects through the use of

programming language. These fora are primarily recreational, and are the least widely used by the general population.

Based on the preceding discussion, the experiment assumed four principles:

- People will naturally form impressions of others when engaged in CMC.
- These impressions will be based solely on verbal discourse.
- These cues are quantifiable through textual analysis.
- They can therefore inform our basic understanding of impression theory, because confounding extra-verbal information is nonexistent

Our experiment examined impression formation in a synchronic conferencing domain involving computer-mediated dialogues between dyads. Overall perceptions of favorable/unfavorable impressions, as well as impressions of six personality dimensions were examined with respect to online behavior. The reciprocity of specific behaviors was also examined in order to address this methodology's possible contribution to the development of autonomous conversation systems. Finally, gender differences in online behavior were examined.

## 1.6 Hypotheses

### 1. Textual Cues Hypotheses

In order to predict which cues might be salient in CMC, the existing literature on verbal and nonverbal communication was examined. We hypothesized that known verbal and nonverbal correlates of likeability would have analogs in CMC.

#### *Positivity of Impressions*

Previous research [12], [19] shows a closer interpersonal distance, a direct gaze and body orientation, equal distribution of "floortime", the use of informal language, and greater involvement to correlate with likeability. In CMC, this was hypothesized to predict that equal division of utterances, the use of informal text, and larger numbers of questions would analogously correlate with likeability.

#### *Personality Dimensions*

It was hypothesized that the positive axes of the personality dimensions would be predicted in similar ways as likeability ratings, and that larger word counts and greater numbers of questions would predict the dimensions of Extroversion and Openness.

### 2. Discourse Cues Hypotheses

Our experiment examined three disclosure variables and their correlations with several impression formation measures in the domain of computer

mediated communication. By conducting the study in a domain impoverished in nonverbal discourse phenomena, more of the variance may be attributed to verbal discourse variables, such as disclosure behavior. Variables and hypotheses were as follows:

#### *Total Amount of Disclosure*

It was hypothesized that individuals with a higher total amount of disclosure will be perceived as more open and extroverted than individuals with lower amounts of disclosure. Effects on perceived positivity or negativity of impressions were not predicted; it was hypothesized that this variable as a whole is too complex to be able to predict impression valences discretely.

#### *Amount of Negative Disclosure*

It was hypothesized that the amount of negative disclosure, expected to activate threats to positive face of the "speaker", would predict negative impressions.

#### *Amount of Evaluative Disclosure*

It was hypothesized that the amount of evaluative disclosure would have a mixed effect on impression formation, with greater relative amounts of evaluative disclosure predicting openness and extroversion.

It was further predicted that the way in which combinations of textual and discursive cues predict impressions might elucidate the predictive power of the basic impression formation theories described above in CMC.

Lastly, we predicted that relative levels of the previously described variables would vary as a function of the co-created intimacy levels during the conversation, and this "emergent" behavior would shed light on the nature of online human-human interaction. Although others [5], [9] have chosen to study e-mail as the primary data set, we elected to examine real-time interaction, as we believed it most closely approximated an analog to face-to-face interaction.

## 2 Method

### 2.1 Subjects

Twenty-five female and fifteen male undergraduate Introductory Psychology students received class credit for their participation in this experiment. They were recruited through an announcement in an introductory psychology class and through sign-up sheets in the Psychology building. They were told that the experiment would last for one hour and that they would receive one credit for their participation. Two subjects were eventually disqualified for discovering one another's identities, and two data sets were discarded due to equipment failure during the experimental session.

No ethical problems with subjects were anticipated, and methods were reviewed and approved by the IRB for protection of human subjects.

All subjects were asked to sign an informed consent form.

## 2.2 Materials

### *Equipment*

Subjects participating in computer-mediated conversations were situated at monochrome VAX terminals connected to the Brandeis BINAH node. Terminals were logged remotely to the MediaMOO program at the MIT Media Laboratory, and were given instructions for communicating in this domain.

### *Questionnaires*

Two questionnaires assessing impressions were administered to subjects upon completion of the conversation. These included

#### a. Global Positivity of Impressions

A seven-item questionnaire which inventoried subjects' impressions of their partner on several dimensions (including friendliness, intelligence and wisdom). Six of the items were answered on a Likert scale, ranging from 1 (most negative) to 7 (most positive). The seventh item was a free-form response, and was not included in the composite score for this measure. Scale items had a reliability rating of .60

#### b. Impressions of Personality Dimensions

A 30-item questionnaire, which measured six personality dimensions (Agency, Agreeableness, Extroversion, Conscientiousness, Openness to Experience, and Neuroticism), was adapted from the MIDAS Midlife Inventory developed by the MacArthur Foundation. This scale was originally used as a self-report measure of subjects' own personality dimensions, but for the purposes of this experiment, it was used to assess impressions of subjects' partner. The self-report information was collected, but not used in the scope of this experiment.

## 2.3: Procedure

### *Experimental Procedure*

Subjects were asked to sign up for designated time slots, and to show up at the specified location. They were specifically instructed not to sign up with other students with whom they had preexisting social relationships. Pairs consisted of both mixed and same-sex dyads. Upon arrival at the experimental room, subjects were seated at a terminal, given a consent form and instructions, and asked to engage in a forced-turn conversation about "Social Life at Brandeis" (i.e. subject 1 was asked to send a message, and then wait for subject 2 to respond before sending another

message). After 40 minutes, the conversation was terminated, subjects were asked to fill out the two impression measures, and were debriefed

### Sample Transcript

A: yep, the social life, hmmm<sup>a</sup>, this is something that I could go on and on about for hours. I think that things here are weird... I can't really put my finger on it but it seems as though something is missing to me - socially that is.<sup>b</sup> It wonder if you think that besides the religious events, the campus lacks fun, spirit, and easy accessibility to the same?

B: This is the sort of campus where I guess you basically hang out with your own group of friends and do your own thing, know what I mean? By the way, what year are you?

A: I am a frosh.<sup>c</sup> I am engaged in the transfer process because I don't love it here.<sup>d</sup>

B: Oh, really, that's too bad. You know, I wonder if I know you... Referring back to the social life, it's not too lively here but at the same time I like it here.

<sup>a</sup>Textual Manipulation

<sup>b</sup>Evaluative Disclosure

<sup>c</sup>Non-Evaluative Disclosure

<sup>d</sup>Negative Disclosure

### *Coding Procedure*

Each subject's set of utterances was treated as data for that subject.

#### 1. Words per Turn (measure of turn length)

The total number of words uttered was calculated for each participant using the "Word Count" feature in Microsoft Word, and divided by the number of turns to arrive at Words per Turn.

All other variables were counted by hand. Each participant's total utterances were initially coded into "Statement Units", which consisted of portions of text bounded on either end by any of the following punctuation symbols: (., !, ?, (), ..., or combinations of such symbols). The purpose of this was to control for differences in amount of text per conversation by creating ratio scores. After this initial quantification, the units themselves were coded sequentially for textual and discourse variables.

#### 2. Frequency of Questions

Statement units were coded as question-inclusive or non-inclusive based on whether they contained a question mark or wording which suggested the utterance was intended as a question. The number of question-including units was divided by the number of statement units to arrive at a percentage score.

#### 3. Frequency of Textual Manipulation

Statement units were coded as textual manipulation-inclusive or not based on whether they contained unusual punctuation or grammatical manipulation. The number of manipulation-including units was then

divided by the number of statement units to arrive at a percentage score.

#### 4. Frequency of Self-Disclosure

Statement units were coded as disclosure or non-disclosure based on whether they contained any of the following personal or possessive pronouns: (I, me, my, we, our, mine, ours), as well as contractions which contained any of these words: (I'm, I'll, I've, we're, we'll, we've). After all statement units had been coded, the number of disclosive statements was divided by the number of statement units to arrive at a percentage score.

#### 5. Relative Frequency of Evaluative Self-Disclosure

Each statement unit which had been coded as self-disclosing was then coded again as evaluative or non-evaluative. This coding was more subjective; the coders were instructed to rate statements as evaluative if they contained opinions, feelings, or affective information. Disclosures which contained only descriptive information were coded as non-evaluative. For example, the statement, "I took an exam this morning", would be coded as a non-evaluative self-disclosure, while the statement "I did really badly on that exam this morning", would be coded as an evaluative self-disclosure. The rules for coding included any disclosures containing verbs of state (feel, think, hope, wish, wonder, guess, agree, love/hate, enjoy, etc., and their past and future tense counterparts), as well as any qualifying adjectives which added affective information to nouns contained in the disclosure (consider above "badly"). An evaluative disclosure percentage score was computed by dividing the number of evaluative disclosures by the total number of disclosive statement units.

#### 3. Relative Frequency of Negative Self-Disclosure

Each statement unit which had been coded as self-disclosing was coded again, in a binary fashion, as negative or non-negative (not necessarily positive). This coding was the most subjective of the three. The coders were instructed to label a disclosure as negative if it contained anything which might threaten the positive face of the speaker, most specifically complaints about the world or negative revelations about the speaker's life. Examples of negative disclosures include: "I don't like my roommate", and "I've found it somewhat difficult to make friends here". Coders were instructed to make their decisions qualitatively, and to code the disclosure as negative if it contained any examples of negativity, complaints or expressions of negative affect. Quantitatively, coders were instructed to look for words of negation (no, not, don't, can't, etc.) that were coupled to verbs (don't like, can't go), as well as words which contain negative affect or tone (hate, dislike, awful, bad, etc.). Additionally, if the speaker apologized (the word "sorry" or "apologize" occurred) the disclosure was coded as negative. A

negative disclosure ratio score was computed by dividing the number of negative disclosures by the total number of disclosive statement units.

All seven transcript variables were assessed for reliability of independent coders rating 10-20% of the same transcripts.

### 3. Results

All of the variables were found to have interrater agreement of >90%, with the exception of the Evaluative Disclosure variable, which had 75% agreement.

#### 3.1. Significant Correlations

*Correlations between Subject and Partner Textual Variables*

Words per Turn (Subject) / Words per Turn (Partner),  
 $r = .64, p = .003$

*Correlations between Discourse Variables and Perceived Personality Measures*

Negative Disclosure/Perceived Neuroticism,  
 $r = .38, p < .05$

Negative Disclosure/Perceived Conscientiousness,  
 $r = .38, p < .01$

Evaluative Disclosure/Perceived Openness,  
 $r = .35, p < .05$

*Intercorrelations between Discourse Variables*

Negative Disclosure/Evaluative Disclosure,  
 $r = .66, p < .01$

*Correlations between Subject and Partner Discourse Variables*

Evaluative Disclosure (Subject) / Evaluative Disclosure (Partner),  
 $r = .59, p < .01$

#### 3.2. Comparison of Means Tests

*Gender Comparisons*

No significant differences were found.

*Detailed Analysis of Amount of Questions*

A post hoc t-test was performed to assess differential questioning behavior between the first and second halves of the conversation for all subjects. It was determined that the amount of questions asked by subjects in the first half of the conversation was significantly greater than in the second half:  $t(37) = 5.06, p < .001$

### 4. Discussion

Overall, results seem to suggest that the methodology may be viable for analyzing and predicting impressions, but that more work needs to be

done to refine procedures. We agree with Harnad [5], that text capturing is one of the most powerful capabilities of online technology, and that experimental analysis of such data sets should be explored widely by others in the field.

A majority of our initial hypotheses for this experiment did not reach significance level. However, the few that did were in the predicted directions, which in itself is encouraging. Additionally, results showed several interesting significant findings, which give us information about emergent phenomena in the computer-mediated-situation itself.

#### 4.1 Statistical Analyses

Unfortunately, none of the textual variables (Words-per-Turn, Textual Manipulation, Questions) predicted impressions, although these variables were examined in a number of ways. A closer examination of the Words-per-Turn variable showed that it was an important variable for emergent behavior in the discourse. Subjects' Words-per-Turn was highly significantly correlated with Partners' Words-per-Turn. Descriptive statistics tell us that this variable is distributed normally, so this significance cannot be attributed to dyads all producing similar turn lengths. Rather, it should be interpreted as evidence that partners tend to equalize turn length during the discourse.

Anecdotally, it can be observed just by reading over the transcripts that as one member of the pair sends a longer or shorter message than the previous pattern, his or her partner often responds with a similar turn length. Perhaps this is a form of social politeness. Future projects might examine whether this phenomenon also occurs in spoken dialogue, or whether it is exclusive to CMC, and driven by the participants viewing the number of words which scroll across the screen.

The Question variable was recoded after the initial analyses in order to explore a post-hoc hypothesis that questioning behavior dwindled as the conversation progressed. This hypothesis was supported by the data, suggesting a natural increase of offered information, as opposed to active solicitation of information from the partner. This result is presumed to be valid only for conversational partners unknown to one another at the onset of conversation. Additionally, it should only be applied to the CMC domain; more research must be done to assess whether this phenomenon is stable across bandwidth. Further coding and analysis of the current data set might also elucidate whether the frequency of other types of utterances increase with conversation length as questioning behavior diminishes.

Several interesting correlations were found between discourse variables and perceived impressions. That no significant correlations existed between Total Amount

of Disclosure and any of the personality variables was not surprising in such a case as predicted in their original hypotheses. Total Disclosure may have a more complex relationship with impression formation, one which can be extracted only by more detailed statistical analysis encompassing different variables. This is material for future research.

The one significant correlation between Evaluative Disclosure and personality impressions was with Openness to Experience. This makes logical sense; that those individuals who tell more about their qualitative experience will be judged as being more open to it. Surprisingly, this variable was not at all related to Extroversion, as was predicted. The small sample size may have contributed to this lack of significant results.

Even though the majority of correlations between Negative Disclosure and personality impressions were not significant, it is of interest that all of these correlations, with the exception of the one negative trait (Neuroticism) were negatively correlated. This suggests that the hypothesis was in the correct direction -- more negative disclosure leads to poorer overall impressions. The one significant correlation in this direction was with Conscientiousness; a possible interpretation is that individuals who disclose less negative information pay more attention (are more conscientious, or monitoring) of their face concerns. The directionality of this variable is further supported by the result that impressions of Neuroticism were highly correlated with negative impressions. Again, a larger sample size might well allow other correlations to reach significance.

One of the most interesting findings was that partners' level of Evaluative Disclosure was highly significantly correlated. Holtgraves [8] suggested that self-disclosing behavior may not be related to personality or conversational style at all, and may in fact be emergent in the discourse. The current experiment, by quantifying this variable, provides empirical evidence for this theory. It further suggests that the emergence may be qualified by the *type* of disclosure. While partners' total amounts of disclosure were not correlated, amounts of evaluative material were. Perhaps this means that partners somehow strive to keep the level of intimacy during the conversation at a constant.

#### B. Implications for Automated Systems

One speaker's utterances were coded, using the criteria given above, "as if" the experimenter was a natural language parser and only had access to word and punctuation recognition. The results were as follows: Statement units = 100% agreement (with human coders); Total amount of disclosure = 81% agreement; Evaluative Disclosure = 89% agreement. These results are encouraging. With more rigorous research, this

methodology would shed light on approaches to creating natural dialogue interfaces.

There are several possible applications for this technology. One would be to aid researchers in the understanding of communication in this area. This type of coding is time consuming and tedious. A program that could do the work automatically and with sufficient accuracy, would catalyze this kind of research dramatically. Additionally, this kind of technology could help systems to understand better the "textual persona" of the user. A more sophisticated version of such a program encompassing several other discourse phenomena researched in a similar fashion, could process a user's email or interactive session and inform the user how the average listener would perceive him or her. Similarly, by reacting to and modeling the key aspects of a user's verbal behavior, computer-learning environments could more closely approximate the quality of human-human interaction, and provide a cognitively richer experience.

Researchers attempting to build conversational agents which more closely resemble human speaking partners should be aware of the wealth of information extractable from the naturalistic observation of mediated verbal interaction. It is suggested that an important feature to build into such systems is the ability to follow and mimic the behavior of the user. This study provides an encouraging beginning. More research should be conducted to discover other variables that affect the perception of such interfaces.

This is an exciting new area of social psychological research; investigators would be well advised to begin exploring the possibilities. Taken as a whole, this study suggests a new methodology, which could be refined and used as a means of quantifying previously unquantifiable data, and provides substantial insight into the verbal dimensions of impression formation.

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