

**COMMUNICATION OF EMOTION IN MEDIATED AND TECHNOLOGY-
MEDIATED CONTEXTS:
FACE-TO-FACE, TELEPHONE, AND INSTANT MESSAGING**

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ABSTRACT

This dissertation work considers communication between people. I look at coordinating dyads (couples in relationships) and people in working relationships to develop an understanding of how people engage in high-stakes, or emotional communication via various communicative media. The approach for this research is to observe and measure people's behavior during interaction and subsequent reporting of that behavior and associated internal experiences. Qualitative and quantitative methods are employed. Quantitative data are analyzed using a range of statistical analyses, including correlations matrices, ANOVAs, and multivariate statistics.

Two controlled laboratory experiments were conducted for this research. These experiments involved couples in relationships. Couples were brought into the lab and argued with each other across one of three technological media: face-to-face, telephone, and instant messaging (IM). In one set of couples' experiments, the couples argued for twenty minutes; in the subsequent couples' experiment, couples were encouraged to take as much time as they needed for their arguments. One of the main results from the first experiment is that couples did, indeed, argue when brought into a laboratory setting. One of the important findings for the second experiment is that time did not affect couples' tendency to reach closure during their arguments.

This research is a contribution in that it examines how people engage in highly emotional communication using various technological media. In a society with ever-increasing communication needs that require technology, it becomes necessary to study its communicative affordances. Understanding the context of highly emotional interactions between members of couples gives insight into how technology meets (or fails to meet) these communication needs.

To my family, and you, Aunt Barbara

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CHAPTER ONE

Introduction

People are using technology to communicate with each other more frequently and for more diverse purposes. For example, teenagers are communicating with each other using IM with growing frequency (Grinter and Palen, 2002), and many companies have found that employees benefit from text-based interactions as a result of introducing instant messaging systems into the workplace (Erickson and Kellogg, 2000; Isaacs, et al., 2000).

Not only do people communicate to convey information, but sociological, psycholinguistic, and interpersonal studies suggest that people have non-information related goals in moment to moment interaction (Clark, 1996; Kiesler, 1996). In particular, they often seek to convey emotion. Communication of emotion is especially important when the stakes are high—that is, when people in close, personal relationships actually care more about their communication. Do current communication technologies support a full range of communication activities and purposes, most notably the communication of emotion?

The current study starts with the belief that emotional and personal aspects of communication are important design factors. Moreover, I argue that these aspects of communication are not well-understood. This research investigates the effects of different technology design and use on the communication of emotion.

The high-level goals of my dissertation research are

- To understand the emotional processes that parties (couples) engage in while communicating via various technologies.
- To evaluate the impact(s), if any, of different communication media design and use on

the communication of high-stakes emotions. Specifically, this research seeks to understand how people manage these high-stakes communications within and across different technological media.

Problem Statement

Does it matter that current communication technologies do not support a full range of communication activities and purposes? This research seeks to offer a model of the communication of emotion that can be applied to the design of computer-mediated communication. A barrier to this kind of research is that situations that are highly emotional are difficult to find in the workplace environment. Thus, this research contributes to the body of communications and human-computer interaction research by providing an in-depth examination of couples' emotional interactions (when using various technologies) and identifying these processes in an empirical way.

Purpose Statement

The purpose of this research is to advance understanding of the communication of emotion across different media. Ultimately, this research seeks to develop an understanding of the communication of emotion that is specific enough to inform the design and use of socio-technical systems. "Social" improvements would include new strategies for technology use, while "technical" improvements would include specific features or utilities that increase users' mutual understanding and coordination that allow users to escape from unwanted coordination.

Research Question Development

To develop the research questions for this dissertation research, I begin by asking questions of the relevant literature. This examination demonstrates the shortcomings of prior work and gives rise

to the benefits of the current research. I began with the following questions:

1. *Do different media have different effects on communication?*
2. *How do people choose media?*
3. *What are users' needs?*

Exploring these questions provided a foundation for the research questions that this research addressed.

Do different media have different effects on communication?

Different theories suggest different answers to this question. However, some existing communication and mass media research (Reeves and Nass, 1996) suggests that 'media equal real life'. This suggests that peoples' interactions with media (computers, etc.,) are "fundamentally social and natural" and exactly like interactions in everyday life. Social information processing (SIP) (Walther, 1992) contends that during CMC, strangers glean as much social information about the other person as possible by adapting to language and behavioral messages that may otherwise be nonverbal. SIP also argues that people will adapt to the communication medium over time such that the exchange of social information will be just as powerful over CMC as in face-to-face exchange.

I proposed that different media *do* have different albeit subtle effects on communication. Specifically, peoples' communication behavior outcomes differ across different communicative technologies. Unfortunately, these differences may not show up clearly enough in situations in which people do not know each other well or in situations that are not important to them. Additionally, people have communicative needs that they seek to gratify through media use. What are these needs and how do people choose media based on these needs?

How do people choose media?

Uses and gratifications (U&G) theory, also called ‘needs and gratifications, is a sociological approach to the question of why user audiences choose certain media (Blumler and Katz, 1974; Reed, 2004). This research contends that since media have different uses, people choose a particular medium to fulfill a particular communicative need. Presumably, this implies that when people employ a non-optimal technology, specific needs will be frustrated. U&G researchers have not, however, offered use scenarios for situations when people are unable to choose media (i.e., when media use is restricted), nor does it prescribe any method for identifying peoples’ needs in specific situations (like high-stakes, for example). This leads to my next question.

What are peoples’ needs?

Media richness theory (MRT) is a communication theory suggesting that people select communication media in order to reduce what they do not know (uncertainty) and ambiguity and misunderstanding (equivocality) (Daft and Lengel, 1984; Daft and Lengel, 1986). In general, MRT theorizes which media are best suited for certain situations based on peoples’ needs to reduce uncertainty and equivocality. For example, a person might choose a communication channel as a way to regulate self. In social psychology, Social Identity/Deindividuation, SIDE, (Lea and Spears, 1991; Postmes et al., 2000) argues that a person within a group has a need to get information about the others in the group in order establish identify. When *personally* identifiable information is present, the person behaves in ways consistent with her own beliefs, norms, and standards. On the other hand, when *socially* identifiable information is present, the person becomes *deindividuated* and behaves in ways consistent with the beliefs, norms, and standards of the group.

Research in Interpersonal Theory/Psychology also examines users’ communicative needs.

Interpersonal Theory/Psychology (Horowitz, 2003; Shechtman and Horowitz, 2001; Stack

Sullivan, 1953) suggests that an individual's goals combined with another's action and vice versa, will predict communicative needs in the moment. As a matter of fact, a person's interpersonal goals will affect the course and outcome of the communication. Interpersonal theory is a theory of individual differences, so it focuses on how people are different from each other (Horowitz, 2004). For example, a person who has a goal of affiliation will be satisfied with an affiliative remark made by another, while a person who has a goal of privacy or isolation will find such a remark intrusive, and respond accordingly. Media will affect both the course and outcome of conflict. Specifically, a couple's need for interpersonal reassurance under conditions of conflict and disagreement will be greater than their need for similar reassurance when there is no conflict.

Finally, research in psycholinguistics has defined constraints imposed by certain media. Clark and Brennan (1991) outline media constraints (like visibility and reviewability) that characterize mediated communication. They argue that people seek to overcome these constraints so that their communicative needs are met.

Research Questions Identified

The literature gives a little information about (a) identifying some of peoples' needs and interpersonal goals and (b) some of the media constraints that users seek to overcome. The focus of this research is on couples who know each other intimately. To address how couples' needs play out during the course of high-emotion interactions, this research explores the following research questions (defined in terms of my high-level goals):

RQ1: What are the different social and personal outcomes of arguments over different media?

RQ2: How is argumentation affected by technology use?

RQ3: How do conflict and its attendant emotional expressions unfold differently across different technological conditions?

Significance

Research in affective computing, in terms of mediating intimacy, is still fairly new. Systems of note are *intimate objects* (Kaye and Goulding, 2004), technological devices that allow couples to maintain their intimacy when they are separated from each other, and *feather, scent, and shaker* (Strong and Gaver, 1996), is a system that, as its name suggests, describes three forms of affective communication using a feather, scented oil, and linked shaker objects. To some extent, these systems succeed in helping people share their emotions, particularly across distance. With these systems, however, couples are limited in what they communicate to each other; that is, they are unable to speak to each other. Communicating emotion matters to couples, and this research seeks to identify and measure the phenomena that accompany high-stakes communication across different technologies.

The significance of the current research is two-fold. This research seeks to develop a conceptual framework that describes issues and challenges of highly emotional communications using technology. This could lead to the development and evaluation of one or more systems that have properties indicated by the results of the current work. Specifically, the current research takes an interdisciplinary approach to examining conflictual communications, between parties who care about their communication and each other, across different communication technologies. If highly successful, this project will lead to new, interesting designs that help people communicate better in the modern world. If less successful, this project will at least raise public and research consciousness about the necessity of increased understanding of media use.

Research Design & Methodology

This research began by examining media use in situations of high stakes emotion. I explore the differences in how people use media in instances when it matters as opposed to the uses indicated in the literature. Using this mechanism, the behaviors that participants use to regulate and make

manifest their emotional states will be identified. Similar to a series of psycholinguistic experiments (Isaacs and Clark, 1987; Tatar, 1998; Wilkes-Gibbs and Clark, 1992), this research will tie global social, personal, and communicative outcomes together. Emphasis is on global outcome measures that include mood differences before and after communication, self- and inter-rater reports of whether couples achieved closure/resolution, judgments about how much couples “got into it”, and closeness measures (i.e., how close each partner felt to the other) between the partners. Specific discourse processing variables examined will include continuity and repetition of topic pursuit.

This research featured two experiments that varied in the stance they took towards the nature of time in the argument, and used a combination of theories to explain phenomena of high-stakes communication. This range allows for both quantitative and qualitative analyses. Qualitative analyses give us insight into user behavior, beyond the statistics (Rice, 1984). It is important that the methodology used in this dissertation research draw on several relevant models in order to accurately describe the phenomena that emerge in the data (Tracey and Glidden-Tracey, 1999). It is also important to note that I believe this research is exploratory in nature. To this end, this research is more concerned with determining the effect of various mediating technologies on high-stakes communication.

Guide To Reading This Document

This chapter presents an introduction to my dissertation research, including discussion of my research questions and the significance of this research. The remainder of this document is organized in the following way. Chapter 2 presents a discussion of relevant topics in my Literature Review, including social computing, CSCW, computer-mediated communication, and media uses and gratifications research. Chapter 3 present the research hypotheses posed by this research, along with a discussion of the research design and methodology used by this research.

Chapter 4 presents the results of the two experiments that conducting for this research. In Chapter 5, a summary of the research questions is presented, as well as discussion of the experimental results. Finally, Chapter 6 provides a discussion of conclusions and contributions of this research.

CHAPTER TWO

This chapter reviews prior research as it relates to the communication of emotion. It begins by surveying social computing systems and their impact on low-stakes communication across different media. Next, a discussion of smaller groups, dyads, in particular, is presented, along with a description of how they interact with each other and the goals they pursue during their interactions. The section that follows more closely examines peoples' interactions in terms of their discourse. The next section discusses media choice and how people decide which media suit their communicative needs. The next two sections discuss the different properties of technological media and the models used to describe communication across these media, respectively. The next section discusses conflict as a high-stakes emotion. This chapter concludes with a summary of the prior work.

Literature Review

Social Computing

Social computing is an area of research that largely addresses the non-cognitive goals of mediated communication by providing technological solutions that support the human-human interaction experience. It is concerned with designing systems that foster collaboration and communication among large groups of people (Erickson and Kellogg, 2000). It starts from the premise that people generally have a good idea of the social mechanics that govern their interactions, and the systems they use to work together should not conceal these aspects of their interaction. *Babble* (Erickson et al., 1999) is a prototype that uses textual and graphical representations to make “socially salient” data visible to users. Social information is made visible to users through persistent textual representations of conversations and a synchronous depiction of all users’

activities. These features tended to increase users' awareness of all conversations that had taken place in *Babble*, as well as increase their accountability since system access is shared by everyone. Although *Babble* is a simple implementation, it claims to make socially rich interactions possible through its use of graphical and textual representations. This system is an example of how collaborative systems can support work, camaraderie, and even trust in the workplace. However, it does not take into account collaboration within personal contexts, nor does it address the emotional implications of system use.

Computer-supported cooperative work (CSCW) is a field of research that studies the design and development of systems that support communities and societies of users. Some CSCW research argues that people tend to behave more like themselves when communicating using the telephone and IM than when they are face-to-face (Connell et al., 2001). Work by Connell et al., (2001) featured both strangers and employees (managers and subordinates) in the workplace, and they showed that people feel less inhibited when communicating over a less rich media. Specifically, they claim that people tend to behave more as they intended and people were more satisfied in phone and IM conditions than in the face-to-face condition. They argue that people's attempts to manage their behavior are influenced by the communication medium they use.

This idea is consistent with Daft and Lengel (1986) in that task performance is improved when the task needs are appropriately matched with a medium's ability to convey information, like immediacy of feedback and language variety. Specifically, the "moderate presence of others" permits people to be open and relaxed enough (but not too much) to use expressive cues to regulate their behavior. Their findings are not sufficient to imply that communication via telephone is necessarily better than face-to-face, but the results do imply that it is possible to attain a certain quality of presence using leaner media (like phone and IM) without the use of high-end media (like video and virtual reality systems).

In their examination of text-based communication, Brennan and Ohaeri (1999) found that although *hedging* (a provisional stance made toward an utterance a person has spoken) less often in electronic than in face-to-face conversations, people posed questions as often as they did in the face-to-face conversations. The participants in their experiments spent more time on the experiment task at hand and less time focusing on the overall social context or on being social (Brennan and Ohaeri, 1999). Brennan and Ohaeri also found that people using text media to communicate were less efficient at reaching consensus. This, they argue, could be due to the cost associated with typed responses over IM as opposed to spoken, face-to-face conversation. One implication for CSCW and CMC research is that people choose media that will help them reach consensus in their communication. The inefficiency of current mediating communication technology is due, in part, to the focus of the primary tasks that involve users. However, there is opportunity here to argue that focus on non-task oriented aspects of interaction, such as politeness, will move participants to the kind of interaction in which their needs are met. By expressly inviting each other to share in the interaction, more and better communication will occur and miscommunications can be minimized. This could help preserve the relationship.

Certain technology tends to be better media for communication, particularly for the purpose of business transactions. Greenspan et al., (2000) cite that among telephone, Internet, and *PhoneChannel* (a hybrid system that loosely couples the Internet, telephone, and PC/television), voice-based media are more effective than visual-based media for conveying trustworthiness. (In this study, participants were prospective homebuyers who selected potential homes from a realtor (stranger) using one of the communications media.) For conversations involving pairs, there was experimental evidence suggesting that voice relay (via telephone) supported reliance on each other and trust formation (emotion-oriented attributions) (Greenspan et al., 2000). Greenspan, et al., argue that emotional attunement and common ground complement each other, and that both affect successful collaboration in business-to-consumer relations. This research is a good

example of how trust and reliability can be affected by telephone use, but what other forms of technology, like IM? The current research seeks not only to understand how emotions can be affected by a larger range of communication media, but also the effects of the communication media on interacting couples.

Dyads and Interpersonal Theory

Interpersonal theory studies the behavioral, cognitive, and emotional processes occurring between people during interpersonal interactions (Horowitz, 2004; Shechtman and Horowitz, 2003). The interpersonal approach takes into account the individual, dyadic relationships, communication, and empathy (Horowitz, 2004). Dyadic relations involve paired behavior enactments, where each member represents a unique set of behaviors, such that the two sets occur in a contiguous time in relation to one another (Carson, 1969).

This point of view focuses on human transactions of behaviors involving and relating to systems of interacting people, not individuals (Kiesler, 1982). Interpersonal acts by individuals within dyads or groups of people are designed to draw, from respondents, feedback that will “confirm, reinforce, or validate” an individual’s presentation of self. Psychiatrist and social scientist Harry Stack Sullivan referred to this as the theorem of reciprocal emotion (1953). The idea is that interpersonal acts are attempts by individuals (within interactant systems) to fulfill their basic interpersonal needs (Kiesler, 1996). Thus, an individual shows enough emotion to another so that she is successful in meeting her needs during the interaction (Kiesler, 1996), and this, in turn, affects the outcome of communication. Different needs like the need for control and affiliation, for example, motivate human interpersonal interaction (Shechtman and Horowitz, 2003). This notion is important to the current research, because it implies that, during their arguments, couples will seek to fulfill their individual needs.

During face-to-face communication, individuals share face-to-face immediacy. That is, there is

very little physical and psychological distance between the individuals (O'Sullivan et al., 2004). However, immediacy also includes nonlinguistic and nonverbal behaviors like signaling the availability for communication and displayed movement and posture, respectively. Since many immediacy models explain the relationship between immediacy and learning (cognitive processing), the current research proposes to extend this idea in a way that shows that the structure of people's cognition is influenced in ways they do not recognize. O'Sullivan et al., (2004) define *mediated immediacy* as those cues in mediated channels that shape how close interactants feel toward one another (also called language of affiliation). The current research attempts to extend this notion to the general context of technologically mediated communication by understanding the kinds of human-human interactions that employ personality, social interactions, and psycholinguistics as a means of informing the design of better mediating systems.

Language and Discourse

When one person comes in contact with another, she seeks to either acquire information about the other person or use her existing knowledge about that person (Goffman, 1973). According to Goffman, when a person is in the presence of others, language expressions fall into two categories: the expressions given—verbal language—and the expressions given off—nonverbal language, such as facial expressions and gestures. Goffman describes a *dramaturgical* approach to interpersonal communication; nonverbal language that refers to interaction. Specifically, an individual puts on an “act” or plays a role in the presence of others. In this sense, there is an active projection of the current situation by the individual, and there is a more passive projection of the current situation by the listening participants. Both verbal and nonverbal descriptions of language are important components of communicative acts. That is, the meta-linguistic and paralinguistic (body language, eye contact, etc.,) acts are inherent components of language and communication. Moreover, Quek et al., (2002) cite the importance of gesticulation with speech

in supporting communication, with useful implications for human-machine interaction. For the current research, I argue that during high-stakes, highly emotional communication, the communication medium will dictate the extent to which individuals openly display their emotions via embodied behaviors.

Media Choice, Uses and Gratifications

Media richness theory (MRT), a theory of communication media preference, is based on the idea that people select communication media in order to reduce uncertainty (which describes absent or unknown information) and equivocality (ambiguity and misunderstanding) (Daft and Lengel, 1984; Daft and Lengel, 1986). Daft and Lengel (1986) incorporate equivocality and uncertainty perspectives on information processing in an effort to answer the question, “Why do organizations process information?” They answer this question by offering three strategies for organizational design. They first describe rich media (like face-to-face) as being the most effective for reducing equivocality. For example, face-to-face interaction allows managers to overcome various frames of reference (exhibited by body language, tone of voice, and physical cues) to process complex information. Similarly, less rich, or “lean” media (like memos or other impersonal documents) promote the reduction of uncertainty. That is, managers are able to process information that is already understood and well-defined. Figure 1 shows the relationship between equivocality and uncertainty.

EQUIVOCALITY	High	1. High Equivocality, Low Uncertainty Occasional ambiguous, unclear events, managers define questions, develop common grammar, gather opinions	2. High Equivocality, High Uncertainty Many ambiguous, unclear events, managers define questions, also seek answers, gather objective data and exchange opinions
	Low	3. Low Equivocality, Low Uncertainty Clear, well-defined situations, managers need few answers, gather routine objective data	4. Low Equivocality, High Uncertainty Many well-defined problems, managers ask many questions, seek explicit answers, gather new, quantitative data
		Low	High
		UNCERTAINTY	

Figure 1: Hypothesized Framework of Equivocality and Uncertainty on Information Requirements¹

Next, they present a hypothetical continuum of seven components that gives structure to organizations enabling them to manage both equivocality and uncertainty. These components—*group meetings*, *integrators* (a middle man, of sorts, to transmit data and help overcome disagreement), *direct contact*, *planning*, *special reports*, *formal information systems*, and *rules and regulations*—provide organizational design with the intent of providing information of appropriate richness in order to reduce equivocality and uncertainty. Finally, sources of organizational uncertainty and equivocality are described as technology, interdepartmental relations (organizational interdependence), and the external environment.

MRT was developed to describe the communicative process within organizations. However, MRT can be used to explain any process of communication over mediated channels. O’Sullivan (2000) builds on MRT by investigating users’ choices for certain communication channels (i.e., phone, answering machine, e-mail, and letters) as a means to regulate self– and partner–self

¹ Reprinted from *Management Science*, Vol. 32, Daft and Lengel, Organization Information Requirements, Media Richness and Structural Design, pg. 557, Copyright 1986, with permission from Richard L. Daft.

perceptions. There are some instances when users choose leaner communication channels in order to *increase* equivocality and preserve self-presentation. In fact, people willfully seek high equivocality and low efficiency when selecting communication media with the goal of suppressing or shaping their impressions of self (e.g., by minimizing or eliminating embarrassing disclosures).

An important question that remains is how do people choose which media to use? In general, MRT theorizes which media are best suited for certain situations (Daft and Lengel, 1986). MRT does not give insight into how people make their media choices. However, Blumler and Katz (1974) argue that through uses and gratification, *audiences* of users *actively* select media that will best fit their needs. Uses and gratifications theory (U&G), also called “needs and gratifications”, is a sociological approach to the question of why user audiences choose certain media (Blumler and Katz, 1974; Reed, 2004). Researchers contend that since media can have different uses, users choose among the different uses to fulfill a particular need. Other communication and mass media research (Reeves and Nash, 1996) suggests that interactions with media are essentially the same as real-life interactions. This would mean that peoples’ interactions with media (computers, televisions, music, etc.,) are basically social and natural and exactly like interactions in everyday life. This has been referred to as Social Responses to Communication Technologies (SRCT). Uses and gratifications theory argues that users actively choose their media (Downing, 1990). That is, once they make a selection for media use, for a particular reason, they continue to be active users of that medium for that particular reason. For example, people tend to use the web to gather information and they watch television for entertainment, and not vice versa (Ferguson and Perse, 2000).

Dimmick et al., (2000) explored the gratification niches of personal email and phone. They argue that for one [newer] medium (i.e., email) to replace another [older] medium (i.e., phone), two conditions have to be met: (1) the newer medium must satisfy the same needs as the older

medium (defined as *overlap*), and (2) the newer medium must be superior to the older medium (defined as *superiority*). The researchers compared the gratifications of email use with the phone. They found that the phone is superior for sociability gratifications such as expressing emotions and affection. Email, on the other hand, is generally superior in providing opportunities for gratifications (that is, opportunities to derive gratification by using email are amplified). However, they provided no evidence that either will replace the other as a preferable communication medium.

Media richness, media choice, and U&G are mentioned here because they are important perspectives in describing peoples' uses and choices for technology. Media richness, particularly the shortcomings of leaner media when it comes to forming and sustaining interpersonal relationships, has been disputed by researchers in computer-mediated communication (CMC). Furthermore, there are two problems of note with the needs and gratifications research. One is that it is too individualistic (Elliott 1974). Research is individualistic in the sense that it is often driven by particular audiences of users, so it is difficult to (1) make generalizations about media use beyond the people studied or (2) rationalize implications in modern society by choosing certain media. Additionally, a common understanding of central ideas is missing from U&G theory (Ruggiero, 2000). How exactly, do we define the *needs* of users? Additionally, what are the implications of users' behaviors, motives, and psychological backgrounds on the media they select? What seems to be missing from the needs and gratifications framework is a closer look at those interpersonal aspects of users that affect media choice. Newer media, such as IM and the Internet, place a much stronger emphasis on interpersonal communication than did earlier kinds of media, like television (Dicken-Garcia, 1998), so it is critical that research in technology-mediated communication focus on interpersonal concepts like personality and behavior. Additionally, it is not clear whether uses and gratifications theory addresses which media are optimal for interpersonal (high-stakes, emotional) communication.

An Approach to Understanding Properties of Communicative Media

Different communication media impose different constraints on communication. Daft and Lengel (1984, 1986) developed media richness theory (MRT) as a way to classify communication media according to its “richness”, or ability to process information within organizational settings. They use a media classification scheme that covers five categories (in increasing richness): numeric documents, impersonal written documents, personal documents (such as letters), telephone, and face-to-face. As the communication medium changes, so does the grounding required for the communication. Clark and Brennan (1991) outlined eight media constraints that tend to impose on two people’s communication, across media: *copresence*, *visibility*, *audibility*, *cotemporality*, *simultaneity*, *sequentiality*, *reviewability*, and *revisability*. Copresence means that the two people are sharing the same physical space, and visibility simply means the two people can see each other. When the two people can actually communicate with each other, audibility is not constrained. Cotemporality and simultaneity refer to two speakers’ ability to receive information at roughly the same time, and their ability to send and receive information at once and simultaneously, respectively. Sequentiality means that the two speakers’ utterances cannot get out of sequence, and reviewability refers to the ability to review the communication after it has ended. Some of these constraints exist for face-to-face communication (i.e., copresence, visibility, audibility, cotemporality), but not for electronically mediated communication (i.e., reviewability, revisability). There are also costs associated with achieving grounding when communicating over different media (Clark and Brennan, 1991). For example, typing an instant message to someone has a higher cost (for most) than does speaking to another person. Reading a written message is typically has a higher cost than simply listening to another.

Unlike Daft and Lengel (1984, 1986), Clark and Brennan (1991) do not rank order media, but they do identify costs. There are also costs relative to the delay of messages; in face-to-face interactions, the costs are higher, as ideas have to be expressed relatively quickly to avoid

breakdowns in communication. In comparison, email and IM exchanges give senders more time to carefully craft their thoughts before the receiver has the opportunity to read them. People often make tradeoffs during communication in order to reduce costs. Fundamentally, people operate using *principle of least collaborative effort* (Clark and Wilkes-Gibb, 1986). The principle of least collaborative effort states that in conversation, people will do *just enough work* to get them from the start of the conversation through the end. As a result, people often balance the costs associated with communicating with each.

Communication requires coordination. However, people cannot coordinate on the content of their communication without first establishing common ground (Clark and Brennan, 1991). Common ground is any sum of two people's joint knowledge, belief, and assumptions (Clark, 1996).

Grounding in communication is the process that aids common ground; it is a continual part of the communicative process that allows speakers to understand each other. In order for people to carry out the joint projects, they must coordinate a system of activities. According to Clark (1996), at each moment during conversation, there is an action ladder of language consisting of at least four levels—1, 2, 3, and 4—each of which consists of a joint action. The actions in each level conform to *upward causality*, *upward completion* and *downward completion*. Upward causality describes the relation between any two actions in the ladder as asymmetric, irreflexive, and transitive. That is, moving up the ladder of action levels causes the next level up the ladder to occur. Upward causality leads to *upward completion* (actions must be completed from the bottom of the ladder upward), which entails *downward evidence* (evidence that a current level is complete is also evidence that all levels below it are complete) (Clark, 1996).

At each level, both the interactants have action-specific roles: *speaker* and *addressee*. At level 1, the speaker executes some behavior for the addressee while the addressee attends to the speaker's behavior. At level 2, the speaker presents some signal to the addressee while the addressee identifies the speaker's signal. This pattern continues for levels 3 and 4. At the third level, the

speaker signals *that* the addressee does something, while the addressee recognizes that something which was signaled from the speaker. At the fourth level, the speaker proposes some joint project to the addressee, while the addressee considers the joint activity proposed by the speaker. In order for the speaker and addressee to be successful, both must coordinate their actions at each level of the ladder. What is important here is that each person has communicative goals that need to be coordinated with the other in the moment. Each set of actions, then, creates an expectation for the next contribution to the conversation.

Without proper coordination, even conversations with little emotional valence can suffer. Media constraints inherent in computer-mediated technology can be exacerbated during high-stakes communication. How do media constraints affect coordination? What happens when one person is contributing more effort in the conversation than the other? The current research anticipates these kinds of questions and seeks to understand the context of these challenges in communication.

Models Used for Describing Computer-Mediated Communication

Three major models have appeared that characterize people's communication via computer-mediated technology. The *cues-filtered-out* model (Culnan and Markus, 1987) argues that the lack of immediacy, synchronization, video and audio communication channels render interaction in email and IM more limited than face-to-face (f2f) interaction. Researchers also argue that people tend to resort to flaming and risky behavior when communicating via computer-mediated technology (Sproull and Kiesler, 1991). This point of view emphasizes the importance of immediacy in face-to-face interaction. The notion of immediacy includes the physical and psychological distance between the individuals (Tidwell and Walther, 2002; Walther et al., 1994). It also includes nonlinguistic and nonverbal behaviors like signaling the availability for communication and displayed movement and posture, respectively.

In contrast, the *Social Information Processing* (SIP) model (Walther, 1992) emphasizes the ways in which people give new meaning to those qualities that are present in mediated interaction (Walther and Burgoon, 1992), much the way a blind person is thought to make more and better use of sound than a sighted person. In this sense, users take advantage of any cues that they have in order to maximize their knowledge of other person. SIP theorists also hold that over time, the lack of both cues or the richness of the medium can be overcome and that the goals intended by the interaction (i.e., interpersonal development) become equal, regardless of the condition (Walther et al., 1994).

The third model, *SIDE*, Social Identity/Deindividuation model, (Lea and Spears, 1991; Postmes et al., 2000) emphasizes the ways in which media increase or decrease reliance on general categories such as social identity compared to particulars about the individual. SIDE theory, for the most part, describes an individual's behavior within a group. People tend to behave less like themselves and display characteristics that are dominated by the group.

All three of these models apply to mediated communication. They call out factors that are important, but do not predict how people will evaluate them as they go about satisfying local conversational goals. This is also true of the Clark and Brennan framework for ascribing different usage characteristics to media choice (Clark and Brennan, 1991). Clark and Brennan present concise constraints that are imposed by media on communication, such as copresence and cotemporality. However, the presence of these constraints does not predict the efforts people will go to circumvent problems, especially not in a real workplace.

The current research goes beyond using a single model to describe high-stakes communication across various technological conditions by (1) applying existing models when appropriate and (2) suggesting an alternative model, as the data suggests, based on experimental evidence, when existing models fail to adequately capture phenomena.

Conflict as High-Stakes Emotion

Conflict can be defined as a high-stakes, incompatibility of values and expectations between two or more parties regarding relational issues (Ting-Toomey, 1994). It is an inevitable component of social interaction and, in particular, of any kind of non-routinized work. Negotiation is an interpersonal, social interaction that involves two or more people to make decisions that are mutual to one another, or at least lead to a particular outcome (Ting-Toomey, 1994). In the laboratory, people have been asked to solve problems or agree on ratings or rankings within different media. Both the amount and kind of conflict has been shown to increase in computer-mediated communication (CMC) compared to face-to-face (f2f) under certain laboratory conditions (Hobman et al., 2002; Zornoza et al., 2002). However, the conflict created in these paradigms may be characterized as “low-stakes.” Furthermore, participants may take their cues about how hard they are to work on resolving differences from the kinds of tasks they are given and the media that they are offered.

Life is different in the workplace, both because people must live with consequences of their actions and because those interactions that rise to a level such that they are characterized as conflict may entail strong emotion. From one perspective, negotiations related to the resolution of workplace conflict are the complement of those related to the creation of workplace trust (Bos et al., 2002), and we might therefore expect to find similar outcomes, with participants showing a preference in conflict resolution for the rich media that are tied to superior trust creation and maintenance.

Participants in a real workplace conflict may not approach its resolution with much or any commitment to the outcome. They may not be sure that they want resolution at the required price, nor may they be committed to exposing aspects of the conflict necessary for resolution. They may seek to avoid or downplay the situation, avoiding interaction altogether, or avoiding it

in situations that threaten their regulation of the situation. This perspective suggests that parties in a conflict may avoid rich media. Aoki and Woodruff (2002) have even proposed to build system features based on conflict avoidance. However, the relationship between high and low stakes emotions and between laboratory and workplace studies remains to be seen.

Summary

The literature gives information about research found on identifying some of peoples' needs and interpersonal goals and the implications of the media constraints that users seek to overcome. Prior work has captured limited features of the communication of emotion. For example, some research has examined technology use by groups of people working together. However, this focus neglects any emotional aspects of interpersonal communication. Other work has focused on interpersonal theory and technology use. What is missing from this perspective, however, is how people in close relationships use the technology to communicate their emotions to each other.

The current research focuses on couples who knew each other intimately. It also addressed how couples' needs play out during the course of high-stakes (conflict-laden) interactions, by examining peoples' communication behavior outcomes differ between face-to-face, phone, and instant messaging (IM) conditions.

CHAPTER THREE

Research Question & Hypotheses

The research questions posed by this dissertation research are:

RQ1: What are the different social and personal outcomes of engaging in conflict utilizing different media for communication?

RQ2: How is argumentation affected by technology use?

RQ3: How do conflict and its attendant emotional expressions unfold differently across different technological conditions?

RQ1: What are the different social and personal outcomes of engaging in conflict utilizing different media for communication?

My first research question addresses the global outcomes of the argumentation, which has been the subject of much experimentally motivated theory. The current research begins from the theoretical stance that the “cues-filtered-out” approach captures an important part of interpersonal communication using different media. This approach captures the incontrovertible fact that different media have different properties. It suggests that couples will be less able to conduct arguments in the restricted atmosphere of IM than in the richer atmosphere of face-to-face interaction. Their arguments will be shorter and less conclusive in more impoverished media than in richer. Consequently, they may also be less distressing. Thus, less of a loss of positive mood and more of a gain in negative mood for arguers in less rich environments is predicted.

The idea that people learn to manage and compensate for the lack of these properties –which social information processing theory argues (SIP; Walther et al., 1994) – implies that not only is such *skill* possible, but also that people have the *experience* to handle the particular personal and interpersonal challenges presented by the technology. Two understandings of this are possible. The first is that we have a generalized, compensatory capability. In this case, SIP predicts that engaging in non-routine, high-stakes interaction (such as arguing) via different media will

produce no media differences from engaging in routine, low-stakes interaction. If, on the other hand, people's abilities to compensate for media inadequacies are tied to specific situations and less to global explanations of adaptation, then non-routine, high-stakes arguments will fail to progress. This too predicts shorter, less conclusive arguments in more impoverished media than in richer. However, under these circumstances, participants may experience active frustration at their lack of skill. This may cause the arguments to be more distressing, increasing the loss of positive mood and the gain of negative mood.

SIDE says that people rely on stereotypes to judge behaviors and calibrate appropriate responses in the absence of information (Lea and Spears, 1991; Postmes et al., 2000). However, when the person being interacted with is already quite individuated and well-known, general stereotypes are unlikely to be invoked. This would imply that SIDE will not be explanatory in the case of couples arguing. If one extends SIDE slightly to argue that people will use their personal model of the other in the absence of information, then one argues that precisely the growth in understanding that is crucial to solving difficult interpersonal problems is unlikely in less rich media compared to richer media. Again, this predicts shorter, less conclusive arguments in more impoverished media than in richer. It also suggests that participants will be frustrated with the other person's lack of acknowledgement of them as a unique individual rather than a model in the more impoverished communication outlets. This may cause the arguments to be more distressing, increasing the loss of positive mood and the gain of negative mood.

Thus, unless the strict form of SIP is correct, RQ1 suggests three research hypotheses:

RH1: Couples will have more difficulty coming to closure when arguing using IM than the phone and more difficulty on the phone than when arguing face-to-face.

RH2: Couples in the face-to-face condition will have more of an argument than couples in the phone condition, and couples in the phone condition will have more of an argument

than couples in the IM condition.

RH3: Couples will be in a more negative mood state after the interaction when arguing using IM than when arguing using the phone and more negative after arguing on the phone than when arguing face-to-face.

RQ2: How is argumentation affected by technology use?

Qualitative analysis gives us insight into user behavior, beyond the statistics (Rice, 1984). It is important that the methodology used in this dissertation research draw on several relevant models to accurately describe the phenomena that emerge in the data (Tracey and Glidden-Tracey, 1999). The current research uses experimentation as a part of the construction of a set of knowledge claims about conflict and the media. Therefore, the driving force behind Research Question 2 is the qualitative question, ‘What is important to say about couples’ interactions across different conditions?’.

From a qualitative perspective, there are interesting, observable actions that can be seen during couples’ arguments in different media. An individual’s goals combined with another’s actions (and vice versa) help to predict his or her communicative needs in the moment. These qualitative analyses will reveal how the course and outcome of peoples’ communication (arguments) are affected by their interpersonal goals. Couples’ changes in mood and closeness, as well as self- and inter-rater reports help to illuminate interaction phenomena during communication. To see how these global theories are tied to the interaction requires looking closely at what couples say to each other and how they respond to each other. Couples’ responsiveness to each other, the frequency (and occurrence) of apologies, and the repetition of topics are ways to examine how couples’ comments are tied to changes in their behavior during the course of their arguments. Responsiveness is interesting because it provides a way to examine peoples’ goals based on how their partners respond to them. For example, do dominant comments yield submissive

comments? Is an intrusive comment returned with a socially avoidant remark? Arguably, if an individual receives the response he or she seeks, interpersonal theory suggests that the couple may be more likely to reach closure or not experience a dramatic change in mood. An argument that features apologies can lead to more amicable behaviors, decreased argumentation, and an overall more positive exchange, which may increase the likelihood of reaching closure.

Additionally, “smaller” arguments can result, and couples might not report feeling less close to each other compared to those arguments in which apologies are not offered during arguments. Repetition of topics during arguments can reduce the likelihood of couples reaching closure, because it could mean that partners are not listening to each other.

Certain constraints of the media will dictate the availability of verbal and nonverbal cues and the extent to which people will be able to respond to such cues (Clark and Brennan, 1991). A rich condition, specifically face-to-face, is more conducive to the visibility of behavioral and emotional cues than a more impoverished medium. In richer media (i.e., face-to-face and phone), people have the benefit of hearing the other person’s voice (including inflection and tone) in order to better understand their partner’s perspectives. The leanest condition, IM, filters out nonverbal cues, however, people will be able to review past comments, as well as revise comments before their partners read them. Additionally, this suggests that individuals will be more likely to review accounts of the conversation so that there are fewer mentions of the same topics.

In terms of understanding peoples’ interpersonal goals and emotional behaviors across different media conditions, RQ2 suggests the following research hypotheses:

RH4: Couples will repeat themselves less when using IM.

RH5: Across conditions, couples that offer apologies to each other will not suffer a significant loss of positive mood when compared to those couples who did offer apologies.

RQ3: How do conflict and its attendant emotional expressions unfold differently across different technological conditions?

The last research question addresses how argumentation plays out across different media.

Different media impose different constraints on communication (Clark and Brennan, 1991; Daft and Lengel, 1986). These constraints help to guide the communication. Given the constraints of different media, I expect that couples' arguments will be more *emotionally* intense in the richer media. Emotional intensity is determined by the presence of physical expressions of emotion during argumentation.

The research hypotheses posed by this Research Question 3 are,

RH6: Couples arguing in the face-to-face condition will express different emotional displays and embodied behaviors than couples arguing in the phone condition, and couples arguing in the phone condition will express different emotional displays and embodied behaviors than couples arguing in the IM condition.

The purpose of the experiments in this research is to study and understand the dynamics of the communication of emotion (conflict, in particular) across different technological media. The research hypotheses posed by will give insight into the communication of emotion.

These experiments will be carried out across different conditions, yet will not give couples a choice in the type of technology at their disposal. Understanding the scenario of users not having a choice in the kind of technology they use to communicate their emotion is of growing importance. Additionally, couples who are separated from each other for long periods of time are forced to communicate with each other via media that are less rich than face-to-face. Although these scenarios are recreated in an experimental laboratory setting, this research provides a glimpse into the dynamics of these kinds of interactions.

Hypotheses

The overall experimental hypothesis is that, because of media richness effects, high-stakes, emotionally involving argumentation should have more negative consequences when conducted in a more impoverished communications environment than when conducted in a richer environment. The specific hypotheses are:

RH1: Couples will have more difficulty coming to closure when arguing using IM than the phone and more difficulty on the phone than when arguing face-to-face.

Analysis: Closure is defined by how couples were able to agree on how to end the argument. Closure is measured by (1) couples' own accounts after the argument (that is, they said they reached closure), and (2) inter-rater coding. (Constructs: participants' self-reports of closure; inter-rater coding of whether couples reached closure.

Rationale: For this study, examining closure is a specific personal outcome measure for how engaging in conflict is different across different technological media.)

RH2: Couples in the face-to-face condition will have more of an argument than couples in the phone condition, and couples in the phone condition will have more of an argument than couples in the IM condition.

Analysis: The intensity of couples' arguments will be affected by the condition. Inter-rater coding is used to measure how 'big' of an argument couples had, across conditions. (Constructs: participants' self-reports of having argued; inter-rater coding of couples' intensity of argumentation. Rationale: For this study, examining how arguments differ in intensity across condition provides insight into the social differences involved in arguing across different technological conditions.)

RH3: Couples arguing face-to-face will experience a greater loss of positive mood than couples arguing using the phone, and couples arguing using the phone will experience a greater loss of

positive mood than couples arguing using IM.

Analysis: Couples' change in positive (and negative) affect is measured by a mood scale. Individual positive and negative affect scores are taken before and after couples' arguments. (Constructs: participants' positive and negative mood state before and after arguing. Participants' mood changes are detected to account for how arguing affected couples across conditions. Rationale: In this study, mood change is a specific personal outcome measure as a result of couples' arguments.)

RH4: Couples will repeat themselves less when using IM.

Analysis: Transcripts of couples' arguments are analyzed according to how often they repeat the same topic during the course of their arguments. (Constructs: number of times participants repeated topics during the course of their arguments; participants' number of words used during arguments. Rationale: Examining the repetition of topics in this study is a specific example of how arguments differ by technological condition.)

RH5: Across conditions, couples that offer apologies to each other will not suffer a significant loss of positive mood when compared to those couples who did offer apologies.

Analysis: Transcripts of couples' arguments are analyzed according to how often they apologize to each other during the course of their arguments. (Constructs: number of times participants apologized during the course of their arguments; participants' number of words used during arguments; participants' positive and negative mood state before and after arguing. Rationale: In this study, examining whether couples offer apologies to each other gives insight into their arguments across technological condition .)

RH6: Couples arguing in the face-to-face condition will express different emotional displays and embodied behaviors than couples arguing in the phone condition, and couples arguing in the phone condition will express different emotional displays and embodied behaviors than couples

arguing in the IM condition.

Analysis: Video data capturing couples' arguments are analyzed for embodied behaviors, which are detected via qualitative analysis. (Constructs: facial displays of occurring during arguments; rich descriptions of couples' arguments. Rationale: For this study, examining the facial displays during conflict provides insight into emotional expressions that occur and how they unfold differently across different technological conditions.)

Experimental Design

Experiment I

This experiment explores the nature of argumentation and technology by contrasting the media in which the argument is held. This is a single factor experiment with three levels based on technological medium: face-to-face, phone, and Instant Messaging (IM). The basic unit of analysis in the experiment is the couple. It has a “between unit” design in which each couple experiences only one condition and holds only one argument. Although a within unit design in which couples argued multiple times in different conditions would have permitted us to see variation in their behavior, the experimental manipulation was not robust enough to permit multiple arguments. Couples were randomly assigned to a condition.

Participants

A call for participation was posted across campus in undergraduate housing, student lounge areas, and the computer science department inviting participation from any self-identified couple in which at least one member (and therefore both) had access to the Virginia Tech Counseling Service which offered the researcher and the participants backup clinical services. It was also posted to the BGSO (the Black Graduate Student Organization) listserv. Couples in different

stages of commitment were encouraged to participate—dating, committed, engaged, living together, and married. All couples were required to have access to the Virginia Tech Counseling Center, so one member had to be affiliated with Virginia Tech. This study was approved by the Virginia Tech Institutional Review Board, approval #05-337, from May 2004 through May 2005. The experiments took place in the Virginia Tech Department of Computer Science Usability Evaluation Lab, in McBryde Hall.

Measures

The researcher used pre- and post-Positive Affect Negative Affect Schedules (pre- and post-PANAS) which were adapted from the Positive Affect Negative Affect Schedule – Expanded Form (PANAS-X; Watson and Clark, 1994). The scale consists of 60 words, and participants are asked to mark each word, using a scale, according to how they are feeling *right now*. The scale is 1 (very slightly or not at all), 2 (a little), 3 (moderately), 4 (quite a bit), and 5 (extremely). The internal consistency reliabilities (Cronbach’s coefficient alpha) are high, generally ranging from .85 to .90 for positive affect, and .85 to .90 for negative affect. Additionally, the correlation between positive affect and negative affect is generally low, ranging from -.05 to -.35, giving quasi-independence between positive affect and negative affect (Watson and Clark, 1994).

An experimental questionnaire unique to the current research was developed to measure closeness between the couple. Using a Likert-type scales, the questionnaire asked couples to rate closeness according to how they personally felt about their partners and the current state of their relationship. They were asked, ‘How close do you feel to your partner?’ (1 – not close at all to 10 – as close as two people can be); ‘How much do you like your partner?’ (1 – not much at all to 10 – as much as possible); ‘How satisfied are you with your partner?’ (1 – as satisfied as possible to 10 – not satisfied at all); ‘How dissatisfied are you with your partner?’ (1 – dissatisfied as possible to 10 – not dissatisfied at all; this question was reverse-coded); and ‘How much would you like to spend together?’ (1 – none to 10 – all the time).

To measure depression, this dissertation research used the Beck Depression Inventory (Beck et al., 1961). This is a 21-item inventory measuring characteristic attitudes and symptoms of depression. Participants are asked groups of questions and then circle the question that most describes the way they have been feeling in the past week, including today. There are four questions in each set, each given a value of 0 to 3. A tally of each of all twenty-one questions yields a total score. The lowest possible score is 0, while the highest possible score is 63. Depressions cutoffs scores for the BDI are 0-9: normal ups and downs; 10-18: mild to moderate depression, 19-29: moderate to severe depression; 30-63: severe depression. Internal consistency ranges from .73 to .92. This scale made it possible to include depression as a variable in our statistical analyses.

The Inventory of Personal Problems – Short Circumplex Form (IIP-32) was used to gather information about participants’ personality (Soldz et al., 1995). This validated, 32-item reliable scale helps categorize people by their self-report of interpersonal behaviors through two kinds of questions: those relating to interpersonal behaviors relating to “it’s hard for me”, and those relating to interpersonal behaviors that “you do too much”. Participants are asked to rate, on a five-point scale (0 – Not at all to 4 – Extremely), how distressing interpersonal problems are for them, such as, “**It is hard for me** to feel close to other people”, and “I open up to people **too much**”. The questions in this inventory span 8 octants: *domineering*, *vindictive*, *cold*, *socially avoidant*, *nonassertive*, *exploitable*, *overly nurturant*, and *intrusive*. These octants are well-established and distinct with coefficient alphas ranging from .68 to .84.

Method

As reviewed in Chapter 2, there has been some prior investigation of argumentation, considerable investigation of the relationship between technology and communication, and a very small examination of both together.

The approach for examining technology use and conflict together is experimental. An experimental paradigm was chosen because (a) spontaneous occurrences of conflict in the workplace are too unpredictable and spread out to study in great detail, and (b) there are too many reasons (both pragmatic and personal) why people would want to mask the impact of their feelings and behaviors. The experimental paradigm chosen for this research, however, emphasizes the emotional involvement of the participants and their long-term stake in the outcome and their relationship with one another. This paradigm builds on a known technique for bringing emotional discussions into the lab (Mendoza, 1996). First, self-defined couples are recruited and asked what they disagree about. All couples have some standing disagreements. They make a list and agree to discuss one. They then hold the discussion. In prior work, ratings by blind coders of emotion and expressivity made from videotapes of these encounters show not only high inter-rater coding, but also a perception of significant emotional involvement (Mendoza, 1996). While this paradigm may not create the full intensity of an unprovoked disagreement between couples in intimate relationships, it represents considerably more emotional and interpersonal investment and involvement than is what is typically brought into the lab in CSCW experiments. The fact that participants already knew a lot about the nature of their disagreement protected them and the researcher from undesirable levels of conflict (more will be said about this in presenting the actual experimental protocol and safeguards). In addition to providing a way to look at conflict and argumentation, this paradigm allowed me to develop hypotheses that focused on couples.

Procedure

Pre-Experiment

Couples first received \$5 for showing up for the study. Next, each person completed an application for participation and a demographics survey which included background information

(see Appendix: Background Information Form). One of the items listed on the application and required for participation in the experiment was that one person in the couple had to be affiliated with Virginia Tech in order to use the Counseling Center. After couples completed the application, they were dismissed and told that they would be contacted later about whether they would be able to participate in the experiment. Couples affiliated with Virginia Tech were contacted and subsequently signed up as study participants.

During the Experiment

All participants received informed consent forms prior to the experiment (Appendix: IRB Proposal Package). Couples who returned for the experiment were first welcomed to the lab and were given \$15 for showing up to complete the experiment. (Some participants elected to receive course credit instead of monetary compensation.) Couples then completed additional paperwork (see Appendix for full documentation):

- the Beck Depression Inventory (Beck et al., 1961),
- a Communications Patterns Survey (developed by the researcher), which asked couples to answer a few questions about how often they communicated with each other over the phone and IM,
- the Inventory of Personal Problems (IIP-32) (Soldz et al., 1995),
- a Pre-Experiment Questionnaire (developed by the researcher) that asked them to describe how close they felt to each other, and
- a Pre-Positive Affect Negative Affect Schedule (pre-PANAS) (Watson and Clark, 1994), in which participants responses were denoted by numbers which could be tabulated.

The pre-experiment questionnaire (which was modified to become the post-experiment

questionnaire) was used so that the level of closeness within a couple could be measured. The pre-PANAS (also modified to become the post-PANAS) was used to get information about participants' moods. In this form, participants reported how they felt at that moment. The PANAS forms were relatively easy to administer and analyze (Watson and Clark, 1994).

Couples did not know that they would be arguing until just before the experiment began. During the time before the experiment began, the researcher worked with each couple to develop a list of topics about which they held differing views. They then chose a topic. Once they agreed on a topic that they could discuss, the researcher helped them create a list of happy experiences that the two of them shared and pick one of those. After choosing a happy reminiscence, the couple was told what technological condition they would be using. They were then escorted to the appropriate room within the lab. Couples were randomly assigned to either the face-to-face, phone, or IM condition. For the face-to-face condition, couples sat about two feet from each other at a small table. For both the telephone and the IM conditions, couples were separated so that each person was in a different room and unable to see or hear the other. Couples were instructed to stay on topic as they argued or otherwise engaged in a contentious conversation.

Two video cameras were situated so that they could capture each participant during the course of the experiment. Once in position, the researcher turned the cameras on and left the room(s) so that the participants could begin the experiment. During the experiment, participants were asked to engage in a discussion about a subject they had previously identified as contentious.

Post-Experiment

After twenty minutes of arguing, the researcher returned to the room and turned off the video cameras. At this time, participants each took a few minutes to write their feelings following the argument. Participants were asked to write candid responses, as their partners would not see their comments. After this brief activity, each participant completed the first of two post-experiment

questionnaires and the first of two post-PANAS scales. Once these forms were completed, participants were asked to rejoin each other (in the cases of the phone and IM conditions), and engage in *happy reminiscences*. During the *happy reminiscence*, couples were asked to recall the happy times they had spent together that were both fun and unforgettable. The goal of this activity was to allow the couples to return to a more natural mood state, one in which their anger levels had dissipated. After the happy reminiscence session, couples completed the final set of post-experiment questionnaires and post-PANAS scales. Couples were contacted two days after the experiment to ensure that there were no side effects from the experiment. They were also reminded that they were eligible for free counseling at the university counseling center.

Couples were compensated as much as twenty dollars. They received five dollars for showing up to complete the application process, and they received an additional fifteen dollars for showing up for the experiment. Some participants elected to forgo monetary compensation and instead, accepted course credit for participating in the experiment. It generally took couples about 1.5 hours to complete the experiment. No participants declined to participate after the initial application. Many couples also stayed behind after their experiment to discuss, with the researcher, implications of the current research.

Experiment II

Experiment II sought to replicate and explain the findings of Experiment I. In the case of the second experiment; however, the goal was to increase power (if possible) and perform more qualitative analyses on the experiment data.

Recruitment

In addition to the recruitment mechanisms used in Experiment I, a call for participation was extended to two other sources: the Virginia Tech Graduate Student listserv and the Virginia Tech

Psychology Experiment Management System. This study was approved by the Virginia Tech Institutional Review Board, approval #05-337, from May 2005 through May 2006. The experiments took place in the same venue as Experiment I.

Procedure

Experiment II followed the same procedure as Experiment I, except that couples could spend as long arguing as they wished rather than being interrupted after 20 minutes. Couples were given more time so that their behaviors and interactions could be compared with the couples in the first experiment.

CHAPTER FOUR

Results

This chapter presents the results for the two experiments discussed in the previous chapter. It begins with a presentation then discussion of the quantitative results for Experiments I and II, respectively. The next section presents a narrative of the qualitative results for the experiments about how arguments played out across face-to-face, phone, and IM conditions. This sections ends by discussing the results in terms of the research hypotheses posed by the current research. The experiments conducted in this research were run from the Spring 2004 academic year through the Spring 2006 academic year. (Additional constructs that were examined (i.e., closeness, affiliation, dominance) are discussed in the Appendix: Additional Analyses/Constructs.)

Quantitative Results

The sections that follow present then discuss the statistical descriptives and results for Experiments I and II, respectively. The SPSS (version 14.0 for Windows) was used to analyze the data for these experiments.

Results – Experiment I

Participant Characteristics

Virginia Tech staff and students (undergraduate and graduate) responded to postings on the internet. At least one member of the couple needed to be affiliated with the university so that they would have access to the counseling center, should they need it. As a result, a total of twenty-four self-described couples were recruited to participate in the study. Participant demographics were as follows: 21 Black; 21 White; 2 Asian; 2 Hispanic; and 2 Indian. The mean

age of male participants was 23.13 (SD = 4.60) and the mean age of female participants was 22.60 (SD = 4.50). Relationship type varied. One couple was engaged, five couples were living together, six were dating, eight were in a committed relationship, two couples were married without children, and two were married with children (Table 1). Thirty-three participants were undergraduates; 11 were graduate students; one participant was a student of Veterinary Medicine; one was a Virginia tech staff member; and one participant self-identified as a non-student.

Table 1. Relationship Type for Couples in Experiment I.

Engaged	1
Living together	5
Dating	6
Committed	8
Married, w/o children	2
Married, w/ children	2
	Total = 24

Depression

Participants completed the Beck Depression Inventory (BDI), a scale that measures attitudes and symptoms that are characteristic of depression. The mean male depression score was 5.96, with 19 as the highest reported score and zero as the lowest score. According to the BDI interpretation, four male participants were mildly to moderately depressed, and one was moderately to severely depressed. The mean female depression score was 7.09, with 23 as the highest reported score and zero as the lowest. Four female participants were mildly to moderately depressed, and one was moderately to severely depressed.

Argument Types

There is evidence that couples argued during the experiments. Many participants commented, after the experiment, that they did argue, even though they initially doubted being able to argue

“on the spot”. Others, during the course of the argument, made comments like, ‘Well, I don’t feel like we should argue anymore’, ‘See, now we’re having a real argument’, implying that they had reached their own, personal thresholds for engaging in argumentation. Some couples said that they did not argue; however, as there was little correlation between these comments and external ratings and since not arguing would tend to weaken any effects, I considered all the couples in my analyses. Finally, results from rater coding (to be discussed later) show that couples exhibited a range of argumentation levels detectable by external observers.

Couples argued about a range of topics. Most couples argued about *how to live*; that is, their attitudes, aspirations, and personal life influences). Many couples also argued about their *homelife*, where topics about chores and taking care of household responsibilities surfaced. A high number of arguments were related to the couples’ relationship. *Politics* and *money* rounded out the nature of couples’ arguments. Figure 2 shows a breakdown of the topics about which couples argued.

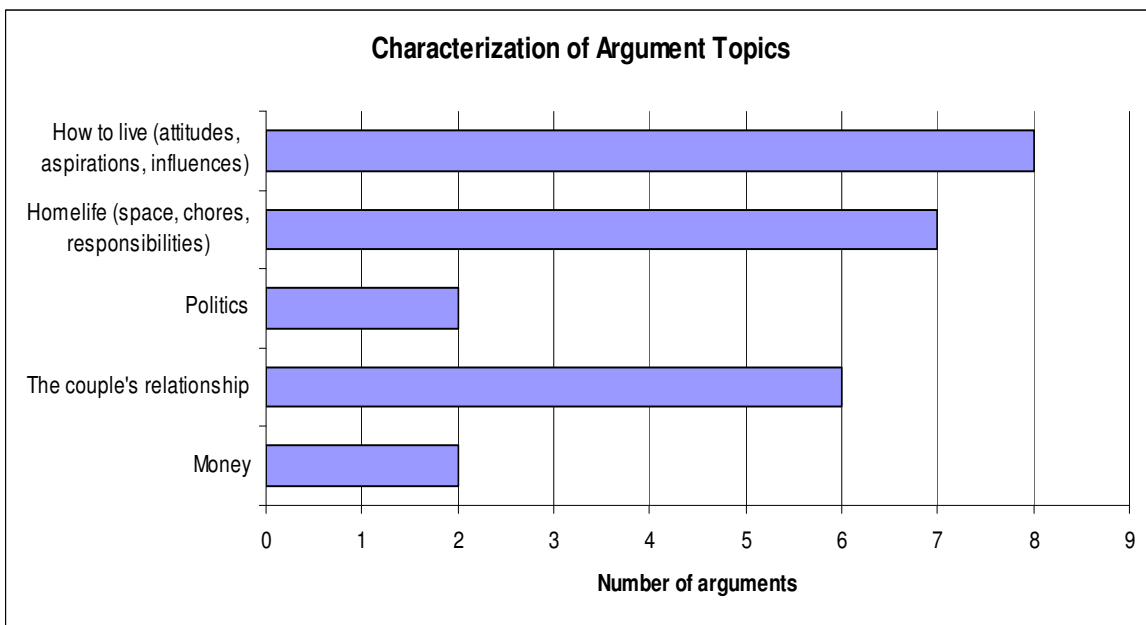


Figure 2. Characterization of Argument Topics for Experiment I

Evidence That People Argued

We asked participants to discuss a contentious topic. Did they, in fact argue? Three sources of evidence suggest that most couples did. First, during their arguments, many couples made remarks about the arguments they were having. Second, additional evidence of the fact that couples argued can be found in couples' self-reports of their feelings following their experiments. After the argument, couples' provided self-reports of their feeling during the experiment. Many made comments about their arguments, often framing them around the argument topic. One male participant wrote, "This is what we always seem to *argue* about...sometimes it's hard". A female participant wrote, of her experience, "The *argument* is one that we've had before." In Experiment I, one-third of the participants self-reported that they argued. The breakdown across conditions for Experiment I is shown in Table 2.

Table 2. Breakdown of Couples Self-Reporting Their Arguments, Experiments I.

	Experiment I	
	YES	NO
F2F	3	5
Phone	3	5
IM	5	3

Finally, rater coding suggests that couples did, in fact, argue, and many arguments were quite intense. Rater coding was done in Experiment I of the current research, and measures the intensity of couples' arguments. Two kinds of inter-rater reliability analyses were performed.

External coding – Closure and Intensity of Arguments

Two CS undergraduate students were recruited to code the degree of couples' arguments and how upset each participant became during the argument. They reviewed video of couples (and used transcripts when necessary) to make judgments about the couples' interactions. The coders had

three tasks: (1) Rate the degree to which each person in the couple clearly represented his or her point of view, (2) Rate the degree of argument for each couples (i.e., rate how big of an argument the couples had), and (3) Rate the degree of argumentation (emotion) for each person (i.e., how upset did each person get?). One coder rated sixteen (16) of the 24 couples; the other coder rated nine (9) couples of the 24 couples.

Figures 3 through 5 show combined inter-rater results for nine couples for each of the rating tasks. They show that the coders were not able to come to good agreement about the nature of the interactions. There were five reasons for this difficulty. One, there were not enough couples. Two, some couples exhibit contradictory or highly complex behavior. Third, the coders were young computer science students, with no relationship experience and no previous experience with behavioral observation. Fourth, the coders were not blind to condition, as they could see the condition on the tapes. Lastly, each coder recognized a few of the experimental participants, which resulted in highly divergent ratings between the two raters for those couples.

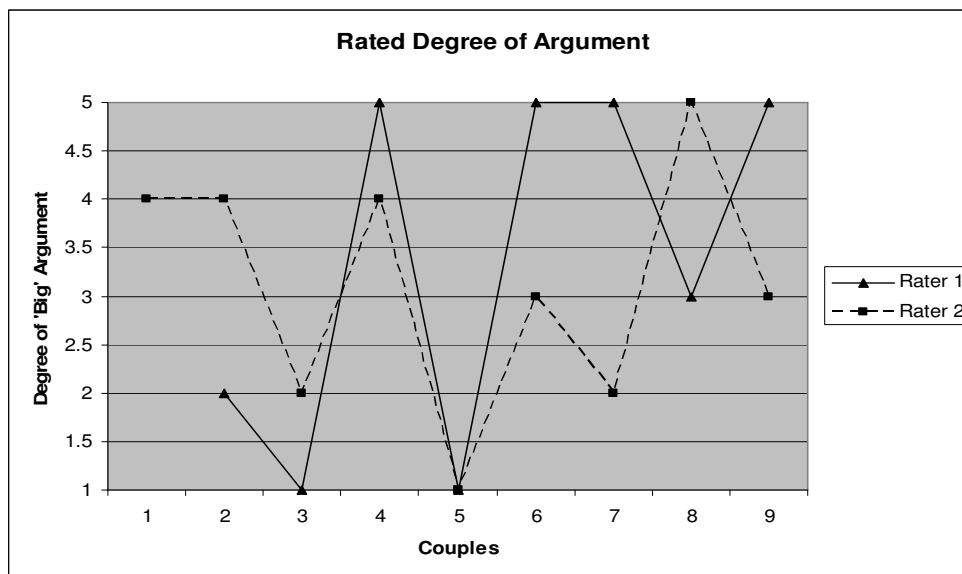


Figure 3. Rated Degree of 'Big' Argument, Per First 9 Couples, Experiment I

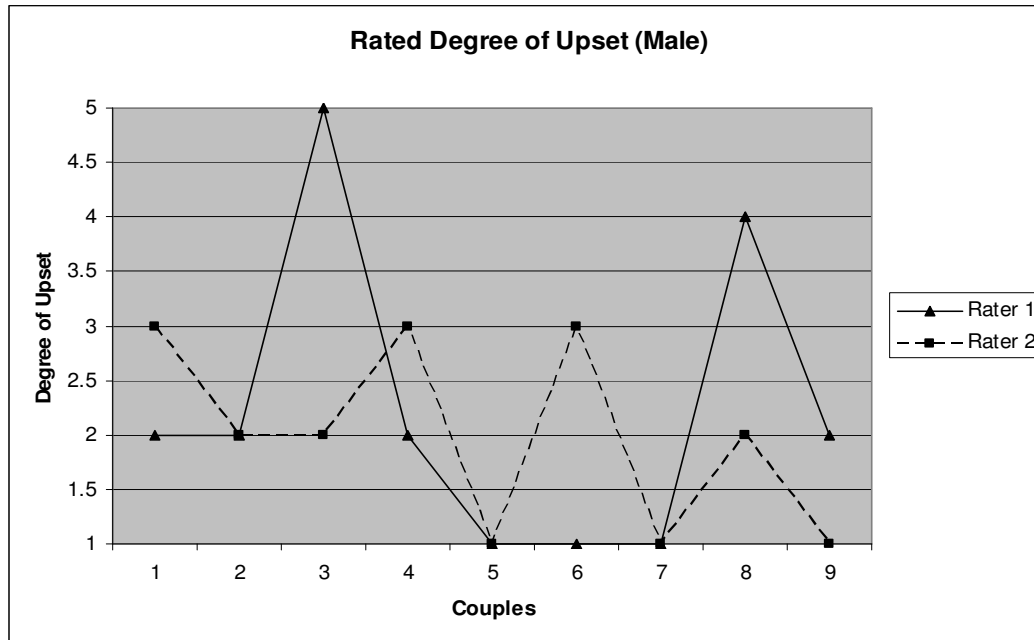


Figure 4. Rated Degree of Being Upset (Male), First 9 Couples, Experiment I

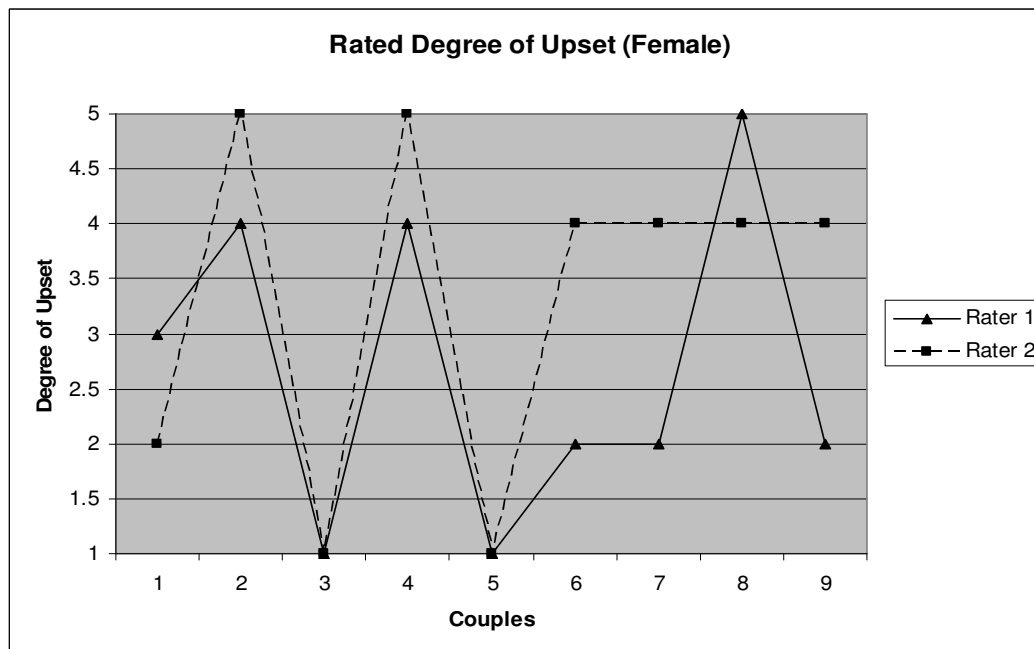


Figure 5. Rated Degree of Being Upset (Female), First 9 Couples, Experiment I

A second set of coders was recruited to rate (1) the intensity (“bigness”) of couples arguments and (2) couples’ reaching closure at the end of their argument. Care was taken to ensure that ensure that the problems experienced with the first set of coders did not recur. Specifically, one

coder was blind to condition, and had a background in human interaction. The other coder was a researcher on the project. Unhappily, ratings were obtained for only 9 couples.

Cohen's kappa measures joint agreement between two raters after the exclusion of agreement due to chance. The kappa statistic (on ratings of the "bigness" of couples' arguments) was .60. The kappa statistic (on ratings of whether couples reached closure) is .71. A kappa statistic that falls between .41 and .60 and between .61 and .80 is interpreted to show *moderate* or *substantial* agreement between raters, respectively (Landis and Koch, 1977; Li et al., 2005).

On average, couples arguing in the face-to-face condition had moderate arguments overall (1 – "Not a very big argument", to 5 – "A very big argument" to rate how big the argument was. *Moderate* is 4 on this scale.) Couples arguing in both the phone and IM conditions, on average, also had moderate arguments. Table 3 shows the average of the two raters' scores for the "bigness" of couples' arguments. On average, couples arguing in the face-to-face condition reached closure a "moderate" amount. (Coders used a Likert-type scale, from 1 – "Did not reach closure", to 5 – "Reached closure", to rate how big the argument was. *Moderate* is 3 on this scale.) Couples arguing in the phone and IM conditions, on average, also reached closure a *moderate* amount. Table 4 shows the average of the two raters' scores for whether couples reach closure.

Table 3. Average Number of Couples Reaching "Moderate" Closure, Experiment I

	F2F	Phone	IM
Avg. Closure	3.8	3.3	4.0
SD	0.6	0.0	0.5

Table 4. Average Number of Couples Having a "Big" Argument, Experiment I

	F2F	Phone	IM
Avg. Closure	3.0	1.0	2.8
SD	1.0	0.0	1.8

Additionally, one of the raters' comments reflected the intensity of couples' arguments with statements like, '[Couple] seems like a big argument because they are uncovering a lot of deeper issues' and 'This was a big argument because it was something that had been brewing under the surface for some time'.

Global Outcomes

Mood Change

Mood was measured by the PANAS, which has two subscales: negative and positive mood. Male and females experienced both loss of positive mood and gain in negative mood. One-way between subjects ANOVAs were run to determine the statistical significance of the loss of positive mood and gain in negative mood for participants, both within condition and across conditions; however, these mood changes were not significant. Figures 6 and 7 show the mean positive moods scores for female participants (Pre- and Post-test), respectively, and Figures 7 and 8 show the mean negative mood scores for females, all by technological condition. (Graphs indicating mood change for the male participants are similar to the female participants.) Although people came into the experiment with a distribution of moods, the differences between conditions were not systematic on pre-test. By post-test, they were systematic. These mood changes, however, were not significant within or across conditions. The numbers shown on each graph is the mean score for each condition.

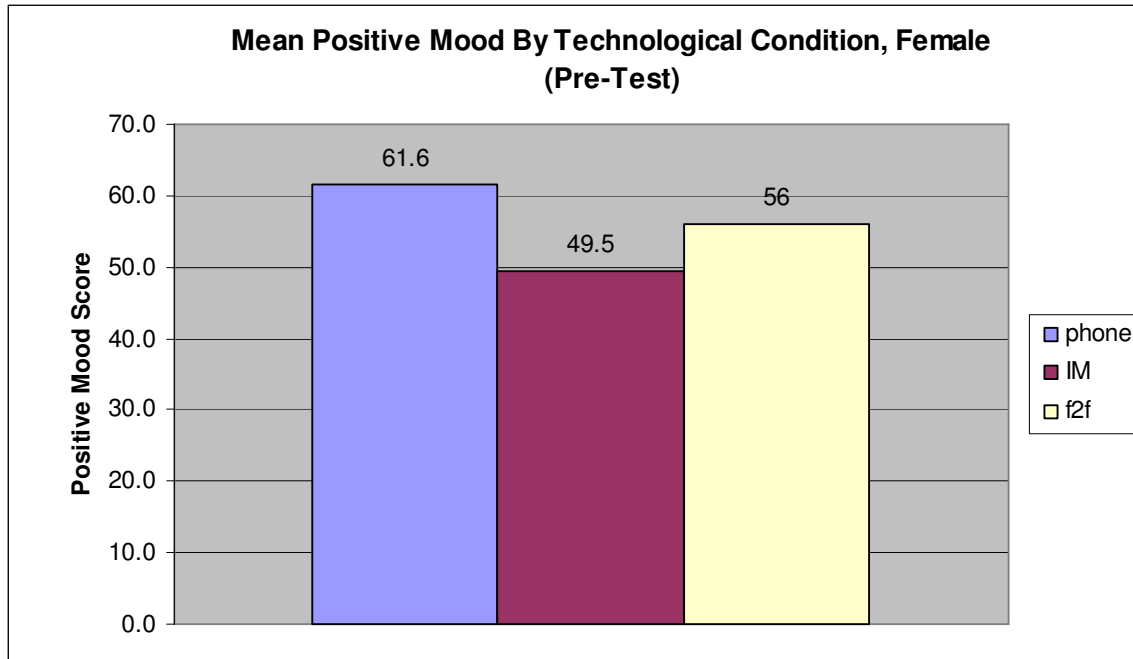


Figure 6. Mean Positive Mood By Technological Condition, Female (Pre-Test), Experiment I, $F(2,21) = 3.13$, $p < .07$

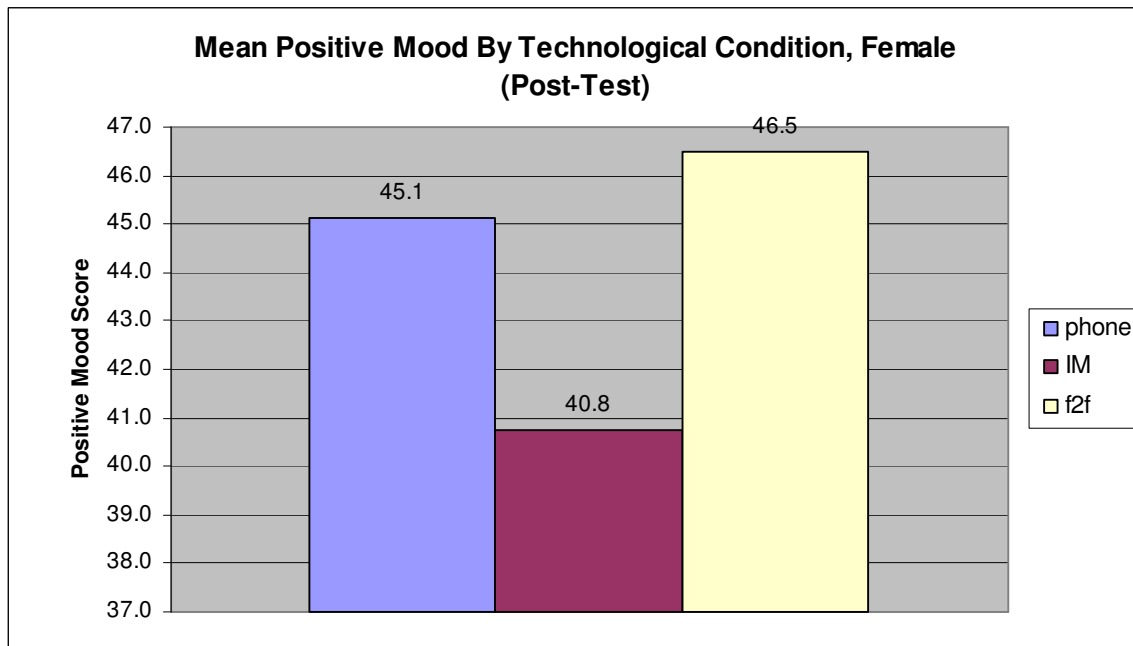


Figure 7. Mean Positive Mood By Technological Condition (Post-Test), Experiment I, $F(2,21) = 7.36$, $p < .49$

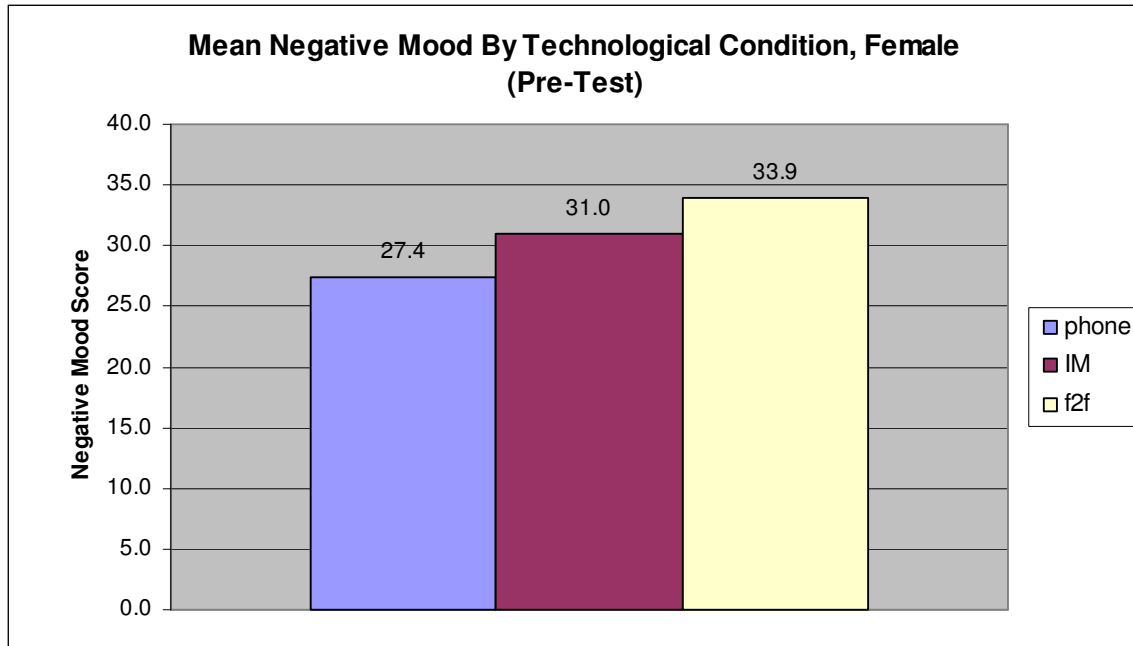


Figure 8. Mean Negative Mood By Technological Condition (Pre-Test), Experiment I, $F(2,21) = .44$, $p < .65$

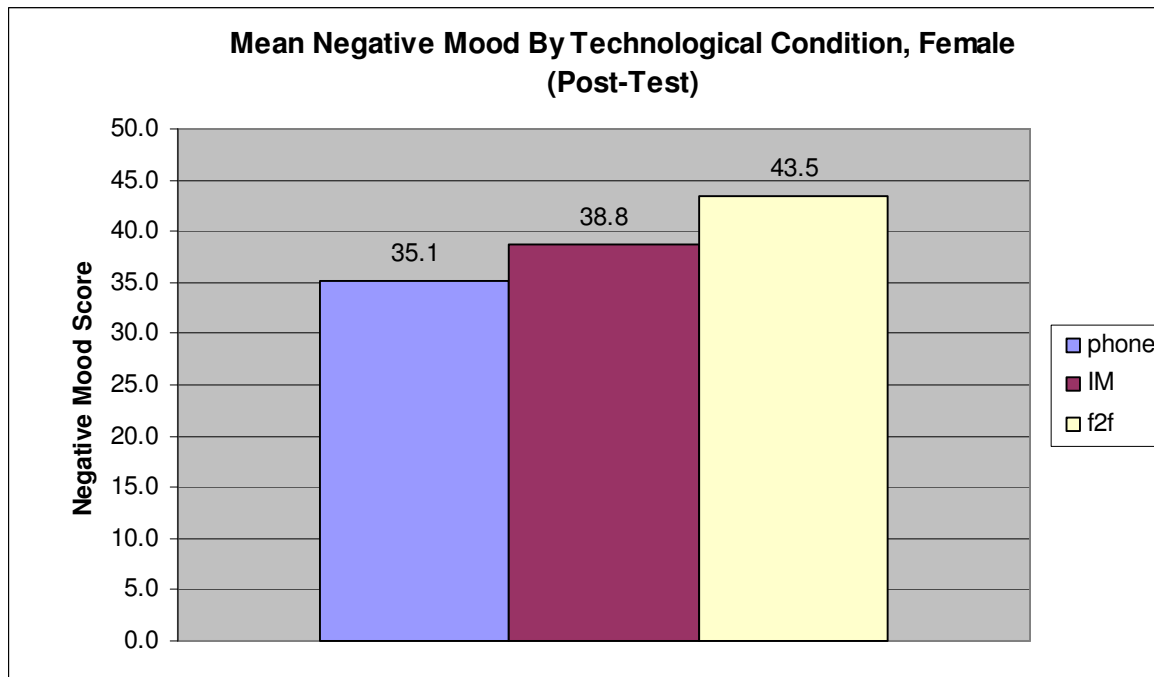


Figure 9. Mean Negative Mood By Technological Condition (Post-Test), Experiment I, $F(2,21) = .02$, $p < .98$

Couples' changes in mood are measured in terms of individual male and female mood change. As shown in the preceding graphs, PANAS results show that participants experienced a loss of positive by condition. Figure 10 shows the mean loss of positive mood, by technological condition, for female and male participants. On average, all participants, across conditions, experienced a loss of positive mood following the experiment. Female participants in the phone condition experienced the worst loss of positive mood (mean loss = 16.40), followed by the face-to-face condition (mean loss = 9.50), then the IM condition (mean loss = 8.80). Male participants in the face-to-face condition also experienced the worst loss of positive mood (mean loss = 13.10), followed by the IM condition (mean loss = 8.80), then the face-to-face condition (mean loss = 5.00). This loss of positive mood, however, was not significant across conditions (Male: $F(2,21) = .39, p < .68$; Female: $F(2,21) = .47, p < .63$).

Participants also experienced a gain in negative mood across conditions from pre- to post-discussion (Figure 11). Female participants in the face-to-face condition experienced the highest gain in negative mood (mean gain = 9.6), followed by the phone (mean gain = 8.4), then IM (mean gain = 7.8). Male participants in the phone condition experienced the highest gain in negative mood (mean gain = 8.4), followed by the IM condition (mean gain = 6.4), then face-to-face (mean gain = 5.6). As with the loss of positive mood, the gain in negative mood was not significant across conditions (Male: $F(2,21) = .185, p < .83$; Female: $F(2,21) = .045, p < .96$).

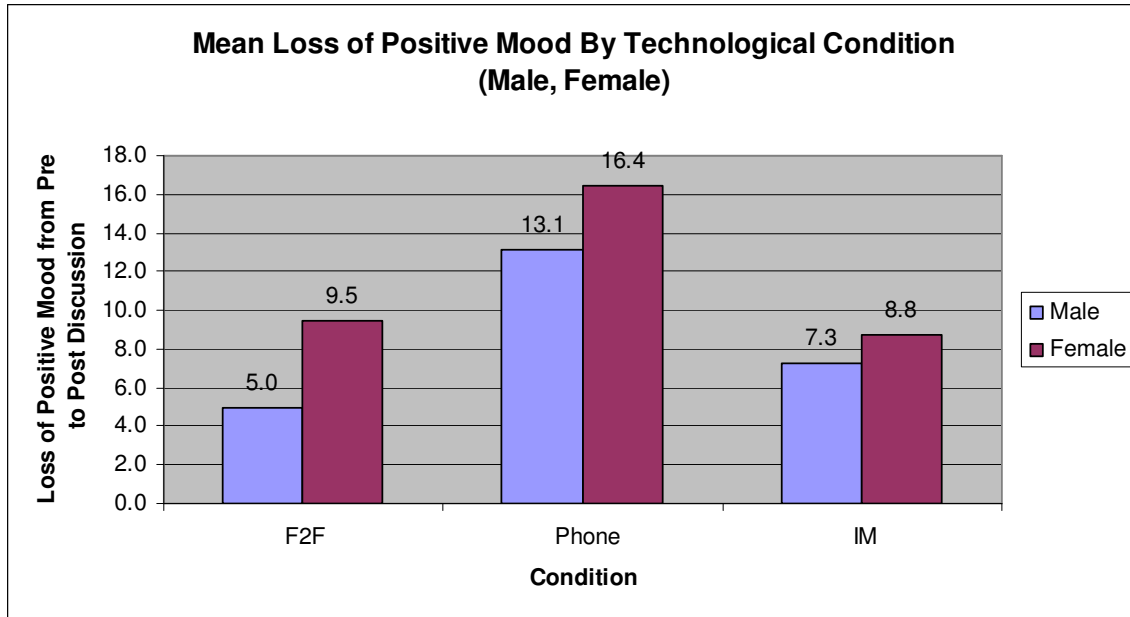


Figure 10. Mean Loss of Positive Mood By Technological Condition, Experiment I,
 Male: $F(2,21) = .39, p < .68$; Female: $F(2,21) = .47, p < .63$

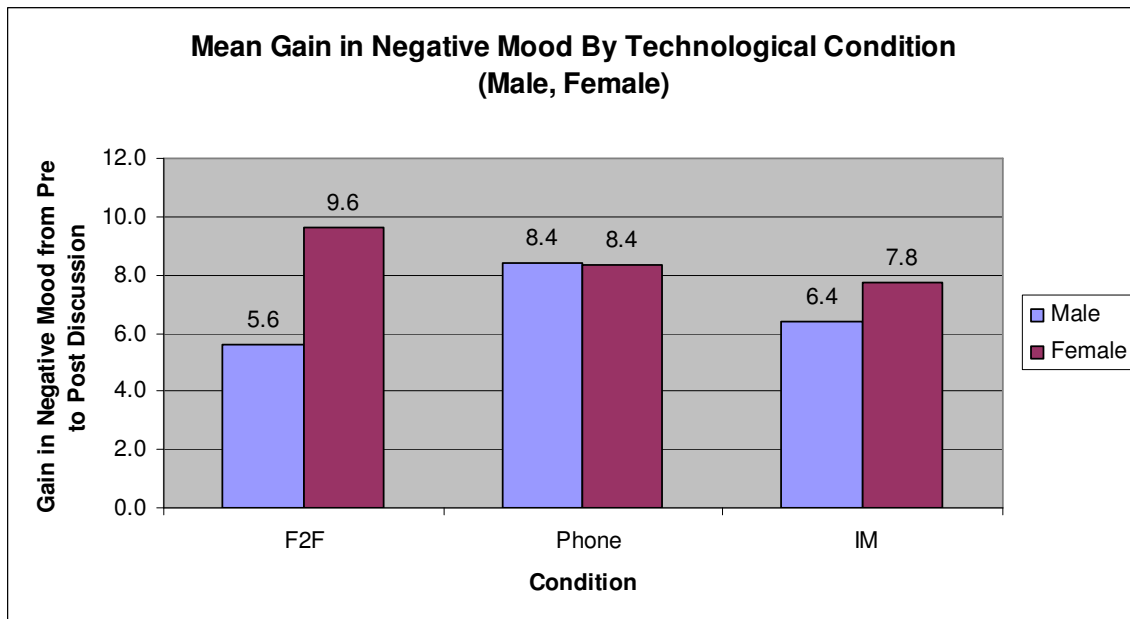


Figure 11. Mean Gain in Negative Mood By Technological Condition, Experiment I,
 Male: $F(2,21) = .19, p < .83$; Female: $F(2,21) = .05, p < .96$

Behavioral Outcomes

Figure 12, labeled Mean Number of Words by Condition and Gender, Experiment I, shows the mean number of words by condition and gender. For the face-to-face condition, the mean number of words used by the female participants is 1550 (SD = 185), and the mean number of words used by the male participants is 996 (SD = 263). For the phone condition, the mean number of words used by the female participants is 1014 (SD = 548), and the mean number of words used by the male participants is 822 (SD = 475). Finally, for the IM condition, the mean number of words used by the female participants is 499 (SD = 274), and the mean number of words used by the male participants is 435 (SD = 202).

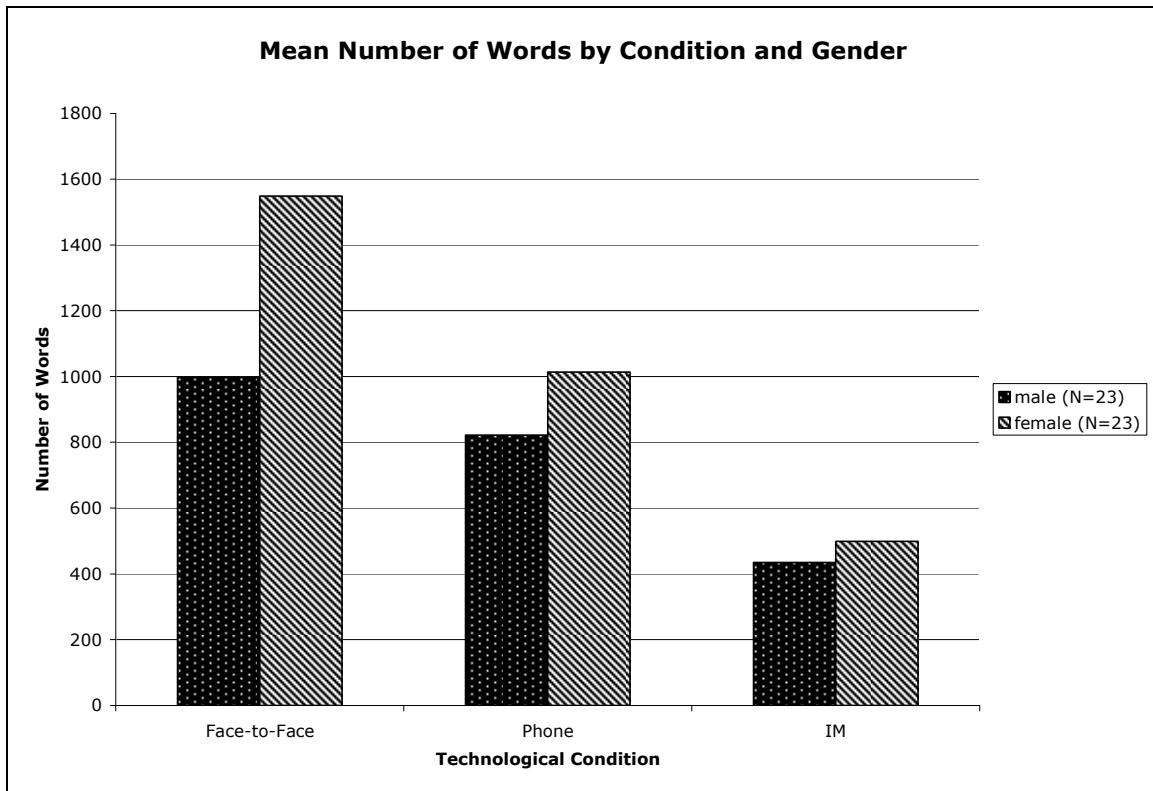


Figure 12. Mean Number of Words By Condition and Gender, Experiment I

Table 5 shows the inter-correlations (for male and female) among number of words, depression, and mood change (positive and negative). The results show that there were strong correlations between male depression and male number of words ($r = .534, p < .05$) and male depression and female number of words ($r = .461, p < .05$).

Table 5. Inter-correlations among Depression, Mood, and Number of Words (Discourse Measure), Experiment I

Measure	M	SD	Depression (M)	Num of Words (M)	Pos Mood Chg (M)	Neg Mood Chg (M)	Depression (F)	Num of Words (F)	Pos Mood Chg (F)	Neg Mood Chg (F)
Depression (M)	6.1	5.4	1	.534(*)	.164	-.183	.071	.461(*)	-.284	.148
				.010	.467	.414	.753	.031	.201	.511
				1	-.331	.226	-.011	.701(**)	-.255	.266
Num of Words (M)	740.6	401.1			.123	.299	.962	.000	.241	.220
					1	-.771(**)	.092	.076	.298	-.287
Pos Mood Chg (M)	-9.4	18.2				.000	.685	.731	.168	.184
						1	-.034	-.062	-.341	.303
Neg Mood Chg (M)	8.0	15.8					.880	.778	.111	.159
							1	.178	-.154	.012
Depression (F)	7.36	4.5						.429	.493	.959
								1	-.191	.214
Num of Words (F)	996.3	563.6							.383	.327
									1	-.792(**)
Pos Mood Chg (F)	-11.5	12.2								.000
										1
Neg Mood Chg (F)	9.3	13.3								

p < . 0.05; ** *p* < 0.01

The total number of words used by the couple is influenced by both technological condition and male depression. Figure 13 shows the correlation between the number of words used (X-axis) and male depression (Y-axis) for the different conditions. For the F2F and phone conditions, the total number of words used is correlated with male depression. However, this is not the case for the couples in the IM condition.

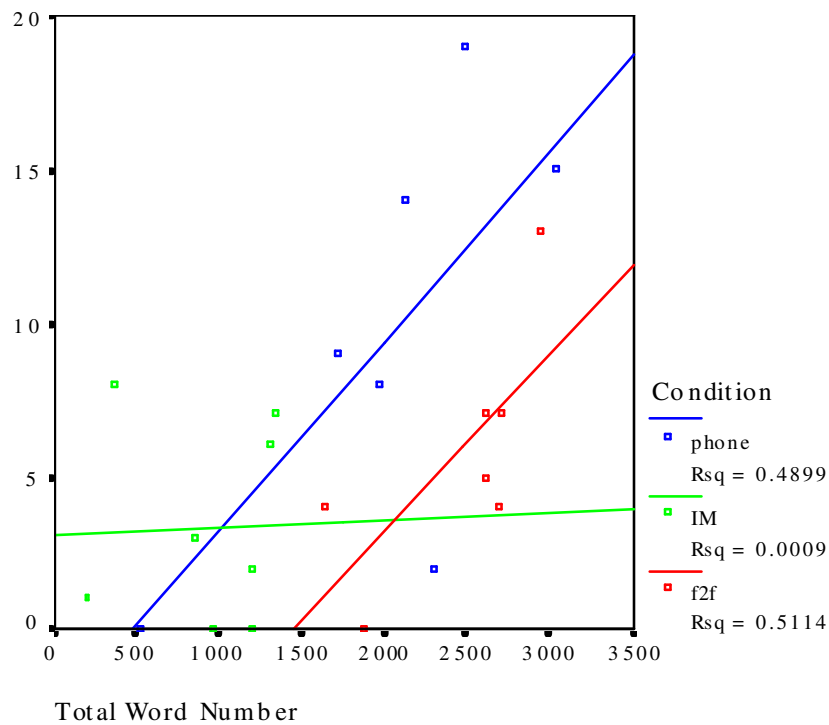


Figure 13. Correlation Between Number of Words Used (X Axis) and Male Depression (Y Axis) for Different Conditions, Experiment I

Total Apologies

Post-hoc qualitative analysis reveals that across all conditions, there were relatively few apologies made during couples' arguments. Table 6 shows the number of apologies made in each condition for Experiment I. In both the face-to-face and IM conditions, female participants offered one apology. In the phone condition, three males and four females apologized during their

arguments. One-way between-subjects ANOVAs and correlative analysis was conducted on the apology data. The resulting analyses revealed that (1) apologies for Experiment I were not significant across condition, and (2) there was only one significant interaction effect between number of apologies and mood change. Table 7 shows that there is significant interaction effect between female number of apologies and male positive mood, post-argument. This ANOVA is a post-hoc analysis, as it was conducted after both experiments were done.

Table 6. Apologies Made During Arguments By Condition and Gender, Experiment I

	Male (N = 12)	Female (N = 12)	Total
F2F	0	1	1
Phone	3	4	7
IM	0	1	1

Table 7. Between-Subjects Effects of Male and Female Number of Apology, Positive and Negative Mood, Post-Hoc

Source	Dependent Variable	F	Sig.
Female Pos Mood (Pre)	Male Num Apology	.171	.690
	Female Num Apology	1.776	.219
Female Pos Mood (Post)	Male Num Apology	.021	.889
	Female Num Apology	2.196	.177
Female Neg Mood (Pre)	Male Num Apology	.032	.863
	Female Num Apology	1.203	.305
Female Neg Mood (Post)	Male Num Apology	.155	.704
	Female Num Apology	.073	.794
Male Pos Mood (Pre)	Male Num Apology	.001	.977
	Female Num Apology	17.795	.003
Male Pos Mood (Post)	Male Num Apology	.109	.750
	Female Num Apology	15.334	.004
Male Neg Mood (Pre)	Male Num Apology	.365	.562
	Female Num Apology	21.113	.002
Male Neg Mood (Post)	Male Num Apology	.005	.944
	Female Num Apology	2.618	.144

a R Squared = .653 (Adjusted R Squared = .046)

b R Squared = .930 (Adjusted R Squared = .808)

Post-hoc qualitative analysis reveals that across all conditions, at least one couple returned to a previously discussed sub-topic during their arguments (Table 8). In the face-to-face condition, there were four sub-topic repeats (by four couples). There were seven sub-topic repeats in the phone condition (by five couples). In the IM condition, only one couple returned to an argument sub-topic.

Table 8. Frequency of Sub-Topics Repeated During Arguments By Condition, Experiment I, Post-Hoc

	Sub-Topic Repeats	Number of Couples
F2F	4	4
Phone	7	5
IM	1	1

Emotional Displays

Couples' interactions were video taped. Each video was analyzed by the researcher for occurrences and types of emotional displays that couples expressed during their interactions.

These analyses showed that not all types of displays occurred in all conditions. The presence of different kinds of displays is shown in Table 9. In particular, displays of negative emotions, like disappointment, confusion, and sadness do occur in the phone condition, but not face-to-face. No instances of excitement, relief, or disappointment were noticed in the IM condition.

Table 9. Facial Displays Appearing in Conversations By Condition, Experiment I

Facial Display	F2F	Phone	IM
Contempt/Disgust (jaw-tightening, moue)	X	X	X
Excitement (gestures, raised eyebrows)	X	X	
Relief (raised eyebrows)	X		
Happiness (social smiling)	X	X	X
Disappointment		X	
Confusion		X	X
Surprise (raised eyebrows, social smiling)	X	X	X
Sadness/Upset		X	X

Discussion of Results – Experiment I

A few notable results emerged from Experiment I. First, many couples did, indeed, argue when they were brought into the lab showing that this paradigm can work for studying conflict and technology use. Second, participants did not experience a significant loss of positive mood following the experiment. Additionally, the loss of positive mood was not significant across conditions. Third, results showed that there were strong correlations and interaction effects with number of words. Specifically, there were strong correlations between male depression and male number of words *and* male depression and female number of words, particularly in the IM condition. Finally, rater coding suggests that couples did not reach closure in the phone and IM conditions.

Research Hypotheses

RH1: Couples will have more difficulty coming to closure when arguing using IM than when using the phone, and they will have more difficulty arguing on the phone than when arguing face-to-face.

Coding results suggest that couples reached moderate closure in all conditions. However, the coding was accomplished on only nine couples. No evidence was found to support RH1.

RH2: Couples in the face-to-face condition will have more of an argument than couples in the phone condition, and couples in the phone condition will have more of an argument than couples in the IM condition.

Coder analysis suggests that there were a range of arguments in all conditions, with a tendency for most to be serious or “big”. Either power was too low, or the measure used was insufficiently sensitive. It is also possible that the hypothesis is incorrect. These results are, in part, consistent

with the prediction RH2.

RH3: Couples arguing face-to-face will experience a greater loss of positive mood than couples arguing using the phone, and couples arguing using the phone will experience a greater loss of positive mood than couples arguing using IM.

The prediction for RH3 did not hold, as there was no statistically significant difference by condition in loss of positive mood. Again, this may have been due to power. The large percentage of depressed participants may have also played a role in the failure to find an effect, as depressed participants may be less sensitive to momentary mood changes than non-depressed participants.

RH4: Couples will repeat themselves less when using IM.

Post-hoc qualitative analysis reveals that across all conditions, 42% of the couples returned to a sub-topic, some more than once. However, in the IM condition, only one couple returned to an argument sub-topic. The prediction for RH4 appears to hold.

RH5: Across conditions, couples that offer apologies to each other will not suffer a significant loss of positive mood when compared to those couples who did offer apologies.

Apologies are a rare event, occurring more often in the phone condition than in the other condition, but not occurring sufficiently frequently to rise to a statistically significant level of difference across technological condition. Results of a post-hoc between subjects ANOVA show that there is only a marginally significant interaction effect between female number of apologies and male positive mood, post-argument. No evidence was found to support the prediction for RH5 for Experiment I.

The first experiment tested the viability of the approach for bringing arguing couples into the lab

and using this paradigm to study the relationship between arguing couples and technology. It also showed a number of significant and unexpected results. As predicted, couples had less difficulty coming to closure when face-to-face than when using IM, but not then when using the phone. As predicted, couples repeated themselves less when using IM than when on the phone or face-to-face but no such relationship obtained for the phone vs. face-to-face.

Three significant results follow from this experiment. First, many or most of the couples in our sample were perceived by raters as engaging in moderate arguments, suggesting that this mechanism, though artificial is a viable way to study argumentation and media in the lab. Second, subtopics were repeated more often in the face-to-face and phone conditions than in the IM condition. Third, I noticed very different patterns of emotional display in the different conditions, with some displays, such as disappointment, occurring only in the phone condition and not in the IM or face-to-face. Other displays, such as confusion and sadness, occurred only in the phone and IM conditions, and yet others, such as excitement, occurred only in the face-to-face and phone conditions.

Three factors condition my understanding of these results. The first is that the experiment was underpowered. There were only 24 couples altogether, 8 per condition. This means that only moderate or large effects could be detected. For some analyses (those involving inter-rater coding) we had data on only 3 couples per condition. This means that the chances of having a Type II, or false negative, result are very high. Second, for some reason there was a very high percentage of seriously depressed participants in the study, 42%. It seems that depression, at least on the part of men, is highly related to behavior. In this case, the relationship is surprising because male depression is positively related to number of words. Depression is a complex psychological state that may interact with other aspects of interaction in unexpected ways. Third, many of the participants reported that they were “just getting started” at the twenty minute point when they were interrupted.

Therefore, a second experiment was run. It was identical to the first, except that argument length (that is, time spent by condition) became an outcome measure, so couples were allowed to argue for as long as they felt necessary. When they got to a point where they believed they could not or did not want to argue any further, they were asked to end their argument and contact the researcher to finish the experiment. The researcher made no mention about reaching a resolution or bringing about closure to the argument to the couples. Couples were also asked how long they had been together.

Do media differ?

At the end of Experiment 1, the answer to this question is still yes. Some of the statistical analyses shed some light on the fact that there are differences in couples' interactions. The behavioral outcomes (number of words, apology, self-reports of argumentation and closure) examined during the first experiment seem to indicate that there is more to couples' interactions than is dictated by the quantitative data, alone. However, at the end of Experiment I, is not clear what these difference are or exactly how they are manifested during the interaction.

Results – Experiment II

Participant Characteristics

A total of forty-five couples were recruited to participate in Experiment II. Participant demographics were as follows: 56 White; 14 Black; 9 Asian; 5 Hispanic; 2 Turkish; 2 Interracial; 1 Italian; and 1 Pakistani. The mean age of male participants was 26.70 (SD = 8.50), and the mean age of female participants was 24.30 (SD = 5.20). The average length of couples' relationships was 3.32 years (SD = 4.20). Two couples were engaged, nine couples were living together, seven were dating, eleven were in a committed relationship, thirteen couples were married without children, and three were married with children (Table 10). Forty participants were undergraduates; thirty-two were graduate students; one participant was a Virginia Tech staff

member; seventeen participants identified themselves as *Other*.

Table 10. Relationship Type for Couples in Experiment II.

Engaged	2
Living together	9
Dating	7
Committed	11
Married, w/o children	13
Married, w/ children	3
	Total = 45

Depression

The mean male depression score was 6.93, with 17 as the highest reported score and zero was the lowest score. According to the BDI interpretation, 10 male participants were mildly to moderately depressed, and 2 were moderately to severely depressed. This is comparable to the lower percentage of the population in Experiment I, 27% as compared to 21%. The mean female depression score was 7.71, with 34 as the highest reported score and zero was the lowest score. Nineteen female participants were mildly to moderately depressed, and 2 were moderately to severely depressed. This level of depression was significantly higher than in Experiment I (47% as compared to 21%) and indicates a mismatch between depression in the sample.

Couples' Arguments

Figure 14 shows the characterization of argument topics for Experiment II. The topics that couples argued about were similar to those for the first experiment. Buying a new home, helping out with household tasks, money, and differences in communication styles were topics about

which couples argued.

As mentioned in the results for Experiment I, couples did, in fact engage in argumentation during the experiments. In Experiment II, thirty (30) of 45 couples self-reported that they argued. The breakdown across conditions for Experiment II is shown in Table 11. Pearson's Chi-square results showed no significant relationship between couples' self-reports of argument and condition.

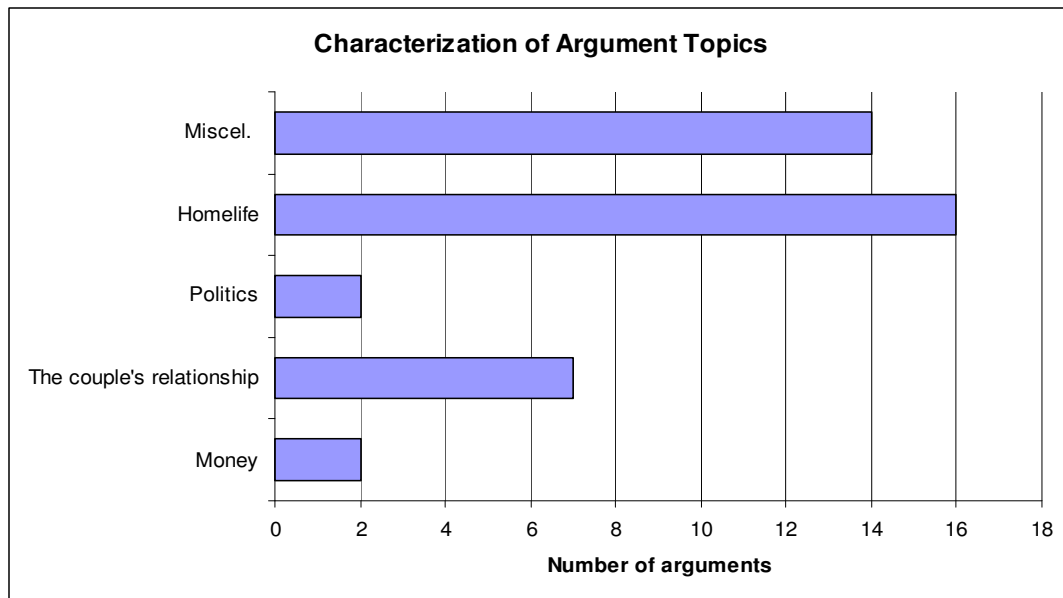


Figure 14. Characterization of Argument Topics for Experiment II

Table 11. Breakdown of Couples Self-Reporting Their Arguments, Experiment II.

	Experiment II	
	YES	NO
F2F	7	7
Phone	4	11
IM	1	14

Table 12a shows that ten couples self-reported closure to their arguments in the IM condition, and only three and two couples reported self-closure in the face-to-face and phone conditions, respectively. This suggests that couples in the IM condition were more likely to reach closure than couples in either the face-to-face or phone conditions. As with Experiment I, a Pearson's chi-square test was performed on the self-reported closure data to assess whether there was a relationship between couples' self-reports of closure and condition. This result was significant, $p < .006$ (Table 12b).

Table 12a. Observations of Couples' Self-Reports of Closure, Experiment II.

		Self-Reported Closure		Total
		No	Yes	No
Condition	F2F	12	3	15
	Phone	13	2	15
	IM	6	10	15
Total		23	15	45

Table 12b. Pearson's Chi-Square Test of Self-Reported Closure By Technological Condition, Experiment II.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.13	2	.006
N of Valid Cases	45		

Results of the test of between-subjects effects showed couples' self reports of closure were significantly different by condition ($p < .004$). Couples' self reports of whether they argued were also significant (Table 13).

Table 13. Test of Between-Subjects Effects of Couples' Self Reports of Closure, Arguments

Source	Dependent Variable	F	Mean Sq	Sig.
Tech Condition	Self-Reported Closure	6.382	1.181	.004
	Self-Reported Argue	3.733	.680	.033

a R Squared = .242 (Adjusted R Squared = .204)

b R Squared = .157 (Adjusted R Squared = .115)

Time to Complete

The mean time that couples argued was 23.20 minutes (st. dev. = 12.40). By condition, 22.90 (SD = 13.70) minutes was the mean argument length in the face-to-face condition; 18.30 (SD = 11.80) minutes for telephone; and 28.40 (SD = 8.20) for the IM. The time to complete the experiments was marginally significant across conditions ($F(2, 42) = 2.93, p < .06$).

Global Outcomes

Mood Change

As with Experiment I, male and females experienced both loss of positive mood and gain in negative mood after the experiment. One-way between subjects ANOVAs were run to determine the statistical significance of the loss of positive mood and gain in negative mood, both within condition and across conditions. As with Experiment I, these mood changes were not significant across conditions. Figures 15 and 16 show the mean positive moods scores for female participants (Pre- and Post-test), respectively, and Figures 17 and 18 show the mean negative mood scores for females, all by technological condition. (Graphs indicating mood change for the male participants are similar to the female participants.) These mood changes, however, were not significant within or across conditions. The numbers shown on each graph is the mean score for each condition.

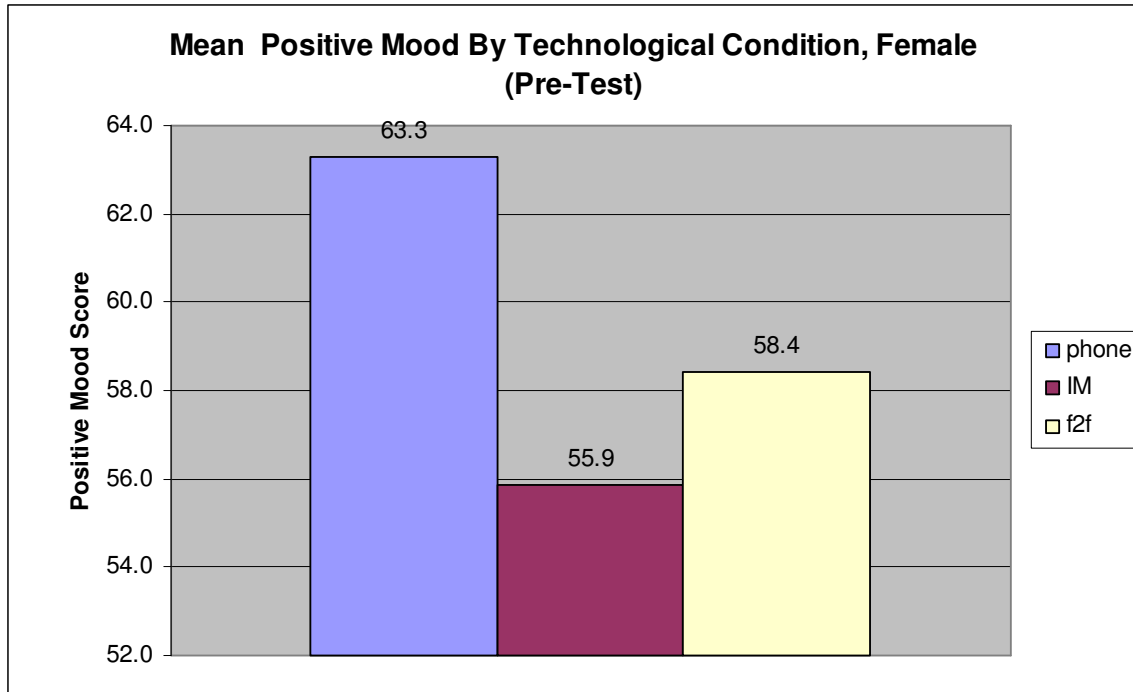


Figure 15. Mean Positive Mood By Technological Condition (Pre-Test), Experiment II, $F(2, 42) = .93, p < .40$

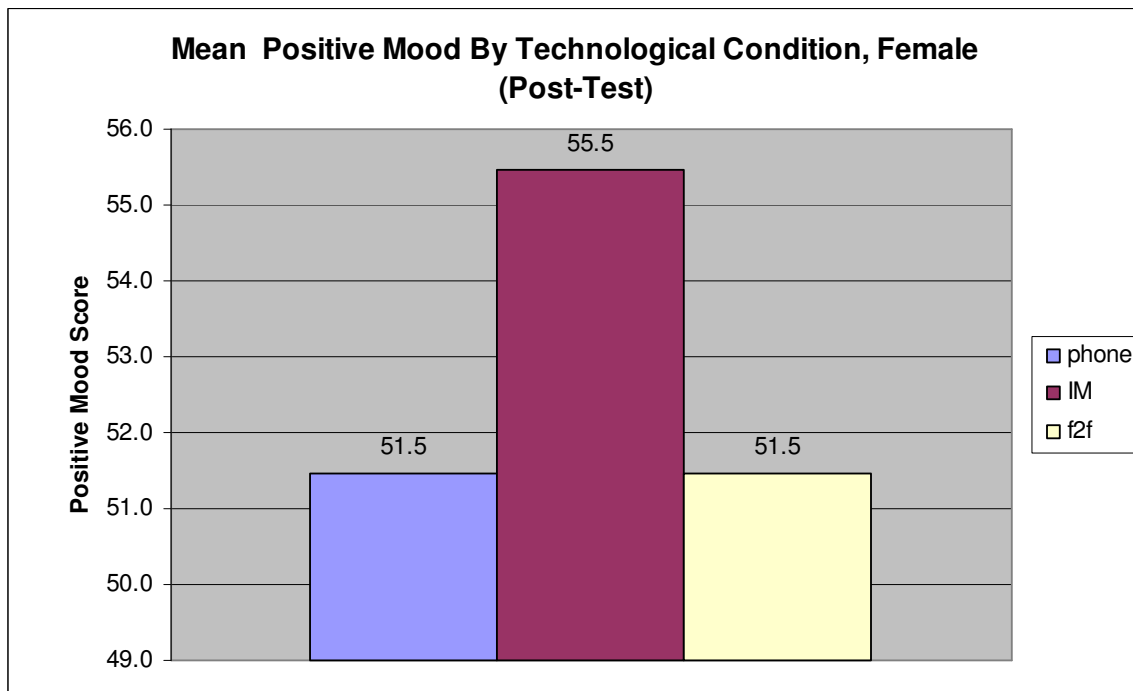


Figure 16. Mean Positive Mood By Technological Condition (Post-Test), Experiment II, $F(2, 42) = .16, p < .85$

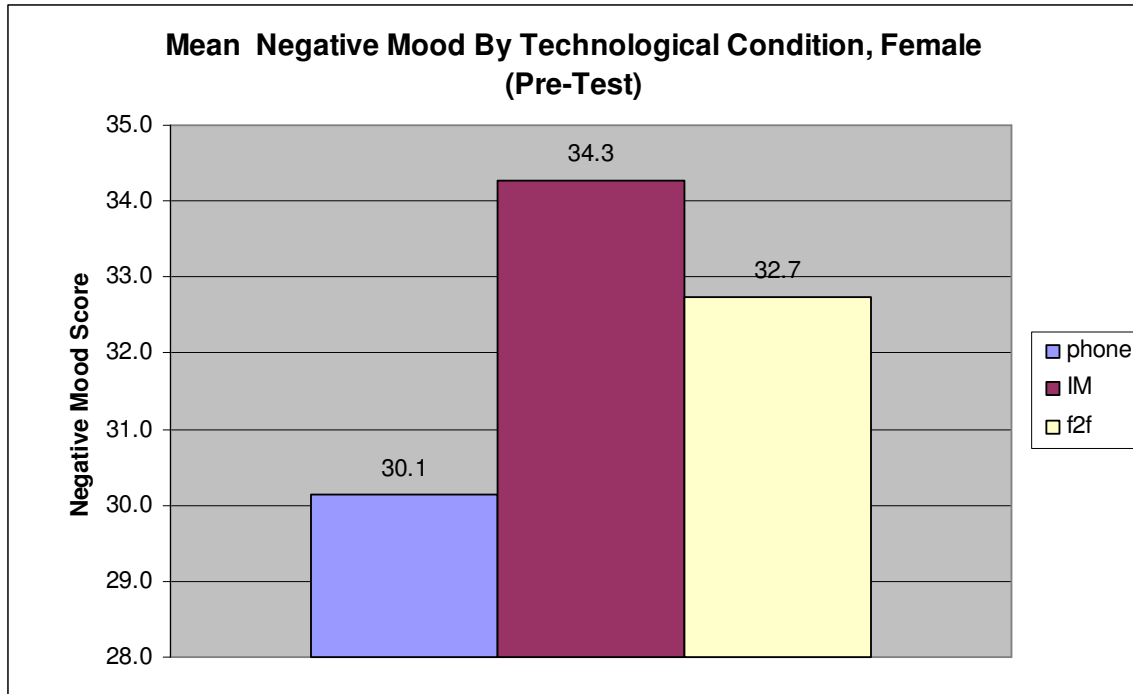


Figure 17. Mean Negative Mood By Technological Condition (Pre-Test), Experiment II, $F(2, 42) = .485$, $p < .62$

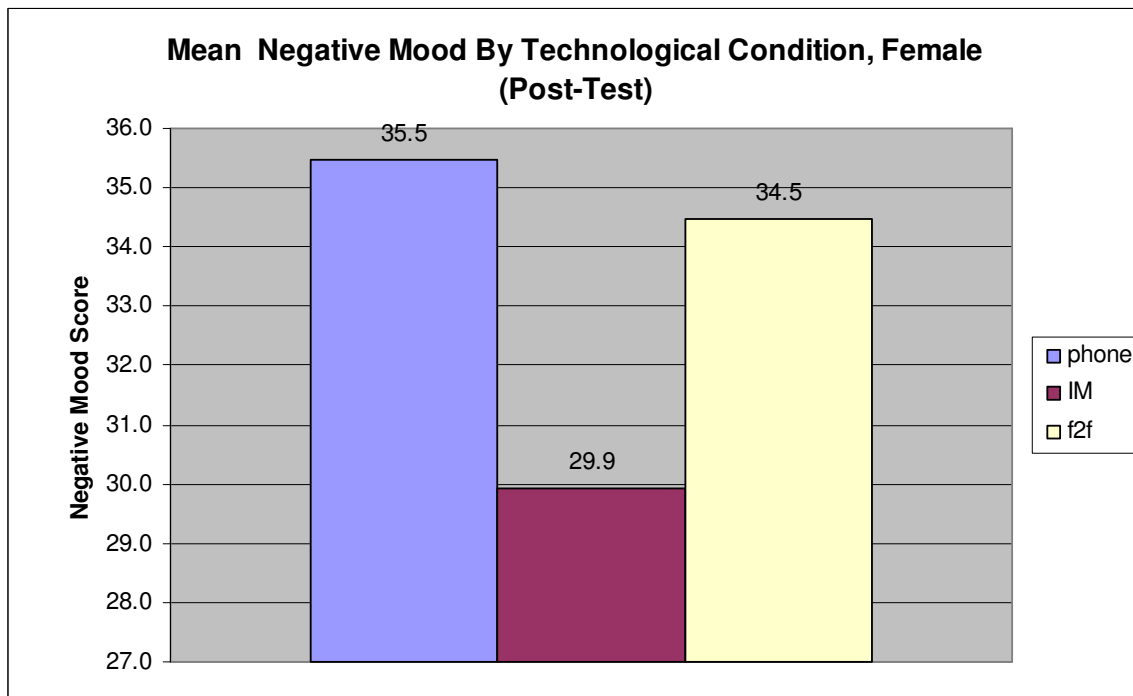


Figure 18. Mean Negative Mood By Technological Condition (Post-Test), Experiment II, $F(2, 42) = 1.33$, $p < .28$

For Experiment II, PANAS results show that participants experienced a loss of positive mood from pre- to post-discussion. Figure 19 shows the mean loss of positive mood, by technological condition, for female and male participants. On average, all participants, across conditions, experienced a loss of positive mood following the experiment. Female participants in the phone condition experienced the worst loss of positive mood (mean loss = 9.60), followed by the face-to-face condition (mean loss = 6.90), then the IM condition (mean loss = 0.40). Male participants in the phone face-to-face condition experienced the worst loss of positive mood (mean loss = 12.20), followed by the IM condition (mean loss = 8.70), then the face-to-face condition (mean loss = 3.00). This loss of positive mood, however, was not significant across conditions (Male: $F(2, 42) = 1.55, p < .23$; Female: $F(2, 42) = 2.15, p < .13$).

Participants (male and female) also experienced a gain in negative mood by technological condition (Figure 20). Female participants in the phone condition experienced the highest gain in negative mood (mean gain = 7.50), followed by the IM (mean gain = 4.90), then face-to-face (mean gain = 1.70). Male participants in the phone condition experienced the highest gain in negative mood (mean gain = 2.20), followed by the IM condition (mean gain = 1.80), then face-to-face (mean gain = 0.90). As with the loss of positive mood, the gain in negative mood was marginally significant across or between conditions (Male: $F(2, 42) = .99, p < .38$; Female: $F(2, 42) = 2.58, p < .09$, though female gain in negative mood was marginally significant).

Couples' changes in mood are measured in terms of individual male and female mood change. Participants experienced both a loss of positive mood and a gain in negative mood from pre- to post-discussion. These trends were similar to the first experiment. However, these results were not significant across conditions.

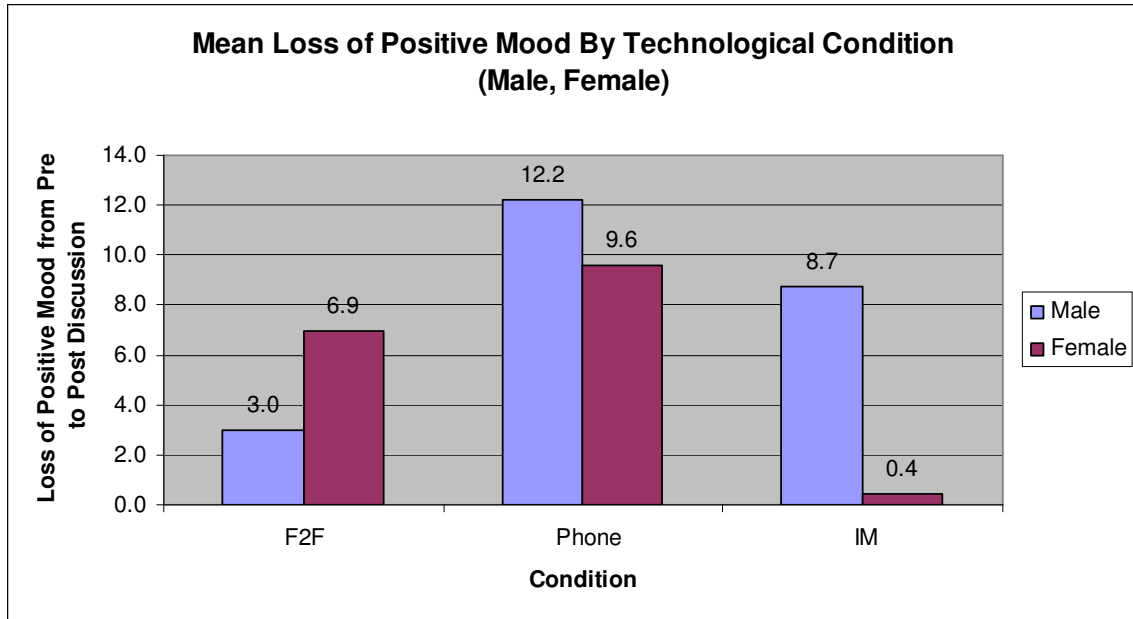


Figure 19. Mean Loss of Positive Mood By Technological Condition, Experiment II,
Male: $F(2, 42) = 1.55, p < .23$; Female: $F(2, 42) = 2.15, p < .13$

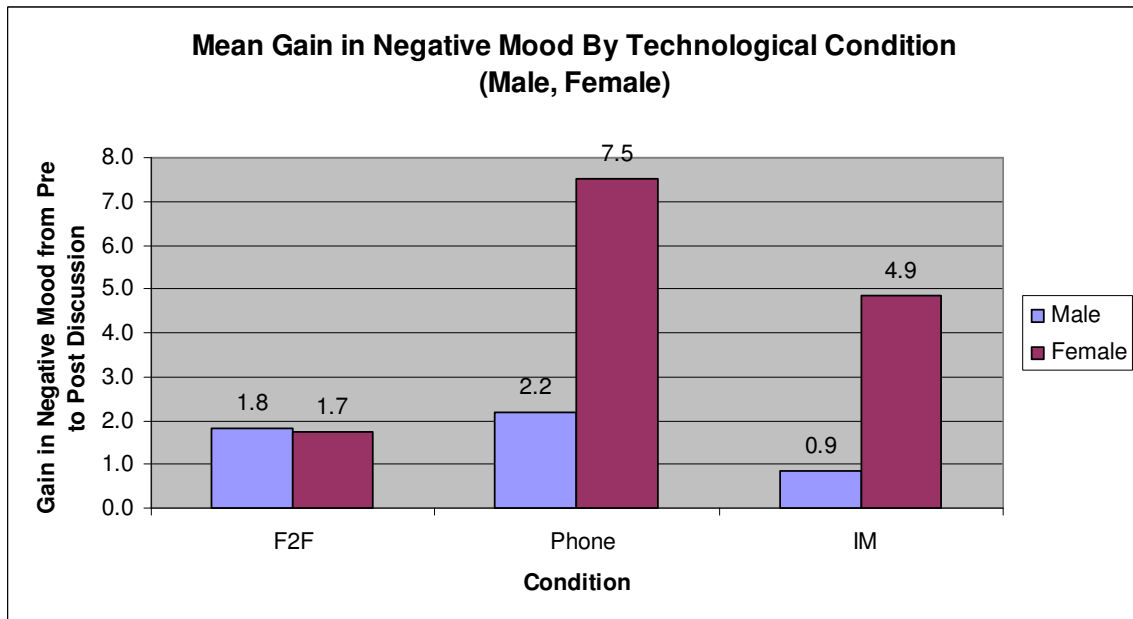


Figure 20. Mean Gain in Negative Mood from Pre to Post Discussion, Experiment II,
Male: $F(2, 42) = .99, p < .38$; Female: $F(2, 42) = 2.58, p < .09$

Behavioral Outcomes

Figure 21 shows the mean number of words by condition and gender. For the face-to-face condition, the mean number of words used by the female participants is 1566 (SD = 880), and the mean number of words used by the male participants is 1386 (SD = 692). For the phone condition, the mean number of words used by the female participants is 1035 (SD = 807), and the mean number of words used by the male participants is 890 (SD = 40). Finally, for the IM condition, the mean number of words used by the female participants is 711 (SD = 257), and the mean number of words used by the male participants is 637 (SD = 42). (Number of word data is included for eleven of the fifteen couples in the phone condition. This is due to problems during the experiments that made it difficult to hear some of the couples' conversations. This will be discussed further in Chapter 5.)

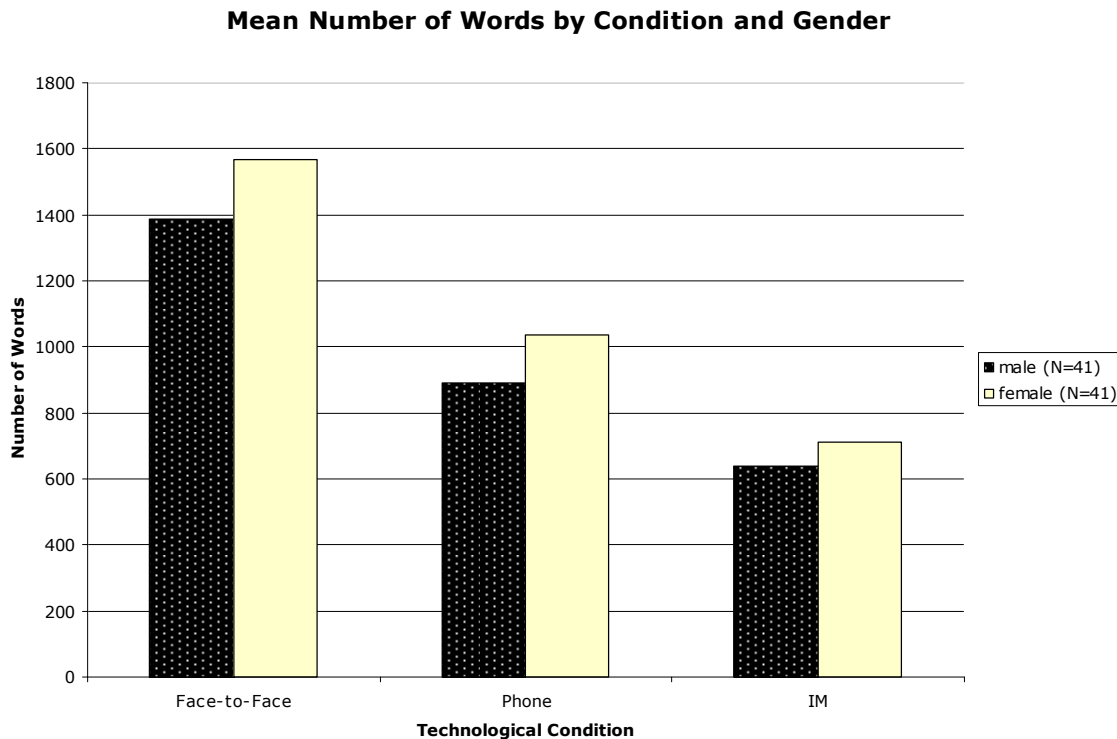


Figure 21. Mean Number of Words By Condition and Gender, Experiment II.

Table 14 shows the inter-correlations (for male and female) among depression, mood change (positive and negative), and number of words. The results show that there is a marginal correlation between female depression and male number of words. (Recall that there was a strong correlation between these variables in Experiment I.) There is a strong correlation female number of words and amount of time the couple argued (argument length, AL; $r = .404$, $p < .05$). There are also strong correlations between male number of words and lack of self-reported closure ($r = -.411$, $p = .05$) and self-reported arguments ($r = .448$, $p = .05$), respectively.

Table 14. Inter-correlations among Depression, Number of Turns, Words, & Self-Reported Closure/Arguments, Experiment II

	Length of Argument (mins)	Male Number Words	Male Number Turns	Female Number Words	Female Number Turns	Self Reported Closure	Self Reported Argued	Female Depression (BDI)	Male Depression (BDI)
Length of Argument (mins) (M = 23.2, SD = 12.0)	1	.275	.500(**)	.404(*)	.538(**)	-.096	.089	.090	-.009
		.091	.001	.011	.000	.541	.565	.555	.956
Male Number Words (M = 957.9, SD = 567.3)		1	.684(**)	.541(**)	.688(**)	-.411(*)	.448(**)	-.153	.232
			.000	.000	.000	.010	.004	.352	.160
Male Number Turns (M = 91.2, SD = 45.5)			1	.544(**)	.879(**)	-.255	.268	-.104	.202
				.000	.000	.123	.099	.528	.223
Female Number Words (M = 1087.4, SD = 758.3)				1	.416(**)	-.345(*)	.298	.017	.090
					.008	.034	.065	.919	.590
Female Number Turns (M = 92.6, SD = 47.2)					1	-.212	.264	-.133	.183
						.201	.104	.420	.272
Self Reported Closure (M = .35, SD = .48)						1	-.129	.056	.019
							.410	.721	.907
Self Reported Argued (M = .27, SD = .45)							1	-.052	.113
								.736	.471
Female Depression (BDI) (M = 7.71, SD = 6.51)								1	.272
									.074
Male Depression (BDI) (M = 6.93, SD = 5.38)									1

** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed).

In Experiment I, the total number of words used by the couple seemed to be influenced by male depression. This relationship existed for couples in both the face-to-face and phone conditions, but not for couples in the IM condition. In Experiment II, this influence, in any condition, diminished, as illustrated in the following graph (Figure 22).

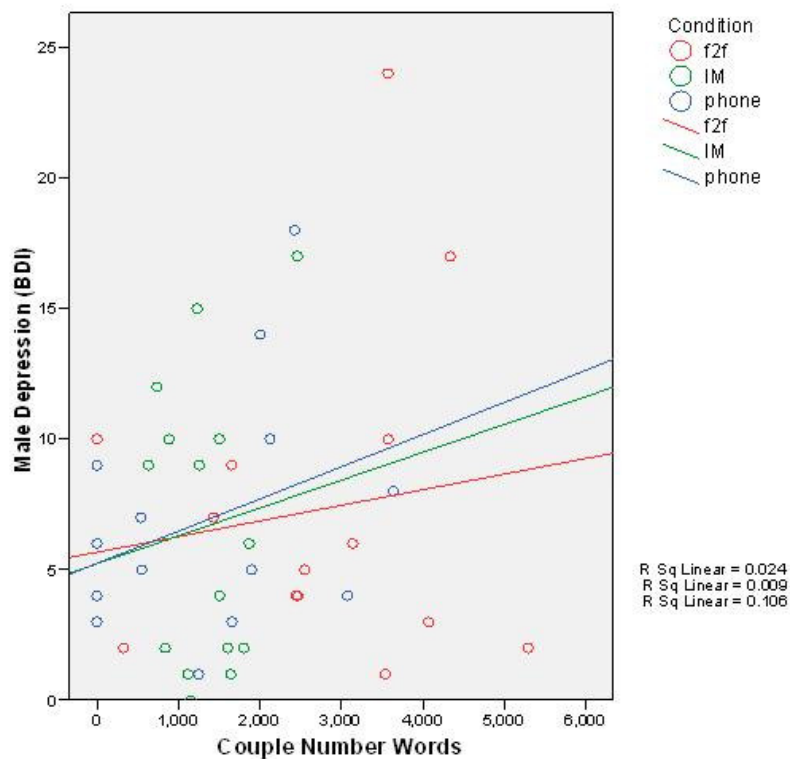


Figure 22. Correlation Between Couple Number of Words Used and Male Depression for Different Conditions, Experiment II

Table 15 shows interaction effects for male and female number of words. The interaction effect between male number of words and self-reports of closure is marginally significant ($p < .08$). Both male number of words and female number of words are influenced by the technology condition. These interaction effects are not significant ($p < .12$ and $p < .13$, respectively.)

Table 15. Tests of Effects of Male and Female Number of Words, Experiment II

	Dependent Variable	Mean Square	F	Sig.
Self-Reports of Closure	Male Number Words	700891.319	3.302	.079
	Female Number Words	776646.872	1.509	.229
Self-Reports of Arguments	Male Number Words	428964.244	2.021	.165
	Female Number Words	147310.996	.286	.597
Female depression	Male Number Words	145636.153	.686	.414
	Female Number Words	203023.519	.394	.535
Male depression	Male Number Words	471958.136	2.224	.146
	Female Number Words	23970.096	.047	.831
Tech condition	Male Number Words	488464.331	2.301	.118
	Female Number Words	1108784.424	2.154	.134
Error	Male Number Words	212239.116		
	Female Number Words	514742.295		

a R Squared = .467 (Adjusted R Squared = .361)

b R Squared = .290 (Adjusted R Squared = .149)

Total Apologies

Post-hoc qualitative analysis reveals that across all conditions, there were relatively few apologies made during couples' arguments. Table 16 shows the total number of apologies made in each condition for Experiment I, as well as apologies made by male and female participants. In the face-to-face condition, seven male participants apologized during the argument, and one female participant apologized. In the phone condition, one male participant apologized, and no female participants apologized. During arguments in the IM condition, two male participants apologized and seven female participants apologized.

One-way between subjects ANOVAs were run to determine whether there was a relationship between mood change and apologies. As with Experiment I, the results revealed no relationship between mood change, positive or negative.

Table 16. Apologies Made During Arguments By Condition and Gender, Experiment II

	Male	Female	Total Number of Apologies
F2F	7	1	8
Phone	1	0	1
IM	2	7	9

Additional analyses, shown in Table 17, reveal an interaction effect between technology condition and female number of apologies that is statistically significant ($p < .009$). There is also a marginally significant interaction effect between technology condition and male number of apologies ($p < .07$).

Table 17. Tests of Effects of Male and Female Number of Apology, Experiment II, Post-Hoc

Dependent Variable		Mean Square	F	Sig.
Male Number of Words	Male Number Apologies	.150	.932	.344
	Female Number Apologies	.006	.048	.829
Male Number of Turns	Male Number Apologies	.002	.011	.916
	Female Number Apologies	.161	1.203	.284
Female Number of Words	Male Number Apologies	.980	6.079	.022
	Female Number Apologies	.029	.215	.647
Female Number of Turns	Male Number Apologies	.018	.114	.739
	Female Number Apologies	.188	1.409	.247
Tech Condition	Male Number Apologies	.486	3.016	.069
	Female Number Apologies	.777	5.809	.009
Error	Male Number Apologies	.161		
	Female Number Apologies	.134		

a R Squared = .497 (Adjusted R Squared = .191)

b R Squared = .513 (Adjusted R Squared = .216)

Sub-Topic Repetitions

Post-hoc qualitative analysis reveals that across all conditions, at least one couple returned to a previously discussed topic during their arguments (Table 18). In the face-to-face condition, there were eleven topic repeats (by four couples). There were two topic repeats in the phone condition (by two couples). Couples in the IM condition returned to argument topics as often as couples in the face-to-face condition (11 times), and by more couples.

Table 18. Frequency of Sub-Topics Repeated During Arguments By Condition, Experiment II , Post-Hoc

	Sub-Topic Repeats	Number of Couples
F2F	11	4
Phone	2	2
IM	11	6

Discussion of Results – Experiment II

There are five main results that emerge from Experiment II. First, time couples spent arguing had only a marginally significant effect on couples' arguments across condition. Additionally, argument length did not significantly affect couples' self-reports of arguments or closure. Second, like Experiment I, the participants in Experiment II did experience a loss of positive mood, but this mood loss was not significant across conditions. Third, results suggest that couples in the IM condition were more likely to reach closure than couples in the face-to-face or phone conditions. Also, couples were less likely to report that they argued in the phone and IM conditions. Fourth, apologies (rare, but arguably significant events) varied by technological condition and gender. Women offered more apologies in the IM condition and men offered more in the face-to-face condition. Last, repetition, which may be a sign of frustration, appears to be related to the face-to-face and IM conditions.

Research Hypotheses

RH1: Couples will have more difficulty coming to closure when arguing using IM than when using the phone, and they will have more difficulty arguing on the phone than when arguing face-to-face.

Analysis of couples' self-reports of closure suggests that couples in the IM condition were more likely to reach closure than couples in either the face-to-face or phone conditions. These results are not consistent with the prediction for RH1.

RH2: Couples in the face-to-face condition will have more of an argument than couples in the phone condition, and couples in the phone condition will have more of an argument than couples in the IM condition.

Based on self-reports, more couples argued in the face-to-face condition than in phone and IM conditions. However, further analysis revealed no significant relationship between couples' self-reports of argument and condition. Since rater coding of the severity of the argument was not performed on Experiment II data, these results are inconclusive in regards to the prediction for RH2.

RH3: Couples arguing face-to-face will experience a greater loss of positive mood than couples arguing using the phone, and couples arguing using the phone will experience a greater loss of positive mood than couples arguing using IM.

To test this hypothesis, participants' mood states were measured before and after their arguments. Male and female participants in the phone condition experienced the worst loss of positive mood, followed by female participants in the face-to-face condition, and males in the IM condition. Female participants in the IM condition and male participants in the face-to-face condition experienced the least loss of positive mood. In this experiment, couples were given as much time

as they needed to argue. This was different from Experiment I, in which couples had only twenty minutes. These results are not consistent with the prediction for RH3.

RH4: Couples will repeat themselves less when using IM.

Post-hoc qualitative analysis reveals that across all conditions, at least one couple returned to a previously discussed topic during their arguments. Surprisingly, couples in the IM condition returned to argument topics as often as couples in the face-to-face condition. For Experiment II, the prediction for RH4 does not hold.

RH5: Across conditions, couples that offer apologies to each other will not suffer a significant loss of positive mood when compared to those couples who did offer apologies.

Statistical analyses did not reveal a relationship between mood change and number of apology. As with Experiment I, the results revealed no relationship between mood change, positive or negative. The prediction for does not RH5 holds.

Qualitative Results

Qualitative data are an important part of the current research. As mentioned in the previous chapter, qualitative analysis provides insight into user behavior, beyond what can be found in statistics alone (Rice, 1984). This section presents analyses of video data that captured couples' interactions during their arguments. Included in these analyses are drawings of participants' interactions. These illustrations mask specific features of participants' identities for the sake of confidentiality. However, the details of the illustrations as they pertain to the discussion are noticeable. Additionally, details about the environment in which the experiments took place, as well as couples' embodied behaviors are also discussed. This section concludes with a discussion

of the main finding in terms of the last research hypothesis (RH6).

How do arguments play out?

Except for those couples arguing in the face-to-face condition, experiments were held in two, different rooms. A small lab is used for one of the rooms. This lab contains three desks and two computers. During experiments in the face-to-face and phone conditions, the computers are powered off as to provide minimal distraction to participants. During experiments in the IM condition, only one of the computers is powered on. This room contains two armless swivel chairs, and during experiments in the phone condition, a phone is brought into the room, as well as an 8 ½ by 11 sheet of paper that has the number to the other phone. One video camera is positioned to capture the front view of participants in the face-to-face and phone conditions. For the IM condition, a camera was set up to capture the right side of the participants, due to positioning constraints of the room. In the second room (used for the phone and IM conditions) there is a desk, where there is a computer and phone. For experiments in the phone condition, there is an 8 ½ by 11 sheet of paper on which is written the number to the other phone. (For experiments in the IM condition, this sheet of paper is removed.) One video camera is perched to capture the front, left of the participant during the experiment. There is a four-legged, wooden chair at the desk. Toward the back of the room are two filing cabinets and a dry-erase board which are not used during the experiments.

Commonalities across conditions

Certain behaviors were common across all the conditions. For example, participants in all conditions took some time to get accustomed to the camera. They made comments like, 'This is weird', 'It's kinda weird arguing in front of a camera'. One participant said of the camera, 'We're not supposed to look...the cameras aren't there. We're here...natural'. Before or during their

arguments, many couples commented on how “stupid” or “weird” they thought their arguments topics were. Also, many did not believe they would be able to argue but they appeared to argue anyway.

Face-to-Face Condition: Embodied Behaviors and Interactions

These couples smiled a lot as they started these conversations. Their body language also varied. Some people swiveled in their chairs and others remained perfectly still. During their conversations, there was typically lots of eye contact, and participants did not spend a lot of time focusing on other items in the room. Couples’ arguments played out through the use of several behaviors during their interactions. At times they were quiet and subdued, and at other times, they were lively and animated. The range of behaviors participants exhibited includes animation, moving and rocking, proxemics, vocal intensity, gesturing, smiles, and repeating each other. Each of these behaviors is now discussed in turn.

Animation (Animated Actions)

Some participants were animated during their interactions. That is, they were lively and exhibited lots of energy. These participants used multiple parts of their bodies for their communication. One participant even stood up and mocked her partner during their argument (Figure 23a). Later in their argument, the same participant can be seen hitting her partner (Figure 23b).



Figure 23a. Animated actions, example 1



Figure 23b. Animation actions, example 2

Participants in the face-to-face condition were more animated when compared to those in the phone condition, and participants in the IM condition did not exhibit animated behaviors. The

next stills show examples of participants in the face-to-face condition exhibiting these behaviors during their interactions. In Figures 24 and 25, the female participants can be seen moving their hands fervently during their conversations. A male participant (Figure 26) motions with his hands and more subtly, with his head, as he speaks to his partner.



Figure 24. Animated actions, example 3



Figure 25. Animated actions, example 4

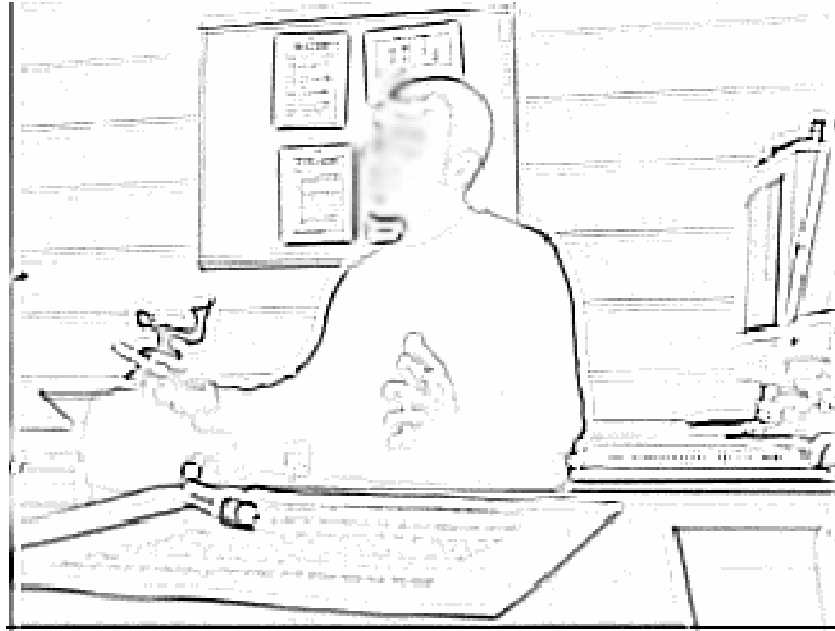


Figure 26. Animated actions example 5

Moving, Rocking

Participants moved around or shifted themselves in their seats during their interactions. The chairs in which the participants sat were swivel-enabled, so many swiveled from side to side as they interacted. Others rocked back and forth or from side to side. Sometimes they moved and shifted as they spoke; at other times their movements were made as they listened to their partners. Other smaller movements that participants made include fidgeting with pens or pencils as they talked, doodling on a piece of paper, and searching for items in a purse. By contrast, other participants sat with their arms folded, making no movements during their interaction, at all.

Proxemics

Participants moved toward and away from their partners during their interactions. They would lean forward for a few seconds then they would sit back. While they leaned toward their partners, they gave direct eye contact. As participants leaned in, their partners either pulled away from

them (by pushing their wheeled chairs back) or met them head-on with direct eye contact.

Examples of couples' proxemics are shown in Figures 27 and 28.

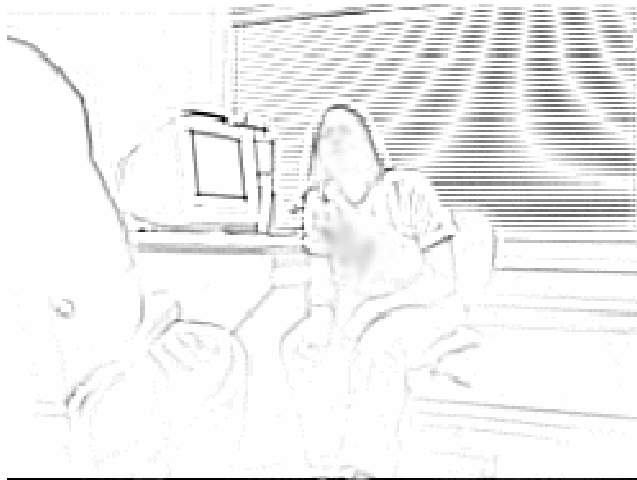


Figure 27. Proxemics, example 1



Figure 28. Proxemics, example 2

Vocal Intensity

Earlier in this chapter, evidence was presented showing that couples actually argued. Many of the participants engaging in the more intense arguments exhibited a range of vocal intensity. If participants raised his or her voice during the argument, their partners would match the rise in

intensity of their partners. In the following face-to-face exchange, both the male and female participants exhibit a range of vocal intensities. At one point during their argument, they were yelling at each other. The words in bold indicate when the participant's voice intensified; the words in bold and underlined indicate when the participant was yelling.

Female: OK, but, when? I do that on purpose. When I turn on my radio, I turn the loud down and the bass out.
Male: **Why?**!
Female: **Not as loud as you.** Not as loud as you!
Male: Yes you do.
Female: You have to have the big amps, so you can make it sound louder. **You do! Yes you do!**

This next example also shows the varied vocal intensity another couple used during their arguments. Again, the words in bold indicate when the participant's voice intensified.

Female: That sounded **awfully** harsh too.
Male: What did?
Female: You're like, '**She likes to be in control.**'
Male: Yeah, I **know**.

Gestures

Gesturing was common in participants in both the face-to-face and phone conditions. Participants gestured (using their arms and hands) to emphasize their comments. Gesturing is distinguished from the animation behavior described above in that it only involves movement of the hand or hands. Figures 29 through 31 show examples of the variety of gestures participants made during their arguments.



Figure 29. Gestures, example 1



Figure 30. Gestures, example 2

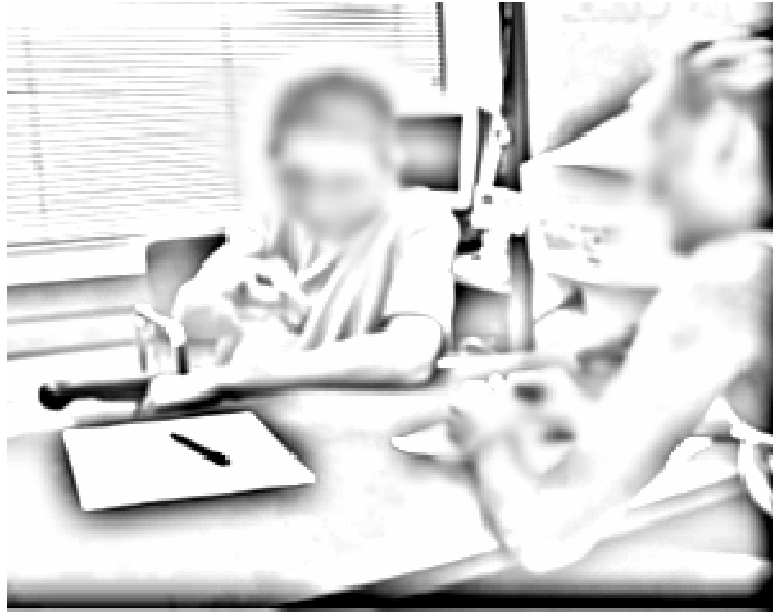


Figure 31. Gestures, example 3

Smiles, Social Smiles

Analysis of the video data revealed that couples in the face-to-face and phone conditions exchanged a great deal more smiles than those participants in the IM condition. Their smiles fell into one of two categories: (1) *felt* or (2) *fake* smiles. The difference between these smiles is that one is felt, an indication of spontaneous positive emotion, and the other is fake, an deliberate attempt to appear as if positive emotion is felt, but is not (Ekman, Friesen, 1982).

Physiologically, this difference is manifested around the inner part of the eye lid, the *orbicularis oculi*. When a person smiles as a result of being happy, the *orbicularis oculi* tightens involuntarily, producing a *Duchenne* smile. It is estimated that only 10% percent of the population can control the movement of this muscle (Ekman, 2003), so it is difficult to ‘fake’ a smile of enjoyment. Participant seemed to smile (and laugh) to show happiness, enjoyment, but they also smiled when it was clear that they were *not* happy. Both felt and social smiles occurred most often in the face-to-face condition. When it was clear (via the tone in their voice or the words they were using) that they were not happy, participants still seemed to smile as they either

commented to their partners or listened to what their partners were saying. Most participants smiled at some point during the conversation. Sometimes partners' smiles were returned, and sometimes they were not, as shown in the following example. The underlined text spoken by the participant indicates that he is smiling, but he is not happy.

Male: You're over there laughing, but you are spoiled.
Female: <laughs>
Male: It pisses me off. You're laughing and I'm smiling, but I'm really upset. I'm not playing with you!

Below are examples of smiling participants. In Figure 32, the male participant is exhibiting a *fake* social smile. The participants in Figures 33 and 34 are exhibiting *felt* smiles.



Figure 32. Social smile, example 1



Figure 33. Social smile, example 2



Figure 34. Social smile, example 3

Repeating Each Other

Many participants repeated each others' comments. This also occurs in the phone condition, though not as often. It does not occur in the IM condition. Sometimes participants seemed to

repeat comments when they wanted to confirm that their partners had said. This was often done in the form of a question, as shown in the excerpt for Couple A in Table 19. At other times, participants repeated their partners' comments in a way that seemed to indicate agreement. This was often done in a declarative statement, as shown in the excerpt for Couple B. There were also instances in which participants repeated their partners' comments in a way that seemed to indicate surprise or voice staunch disapproval. The excerpt for Couple C shows an example of this.

Table 19. Face-to-face Condition. Examples of exchanges in which couples repeat each other. The comments being repeated are shown in bold.

Couple A: Argued about her talking on her cell phone too much	
	<p>Female: I didn't think it was that big of a deal...I really didn't. I know it bothers you, but...</p> <p>Male: So you know it bothers me?</p> <p>Female: I know it bothers you, but, it's like, I mean...</p> <p>Male: Not that big a deal...</p>
Couple B: Argued about not spending enough time together	
	<p>Male: That'll be another way we can...</p> <p>Female: Do more things.</p> <p>Male: Do more things.</p> <p>Female: Right.</p>
Couple C: Argued about ways to raise children	
	<p>Female: You're gonna have a daughter somebody and she's going to be your little princess and you're gonna spoil her rotten.</p> <p>Male: And she's gonna go to military school.</p> <p>Female: No, she is NOT going to military school!</p>

Phone Condition: Embodied Behaviors and Interactions

Much like the couples in the face-to-face condition, couples in the phone condition smiled a lot as they started their conversations. Most of their body movements were gestures, as they did not do much moving around. In the absence of their partners, couples spent time focusing on other items in the room. Couples' arguments played out via several behaviors during their interactions, some of which are similar to those in the face-to-face condition. The range of behaviors participants exhibited include vocal intensity, gesturing, smiles, looking/fidgeting around the room, physical signs of distress (men), and repeating each other. Discussion of each of these behaviors follows.

Vocal Intensity

Earlier in this chapter, evidence was presented showing that couples actually argued. Many of the participants engaging in the more intense arguments exhibited a range of vocal intensity. If participants raised his or her voice during the argument, their partners would match the rise in intensity of their partners. In the following exchange over the phone, the female participant raises her voice to match her partner's intensity as he tells her to shut up. In an excerpt of their exchange that follows, the words in bold indicate when the participant's voice intensified; the words in bold and underlined indicate when the participant was yelling.

Male: So...**shut up**...**shut up**.
Female: Don't tell me to **shut up**!

In the following example in which a couple is arguing about the war in Iraq, the female participant gets frustrated and her voice intensifies. Her partner responds with intensity.

Female: Well, because **somebody** had to go out there
 and fight. I'm not going to tell some guy,
 'You shouldn't be out there fighting'.
Male: Oh, **really**?
Female: No, not exactly...**Oh, give me a break! No!**

Gestures

Even though couples were in separate rooms, gesturing was common in the phone condition. Participants gestured (using their arms and hands) to accompany their speech. Sometimes participants gestured as their partners made comments. In Figure 35, for example, the participant is gesturing in response to his partner's comments.

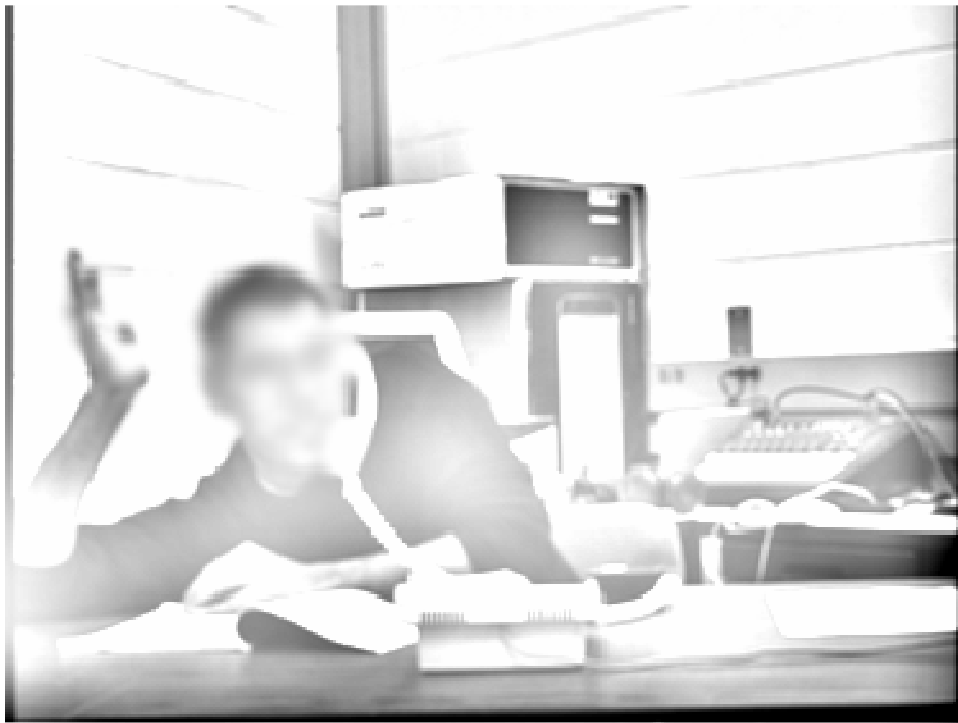


Figure 35. Gestures (phone), example 1

Most often, however, participants gestured as they spoke. This is indicated Figures 36 and 37 below.



Figure 36. Gestures (phone), example 2



Figure 37. Gestures (phone), example 3

Smiles

Couples smiled more in the face-to-face and phone conditions than those couples in the IM condition. However, couples in the phone condition did not produce as many social or fake smiles as the couples did in the face-to-face condition. Instead, couples (female participants, in particular) seemed to smile (and laugh) to show happiness or enjoyment at their partners' comments. Figures 38 through 40 illustrate examples of participants' smiles.



Figure 38. Smile (phone), example 1

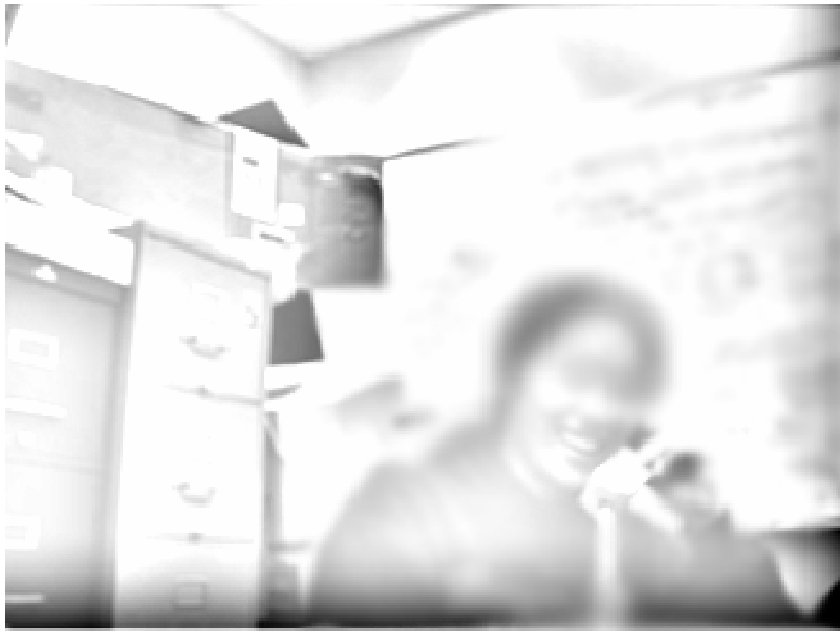


Figure 39. Smile (phone), example 2



Figure 40. Smile (phone), example 3

Looking/Fidgeting Around the Room

Couples in the phone condition seemed to look around the room much more frequently than couples in the other conditions. As they talked with their partners, they looked around to see what was around them. Couples also fidgeted with items in front of them. They would pick up a pen or pencil, thumb through the pages of a magazine (Figure 41), fidget with the phone (Figure 42) and phone cord (Figure 43). One participant opens the drawer of the desk in front of her (Figure 44).



Figure 41. Fidget (magazine), example 1



Figure 42. Fidget (phone), example 2



Figure 43. Fidget (cord), example 3

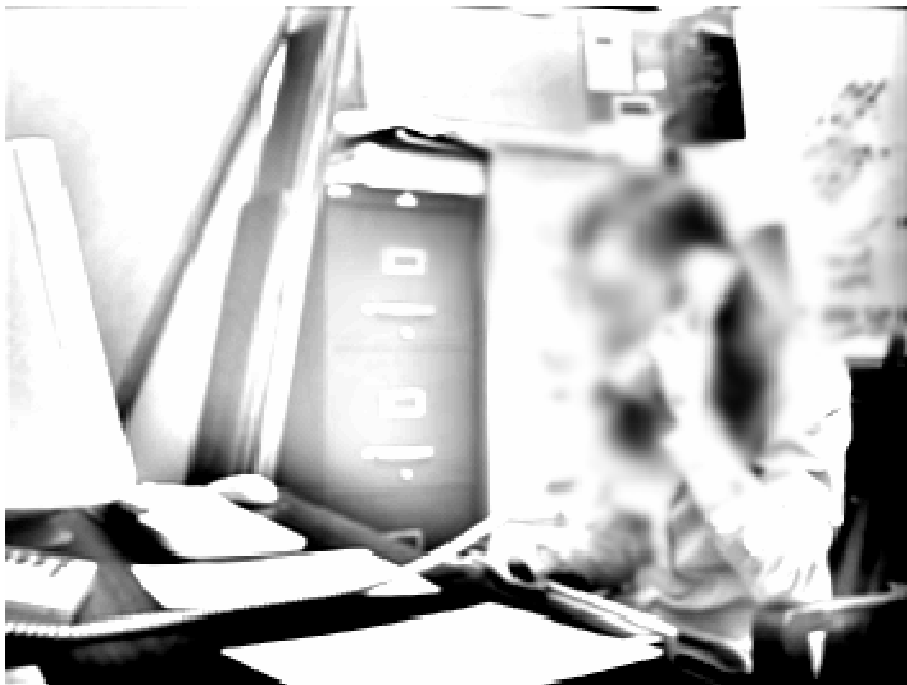


Figure 44. Fidget (drawer), example 4

Physical Signs of Distress

Many male participants in phone condition showed physical signs of distress during their arguments in comparison to the female participants. In particular, they sighed or exhaled sharply during their conversations, as shown by the male participant in Figure 45. One male participant hung up the phone in the middle of his conversation with his partner. Additional examples of male participants showing signs of distress can be seen in Figures 46 and 47.



Figure 45. Distress, example 1



Figure 46. Distress, example 2



Figure 47. Distress, example 3

Repeating Each Other

As stated in the previous section, participants seemed to repeat their partners' comments in both the face-to-face and phone conditions. The pattern of repetition is very similar to the face-to-face condition. Table 20 gives examples of couples' exchanges. There were instances in which participants repeated their partners' comments in a way that seemed to indicate surprise or voice staunch disapproval. In the excerpt for Couple I, the male participant is disagreeing with his partner. Sometimes participants seemed to repeat comments when they wanted to confirm that their partners had said. This was often done in the form of a question, as shown in the excerpt for Couple II in the table. At other times, participants repeated their partners' comments in a way that seemed to indicate agreement. This was often done in a declarative statement, as shown in the excerpt for Couple III (Table 20).

Table 20. Phone Condition. Examples of exchanges in which couples repeat each other. The comments being repeated are shown in bold.

Couple I: Argued about differing views on abortion	
	<p>Male: And kill it? Why, because we don't want it?</p> <p>Female: We don't kill everything that we don't want.</p> <p>Male: We kill everything we don't want.</p>
Couple II: Argued about differences in personal drive	
	<p>Female: So, you're saying that you're more determined and goal-oriented than I am.</p> <p>Male: Yes, that's what it seems like to me, at least.</p> <p>Female: That's what it seems like to you? Ok...so how did you come to this conclusion?</p>
Couple III: Argued about when to have a baby	
	<p>Female: Oh alright. That's in a year right? Get cracking!</p> <p>Male: Yeah, maybe if I finish in a year. Get cracking (laughs).</p>

Instant Messaging (IM)

IM Condition: Embodied Behaviors and Interactions

Couples arguing in the IM condition displayed the fewest embodied behaviors. These couples sat, mostly unmoved, as they typed to their partners. Thus, their body language was minimal.

During their conversations, couples were typically very focused on their conversation and were

not distracted by anything else. However, there were a few behaviors that couples exhibited that were unique to the IM condition. These behaviors include a select group of facial displays, talking back to the screen, positioning and posturing, and camera references. Each of these embodied behaviors is now discussed in turn.

Facial Displays

The female participants showed facial displays that ranged from contempt to happiness. Female participants tended to produce more facial displays than did the male participants. The displays most common among the female participants were social smiling, brow furrows, and pouts or grimaces. First, they smiled a lot during their conversations. They smiled in response to their partners comments (after reading comments on screen) and in response to their own comments (after typing their comments). Many female participants smiled continuously for periods of time during the course of their conversations. One female participant smiled for several minutes at a time during her conversation. Some female participants would smile before bursting into laughter or before making some other facial gestures. For example, many would continue to smile after laughing at their partner's comments (Figure 48).



Figure 48. Smile (IM), example 1

Social smiles appeared to occur most often among the female participants. They smiled both in response to comments they had read or comments they had made. Often after reading a comment that her partner had sent, a female participants would smile as she read it. Many times, the female participants would smile as they were writing their own messages to their partners.

A few male participants displayed social smiles during their conversations. Their smiles occurred in similar fashion as their female counterparts – either after they had written their comments or after they had read their partner’s comments. However, for the most part, their smiles occurred right at the start of their conversations then disappeared as their conversations continued.

Examples of smiling male participants are shown in Figures 49 and 50.



Figure 49. Smile (IM), example 2



Figure 50. Smile (IM), example 3

Many female participants furrowed their eyebrows during their conversations. In one case, a participant appeared to frown as she typed one of her responses, as shown in Figure 51.

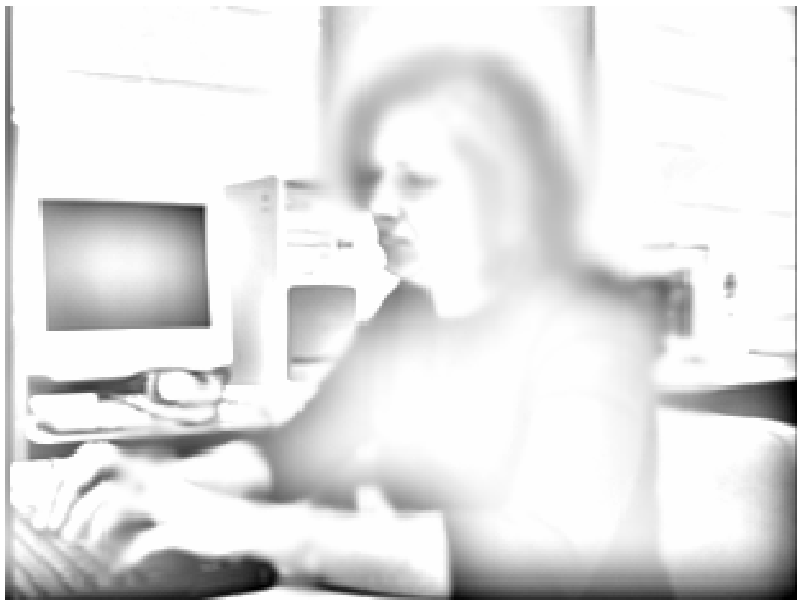


Figure 51. Frown (IM), example 1

Another participant furrowed her brow and frowned a great deal during her conversation. Her frowns did not appear to indicate a negative emotion as much as they seemed to punctuate her comments. After sending a comment to her, she would frown a little and raise her brow. At other times, this same participant would simply raise her brow as she typed her response to her partner, as shown in the stills of Figure 52.



Figure 52. Frown, brow (IM), example 2

At other times, female participants grimaced at their partners' comments. In many cases these were micro-expressions (expressions that happened very quickly), but at other times, they lingered for a several seconds. In a few cases, female participants read their partner's comments, and then grimaced. During their responses to their partners, they either continued to grimace or they puckered their mouths. Figures 53-54 show grimaces that occurred very quickly as the female participants displayed them in response to their partner's comments.



Figure 53. Grimace, example 1



Figure 54. Grimace, example 2

Talking Back to the Screen

A small number of male participants talked back to the screen during their conversations. This did not occur often. These “talk-balks” were often mumbled, so it is unclear exactly what the participant said. However, their comments were short, and as quickly as they talked, they were silent again, typing their conversations.

Positioning and Posturing

Female participants tended to sit straight up in their chairs. Some sat with their backs against the chair, but for the most part, many sat straight, using correct posture in front of the computer. A few male participants leaned forward as they typed, yet most of them, while they typed, tended to lean back in their chairs.

Sometimes, during the course of their conversations, participants would reposition themselves in their chairs. Some participants shifted their weight in their chair, some almost stood up completely to reposition their chair, and others took long stretches, raising their hands high over their heads and pushing their legs far under their desks.

Often, both male and female participants would lean forward in their seats to look more closely at the computer screen. Sometimes they leaned in close after they typed in their responses, while others leaned in to read prior to responding to their partners’ comments. In any case, they leaned in more closely apparently reading what appeared on the screen. Some smiled as they leaned in, and others looked pensive. Some participants leaned forward for a several seconds, and others leaned in closely for longer periods of time. After reading (or re-reading) comments, participants sat back in their chairs either to continue reading the comments on screen or to think about what they had read before making their own comments. Many of the female participants repositioned themselves to the front of their seats and leaned on the desk as they typed. Figure 55 shows an

example of a male participant leaning forward while responding to his partner.



Figure 55. Posture

Camera References

A few participants made comments or references to the video camera. Most of these references were made by the male participants. A male participant, for example, made two references to the running camera. In the first instance, after about five minutes into his conversation with his wife, he turns to the camera and makes a face. He then resumes the conversation. In the second camera reference, he thinks he hears a knock at the door and gets up to open it. After returning to his seat, he looks to the camera and says, 'And we're back!'. Another male participant, after typing a response to his partner, remarks, 'She's not going to like that.'

Discussion of Qualitative Results

To review, the range of behaviors couples exhibited during face-to-face arguments includes animation, moving and rocking, proxemics, vocal intensity, gesturing, smiles, and repeating each other. The range of behaviors that couples exhibited during phone arguments includes vocal intensity, gesturing, smiles, looking/fidgeting around the room, physical signs of distress, and repeating each other. Finally, the range of behaviors couples showed during arguments over IM included a select group of facial displays, talking back to the screen, positioning and posturing, and camera references.

RH6: Couples arguing in the face-to-face condition will express different emotional displays and embodied behaviors than couples arguing in the phone condition, and couples arguing in the phone condition will express different emotional displays and embodied behaviors than couples arguing in the IM condition.

There are three main findings that emerge from the analyses of these qualitative data. First, there is a *range* of behaviors that couples exhibit as they are communicating emotion across different media. These are behaviors that can only be found through careful observation and scrutiny of couples' interactions. These behaviors differ importantly between conditions and not always in the obvious or expected direction. Second, there are both similarities and differences in how couples argue in the face-to-face and phone conditions. In particular, couples arguing in both of these conditions are able to hear each other's voice inflection and tone (voice intensity). It has been claimed that couples in the phone condition are able to have the right mix of social presence and (Connell et al., 1994). However, there are also differences in these media that are manifested in how the arguments, themselves, play out. Couples in the phone condition did more looking around or fidgeting with objects in the room during their interactions. Arguably, couples interacting in the phone condition must compete with other objects vying for their partners'

attention. Third, there are differences in how couples argue in the richer media (face-to-face and phone) and the leanest medium (IM). Specifically, female participants tended to produce more facial displays than did the male participants, and their displays range from contempt to happiness. The displays most common among the female participants were smiling, brow furrows, and pouts or grimaces. These facial displays map, roughly, happiness, confusion, contempt/disgust, respectively (Ekman, 2003). These results show that female participants are less likely to suppress their emotions when arguing with their partners.

CHAPTER FIVE

This chapter will summarize the results for Experiments I and II, including the qualitative analyses. The next section discusses the main research questions in terms of the experimental results and the appropriate literature. The section that follows presents the makings of a model derived from the constructs examined in this study. This chapter concludes with a discussion of the contributions and limitations of the current research.

Review of Research Questions

The research questions posed by this research are

- RQ1: What are the different social and personal outcomes of arguments over different media?**
- RQ2: How is argumentation affected by technology use?**
- RQ3: How do conflict and its attendant emotional expressions unfold differently across different technological conditions?**

Experiments I & II

The experiments in this research featured couples who argued with each other cross three technological media: face-to-face, phone, and instant messaging (IM). A main focus of the first experiment was re-creating couples' conflict-laden interactions in a lab setting, then examining the dynamics of the interactions. Different global measures were used to examine the social, personal, and communicative outcomes of couples' experiments. In particular, this research examined mood differences before and after communication, self- and inter-rater reports of whether couples achieved closure/resolution, judgments about how much couples "got into it", and closeness measures (i.e., how close each partner felt to the other) between the partners. A main focus of the second experiment was to understand how time spent by condition affected couples' conflict-laden interactions. Both experiments presented opportunities to investigate the applicability of current theories that exist to explain mediated communication. Discussion and

interpretation of the results and outcomes of each experiment follow.

Discussion

Experiment I

Experiment I was designed to examine couples as they engaged in highly emotional interaction via different technological media: face-to-face, phone, and IM. In this experiment, couples were given twenty minutes to engage in an argument. The main results from this experiment are the following:

- Many couples did, indeed, argue when they were brought into the lab showing that this paradigm can work for studying conflict and technology use.
- Participants did not experience a statistically significant loss of positive mood possibly due to lack of power.
- Results showed that there were strong correlations and interaction effects between male depression and male number of words, particularly in the IM condition.

One contribution of Experiment I is that it showed that emotionally charged interactions can be brought into the lab and examined in relationship to media use. Studying personal interactions between couples whose communications matter to each can lead the way to understanding workplace conflict, particularly when it (conflict) is mediated via technology.

Another contribution of Experiment I is illustrated via the strong correlation between male depression and couple number of words used. (Recall that this result was significant in the face-to-face and phone conditions.) This suggests that depressed men interact differently in the IM

condition than in the face-to-face and phone conditions. This preliminary finding suggests that there are complex interactions of emotional and personal states with communicative goals and media effects that are not clearly understood. In order to investigate this result further, these findings need to be replicated in another experiment identical to Experiment I.

Experiment II

The main results from Experiment II are that

- Time spent by condition had only a marginally significant effect on couples' arguments across conditions. Additionally, time spent by condition did not significantly affect couples' argument or closure self-reports.
- Though participants did experience a loss of positive mood, this change was not significant across conditions.
- Couples in the IM condition were more likely to reach closure than couples in the face-to-face or phone conditions.

Time Spent by Condition, Experiment II

One contribution of Experiment II is that time spent by condition only had a marginally significant effect on couples' arguments across conditions. Additionally, time spent by condition did not significantly affect couples' argument or closure self-reports. This suggests two things: (1) couples may have had the opportunity to calm down during their arguments, and either reach resolution or agree to disagree, and (2) giving couples as much time as they needed during their arguments had little to no bearing on their ability to reach resolution. These results seem to counter existing CMC research which argues that over time, people engaging in computer-mediated communication reach the same goals as those communicating in richer media (Straus

and McGrath, 1994; Walther, 1995). Existing research also argues that people in face-to-face interactions take less time to make decisions or complete tasks (Straus and McGrath, 1994). However, in the current research, there was no relationship between couples arguing in the face-to-face condition and their self-reports of reaching closure. Additionally, couples' interactions across conditions are not equal (as show by qualitative analyses), regardless of time involved. As a result, the current research raises the issue that not enough is known about interpersonal, mediated communication to expect that increasing the time during which computer-mediated exchanges occurs would necessarily allow participants to meet the same goals as if they were to interact via a richer medium.

Qualitative Analyses

The main results from the Qualitative Analyses are that

- There is a *range* of behaviors that couples exhibit as they are communicating emotion across different media.
- There are both differences and similarities in how couples argue in the face-to-face and phone conditions.
- There are differences in how couples argue in the richer media (face-to-face and phone) and the leanest medium (IM).

The main outcome of the qualitative analyses is examination of important features of couples' interactions that otherwise would have been overlooked. Video analysis shows that participants managed their arguments differently by condition. These findings suggest that there are differences in how people communicate their conflict across media, though these differences may not show up in quantitative analyses.

Research Question 1

As mentioned earlier, the current research starts from the theoretical stance that the “cues-filtered-out” approach captures an important part of interpersonal communication using different media. This approach implies that different media have inherently different properties that impede successful communication (Culnan and Markus, 1987; Sproull and Kiesler, 1992). This would suggest that couples will be less able to conduct arguments in the restricted atmosphere of IM than in the richer atmosphere of face-to-face interaction, and their arguments will be shorter and less conclusive in more impoverished media than in richer. However, the current research has shown, as a result of Experiment I, that couples in the IM condition can have arguments as big as couples in the face-to-face and phone conditions.

Social information processing (SIP) predicts that engaging in non-routine, high-stakes interaction (such as arguing) via different media will produce no media differences from engaging in routine, low-stakes interaction. As an alternative, people’s abilities to compensate for media inadequacies could be tied to specific situations and less to global explanations of adaptation. As a result, the prediction would be that non-routine, high-stakes arguments will fail to progress, predicting shorter, less conclusive arguments in more impoverished media than in richer. However, as a result of the Experiment II of the current research, couples arguing in the IM condition self-reported their coming to a resolution more often than couples in face-to-face and phone conditions.

Social Identity/Deindividuation (SIDE) model says that people rely on stereotypes to judge behaviors and calibrate appropriate responses in the absence of information (Lea and Spears, 1991; Postmes et al., 2000). However, in the case of intimate couples, the person being interacted with is already quite individuated and well-known, making it unlikely for general stereotypes to be invoked. This would imply that SIDE will not be explanatory in the case of couples arguing.

Extending the SIDE model slightly to argue that people will use their personal model of the other in the absence of information, then one argues that precisely the growth in understanding that is crucial to solving difficult interpersonal problems is unlikely in less rich media compared to richer media. Thus, their own personal model of the other person in the absence of information would predict shorter, less conclusive arguments in more impoverished media than in richer. However, as a result of the experiments in this research, couples in the IM condition were most able to come to closure when compared to other conditions (in Experiment II).

Research Question 2

Couples' change in mood and closeness, as well as self- and inter-rater reports help to illuminate interaction phenomena during communication. In particular, couples' responsiveness to each other, the frequency (and occurrence) of apologies, and the repetition of topics are ways to examine how couples' comments are tied to changes in their behavior during the course of their arguments. For the current research, the number of apologies was not significant across conditions. Additionally, number of apologies had only a marginally significant effect with male positive mood, post-argument (for Experiment I, only).

Results from Experiment I show that couples did not repeat sub-topics during their arguments in Experiment I, but they also had difficulty reaching closure. However, coder results show that couples' arguments in the IM condition were as big as couples' arguments in the face-to-face and phone conditions. This might suggest that couples may not have been paying attention to each other during their arguments.

Research Question 3

Different media impose different constraints on communication (Clark and Brennan, 1991; Daft and Lengel, 1986). These constraints help to guide the communication. Given the constraints of

different media, I expected that couples' arguments would be more *emotionally* intense in the richer media. Qualitative analyses of videos of couples' interactions reveal that emotional intensity varies throughout conditions. Couples in the richer conditions express more emotional intensity through their facial displays and physical responses during the interactions.

Makings of a Model: Communication of Emotion

The current research takes a *grounded theory* approach to understanding the communication of emotion. Grounded theory is a comparative method that is grounded in data which is systematically gathered and collected (Glaser and Strauss, 1967). There is constant interplay between analysis and data collection. This kind of approach to research takes time and care, particular in the observation and recording of data and analysis.

Many of the constructs used in the current research did not yield significant results (Appendix: Additional Analyses/Constructs). Closeness, which measured how close couples felt to each other before and after the experiment, did not change significantly across conditions. Number of turns was another construct examined in the current research. This analysis was conducted to determine whether male or female input toward the argument was significant across conditions. This construct also yielded no significant results. The Inventory of Personal Problems, short form (IIP) was used to gather information about participants' personalities (Soldz et al., 1995). The goal in the analysis of participants' personalities was to understand their responsivity toward each other. In Experiment II, there were marginally significant correlations between male and female needs for dominance/affiliation and other constructs. Further examination of the relationship of these behaviors, with an increase in number of participants would give further insight into how these constructs affects highly emotionally-charged interactions via different media.

Though little of the quantitative data presented in the current research produced significant results – particularly across technological condition – other constructs examined during the course of this research have provided insight into the different behaviors that affect interpersonal communication. Nonetheless, examining several constructs together technological condition provides further insight into the dynamics of media use and high-stakes interactions. For example, a communication model could be derived to show the relationship between technological condition and closure. Figure 56 shows a model that incorporates whether couples argued, whether they apologized to each other, and whether they repeated themselves to predict closure.

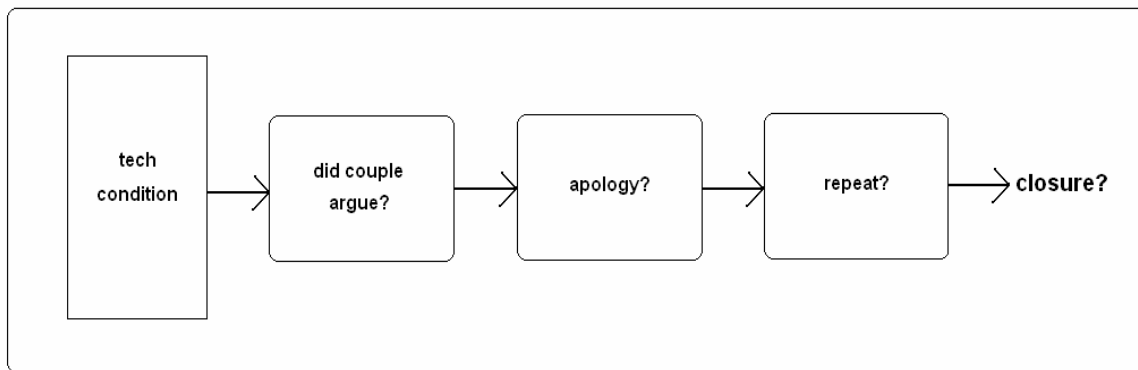


Figure 56. Model of Technological Condition and Argumentation

Men: Depression and Distress

There seemed to be an interesting and possibly complex interaction between emotional/personal states and media effects. For instances, results from the current study show signs of a relationship between depression and technological medium. In particular, depressed men seem to IM differently to communicate. It could be that IM acts as a buffer for depressed men, especially for sensitive discussions. Additionally, in the current study men in the phone condition (who may or may not be depressed) showed signs of distress much more frequently than they did in the other conditions. It is clear that *something* is happening during these interactions, and people do use

media differently. These phenomena deserve more study and may shed light not only on media choice, but also on the behavioral mechanisms that guide peoples' use of different media.

Some important design questions remain as a result of the current research. When, for example, should users switch to a different communication medium? Is there a point during their interaction when they should move to a richer or less rich medium? What happens when they are unable to switch? How do they compensate? Finally, can we make more targeted designs or usage suggestions for novel technologies such as the Emotion Mouse (Ark, et al., 1999)? These questions push the need to understand more about complex emotional interactions.

Limitations

One limitation of the current research is that neither experiment featured a very large N. In Experiment I, there were 24 couples, total, leaving only 8 couples in each condition with which to run analyses. Experiment II was a larger, with 45 couples; however, many of the statistical analyses were just shy of being statistically significant, indicating that more power was needed. Future research should involved more couples, at least thirty in each condition. Another limitation is that all phone and IM experiments were not held in the same room. Due to space constraints or room availability, a single, dedicated space in which to run every experiment was not possible. This likely introduced factors that added to variance in the data.

CHAPTER SIX

Conclusions

Technology has permeated nearly every part of human life. This is especially true of peoples' communications. More and more, people depend on technology to mediate their communications, and, often, their emotions. With such dependency of use, it is necessary to understand the various ways people use the technology. This research facilitated the creation of highly emotional situations as a means to push the current understanding of technology use and draw attention to the ways people use technology to mediate conflict.

The current research began by asking specific questions about the communication of emotion:

1. *Do different media have different effects on communication?*
2. *How do people choose media?*
3. *What are users' needs?*

This research purports that media do have different effects on communication, and these differences manifest themselves differently during human-communication interactions. People choose media based on their goals for the interaction. However, when people do not have a choice, they must to adapt. The current research explores a new paradigm for understanding emotional communication and technology use. Experimental results show that there is still much that needs to be understood about how people used technology for such important exchanges.

As mentioned in Chapter one, research in affective computing, in terms of mediating intimacy, is still fairly new. *Intimate objects* (Kaye and Goulding, 2004) are technological devices that allow couples to maintain their intimacy when they are separated from each other, and *feather, scent, and shaker* (Strong and Gaver, 1996), is a system that describes three forms of affective communication using a feather, scented oil, and linked shaker objects. The emotion mouse (Ark et. al, 1999) is a device that is able to detect a user's emotional state by tracking physiological

changes such as heart rate. The problem with these systems, however, is that either people are limited in what and how they can communicate to each other, or the system is at risk of misreading or misinterpreting information. Communicating emotion really matters to people, specifically couples. An advantage of the current research is that there is opportunity to inform the design of such systems.

Contributions

The current research attempts to take a multi-disciplinary approach to understanding a technological problem. It is hoped that this research adds to the body of human-computer interaction research by

- (1) laying the groundwork for the development of a more generalized model of the communication of emotion which extends conflictual situations,
- (2) examining technology use when users have not been given a choice, and thus
- (3) confirming that highly emotional and personal interactions can be studied within the context of technology use, and
- (4) providing an in-depth examination of couples' emotional interactions and identifying these processes in an empirical way.

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APPENDIX A – IRB Approval Memo



VIRGINIA POLYTECHNIC INSTITUTE
AND STATE UNIVERSITY

Institutional Review Board

Dr. David M. Moore
IRB (Human Subjects) Chair
Assistant Vice President for Research Compliance
1880 Pratt Drive, Suite 2006(0497), Blacksburg, VA 24061
Office: 540/231-4991; FAX: 540/231-0959
email: moored@vt.edu

DATE: February 27, 2006

MEMORANDUM

TO: Deborah Tatar Computer Science 0106
Jamika Burge

FROM: David Moore 

SUBJECT: 12:51:4 "Comprehensive Study of Human Communications Under Various Technological Conditions"
IRB # 05-337

The above referenced protocol was initially reviewed and approved by the Virginia Tech IRB on May 11, 2005. DHHS Office for Human Research Protections (OHRP) regulations require that on-going projects be reviewed and re-approved within 12 months (or sooner) from the date of the original approval of the protocol.

This memo is intended to ascertain the current status of your protocol, and, if needed, to prompt you to seek re-approval. Please provide the information requested below, and return a copy of this document to the Office of Research Compliance (attn: David Moore, Mail Stop 0497) at your earliest convenience.

Regarding the above referenced protocol [check the applicable statement]:

- ☐ **YES**, the project has been completed.
☐ **NO***, it has not been completed, and will require an extension beyond the original 12 month approval.

*NOTE:

If you checked NO, then you must submit the following materials for review and re-approval by the IRB Chair.

1. A copy of the original signed approval form.
2. A brief progress report to include: how many subjects were involved to date, and a description of any unforeseen complications or events which increased the level of risk to the subjects.
3. Any planned changes in the protocol which would impact the human subjects and the level of risk.
4. A re-analysis of the risks and benefits in light of the experience gained in the project to date.
1. An estimate of the time required (in months) to complete the study.

Your re-application package should be submitted through your departmental Human Subjects Committee or designated departmental IRB reviewer. Prompt completion of the package and transmittal to the Office of Research Compliance (attn: David Moore, Mail Stop 0442) will ensure timely action by the IRB prior to the approval expiration of the original protocol. As stated in the original approval letter, the request for continuation must be received **30 days prior** to the expiration date. Failure to submit the requested materials 30 days in advance of the expiration date may result in notification of the PI to stop all Human Subjects activities until updated approval is received.

APPENDIX B – IRB Proposal Package

Request for Expedited Approval of Research Involving Human Subjects

Investigators: **Jamika D. Burge, Deborah Tatar**

Department(s): **Computer Science**

Mail Code: **0106** E-mail: **{jaburge, tatar}@vt.edu** Phone **540.231.3986**

Project Title: **Comprehensive Study of Human Communications Under Various Technological Conditions**

of Human Subjects **60**

Source of Funding Support: ☒ Departmental Research _____ Sponsored Research (OSP No.: _____)

☐ All investigators of this project are qualified through completion of the formal training program or web-based training programs provided by the Virginia Tech Office of Research Compliance.

Note: To qualify for Expedited Approval, the research activities must: (a) present not more than minimal risk to the subjects, (b) not involve any of the special classes of subjects, except children as noted, and (c) involve only procedures listed in one or more of the following categories. The full description may be found in the Expedited Review section of the Virginia Tech “IRB Protocol Submission Instructions Document” or 45 CFR 46.110 (<http://ohrp.osophs.dhhs.gov/humansubjects/guidance/45cfr46.htm#46.110>)

Please mark/check the appropriate category below which qualifies the project for expedited review:

- ☐ 1. Clinical studies of drugs and medical devices when proscribed conditions are met [see item (1), page 8 of the “Instructions” document].
- ☐ 2. Collection of blood samples by finger, heel or ear stick, or venipuncture subject to proscribed limitations [see item (2), page 9 of the “Instructions” document].
- ☐ 3. Prospective collection of biological specimens for research purposes by noninvasive means. Examples: hair and nail clippings, deciduous teeth, permanent teeth, excreta and external secretions, uncannulated saliva, placenta, amniotic fluid, dental plaque, muscosal and skin cells and sputum [see item (3), page 9 of the “Instructions” document].
- ☐ 4. Collection of data through noninvasive procedures routinely employed in clinical practice, excluding procedures involving x-rays or microwaves [see item (4), page 9 of the “Instructions”].
- ☐ 5. Research involving materials (data, documents, records or specimens) that have been collected or will be collected solely for non-research purposes (such as medical treatment or diagnosis [see item (5), page 10 of the “Instructions” document].
- ☒ 6. Collection of data from voice, video, digital, or image recordings made for research purposes [see item (6), page 10 of the “Instructions” document].
- ☒ 7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language communication, cultural beliefs or practices, social behavior), or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies [see item (7), page 10 of the “Instructions” document].

Investigator(s)	Jamika Burge Print Name	Date
Investigator(s)	Deborah Tatar, PhD Print Name	Date
Departmental Reviewer	Dennis Kafura Print Name	Date
Chair, Institutional Review Board		Date

Outline for Protocol to Accompany IRB Request

Justification of Project

This experiment seeks to understand the extent to which and processes by which technology mediates communication and emotion between two people who have a stake in the interaction and in maintaining their relationship. This experiment replicates a procedure used with a similar demographic group in a social/personality psychology research context and extends it to considering the effects of technology. The growth of ubiquitous computing suggests that the boundaries between social and task attention, cognition, affect and behavior will continue to grow as factors affecting technology adoption and success (on the one hand) and interpersonal interaction (on the other). The relevant processes need to be identified and their consequences understood.

Procedures

The participant pool for this study will be members of the university involved in male/female couples relationships who have access to the resources of the university counseling agency. These couples will be sought through email solicitation and posted announcements on campus. All interested couples will complete a background/demographics survey and be interviewed for the study. From this interview, thirty couples (sixty people) will be selected to participate in the experiment.

First, we will ask couples to come up with a list of topics that they disagree about and a list of happy reminiscences. Each will complete an initial demographic, personality inventory, technology history, couples history form, intimacy/satisfaction scale and generate a list of grievances and a list of happy reminiscences. Then, couples will engage in argument or planning sessions in one of three conditions: face-to-face, by phone or communicating by Instant Messaging. Interactions will be video and audio-taped at both ends. Couples will be interrupted after twenty minutes. The couple will separately report through interview and questionnaire techniques on what happened during the session, how they feel about themselves, the other, and the relationship and indicate their mood. Couples will be brought together (face-to-face) to engage in a twenty minute happy reminiscence session. Again, they will be separated to complete another mood questionnaire.

We will contact each member of the couple two days after the experiment to ensure that there are no side effects from argumentation (although in previous research no such side-effects were found).

Risks and Benefits

Since couples are asked to engage in an emotional encounter, there is some possibility of an emotional aftereffect. This possibility is mitigated by asking participants to agree ahead of time on a topic, thus allowing them to pick something at an appropriate level. In previous studies, no distress has been encountered. Nonetheless, participants will only be considered who have access to the 24 hour university counseling services in case any upset results from the discussion. Furthermore, we will contact the participants two days after the discussion to check in with them.

Confidentiality/Anonymity

We will treat all data as anonymous and confidential. Subjects will be videotaped, with permission, and their identities will be kept in strictest confidence. Subject names and videotapes will be kept in locked cabinets separate from other data. We will ask subjects for permission to use short video clips for illustrative purposes in research contexts.

Informed Consent for Participants in Research Projects Involving Human Subjects

Title of Project: Comprehensive Study of Human Communications Under Various Technological Conditions

Investigator(s): Deborah Tatar, PhD and Jamika D. Burge

I. Purpose of this Research/Project

This research will seek to understand the effects of different communication media on couples' communication, especially when they have feelings about the topic, and when they disagree.

II. Procedures

First, we will ask you to come up with a list of topics that you and your partner disagree about and a list of happy reminiscences. We will also ask you to fill out questionnaires about yourself, your relationship, your mood, and your prior use of technology. Then you and your partner will agree on a contentious topic to discuss. Some couples will talk face-to-face, some over the phone and some using Instant Messaging. You will be video and audio taped during this discussion. After about twenty minutes, you will separately report on what happened during the session, your feelings, and your feelings about your partner. Then, we will ask the two of you to agree on some happy memories to discuss. You will be asked to talk about these, face-to-face for twenty minutes. This will also be videotaped. Then you will be separated to report again on your feelings, your partner and your relationship.

We will contact you two days after the experiment to check on how you are feeling about this experience and your relationship.

III. Risks

There is no risk or threat of physical harm to those who participate in this study. Risk of damage to the relationship or your feelings is no greater than with naturally occurring discussions of contentious topics.

IV. Benefits

From this experiment, we expect to better understand people's interactions and compare these interactions within different communications media are used. We hope to apply our findings to technology's current state-of-the-art. Ultimately, we hope to be able to help foster the quality of communication via technical channels (IM, phone) in a fashion that mimics face-to-face as closely as possible. Participants may come to understand one another and their relationship better through the encounter.

V. Extent of Anonymity and Confidentiality

Your identity will be kept anonymous. We will treat all data as confidential. You will be video and audio taped. Your name and the original videotape will be kept in locked cabinets. Videotapes will be shown only to project personnel.

We would like to ask you for permission to use short video clips for illustrative purposes in research contexts. There is a slight risk that you might be identified by material in the clip if someone in the research audience knows you well. Your initials here indicate that you agree to this:_____. Your name will not be used.

VI. Compensation

There will be monetary compensation not to exceed \$20. The experimenters will comply with the needs of any participant who requires medical attention.

VII. Freedom to Withdraw

Participants are free to withdraw from a study at any time without penalty. If you choose to withdraw, you will be compensated for the portion of the time of the study (if financial compensation is involved) that you completed. If you choose to withdraw, you will not be penalized by reduction in points or grade in a course (if course credit is involved). You are free not to answer any questions or respond to experimental situations that you choose to, without penalty.

There may be circumstances under which the investigator may determine that a participant should not continue. In this event, you will be compensated for the portion of the project completed (if financial compensation is involved).

VIII. Approval of Research

This research project has been approved, as required, by the Institutional Review

Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University, and by the Department of Computer Science and the Center for Human-Computer Interaction.

IX. Subject's Responsibilities

I voluntarily agree to participate in this study.

X. Subject's Permission

I have read and understand the Informed Consent and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent:

_____ Date _____

Subject signature

Should I have any pertinent questions about this research or its conduct, and research subjects' rights, and whom to contact in the event of a research-related injury to the subject, I may contact:

Jamika D. Burge

Investigator

Dr. Deborah Tatar

Faculty Advisor

Dr. Dennis Kafura

Departmental Reviewer/Department Head

David M. Moore

Chair, IRB

Office of Research Compliance

Research & Graduate Studies

540.231.3896/jaburge@vt.edu

Telephone/e-mail

tatar@cs.vt.edu/540.231.8457

Telephone/e-mail

kafura@cs.vt.edu/540.231.6931

Telephone/e-mail

540-231-4991/moored@vt.edu

Telephone/e-mail

This Informed Consent is valid from **May 11, 2004** to **May 11, 2006**.

APPENDIX C – Background Information Form

1. Name: _____
2. Name of Partner: _____
3. Date: _____ Time: _____
4. Age: _____
5. Please Circle: Freshman Sophomore Junior Senior
Master's PhD None Other
6. What is your chief area of study? _____
7. Please circle: Male Female
8. Please circle: White Black Asian Hispanic Other: _____
9. Are you a U.S. citizen? Yes No
10. Were you born in the United States? Yes No If not, where: _____
11. What was your first language? _____
12. Where did you grow up? _____
13. How many years have you been in Blacksburg? _____
14. Do you live on campus? _____

APPENDIX D – Communications Patterns Survey

Name: _____ Gender: _____

1. Have you ever used IM? _____

2. If you have used IM, what kind of IM software have you used?

- i. AIM (AOL)
- ii. Instant Messenger (MSN)
- iii. Yahoo Messenger (Yahoo)
- iv. Other _____

3. Approximately how often would you say you use IM?

Never use it	Once or twice a week	Three to five times a week	Several times a day	I'm always on IM!
-----------------	-------------------------	-------------------------------	------------------------	----------------------

4. How often do you talk on the phone with your partner?

1	2	3	4	5	6	7
never						several times a day

5. How often do you use IM to chat with your partner?

1	2	3	4	5	6	7
never						almost all the time

6. How often is your partner unresponsive during personal discussions?

1	2	3	4	5	6	7
never						always

APPENDIX E – Pre/Post-Experiment Questionnaire

Gender _____ Age _____

Please answer each of the following questions according to how you personally feel about your partner and the relationship you now have with your partner. Select your response for each question by circling the number that best represents your feeling.

Your answers are anonymous and confidential. Your partner will never see them. Please answer honestly. Thank you!

1. How close do you feel to your partner?

1	2	3	4	5	6	7	8	9	10
not close					as close as two				
at all					people can be				

2. How much do you like your partner?

1	2	3	4	5	6	7	8	9	10
not much					as much				
at all					as possible				

3. How satisfied are you with your partner?

1	2	3	4	5	6	7	8	9	10
as satisfied as					not satisfied				
possible					at all				

4. How dissatisfied are you with your partner?

1	2	3	4	5	6	7	8	9	10
as dissatisfied as					not dissatisfied				
possible					at all				

5. How much time would you like to spend together?

1	2	3	4	5	6	7	8	9	10
none					all the time				

6. How much did you enjoy participating in this experiment?

1	2	3	4	5	6	7	8	9	10
not at all					a great deal				

7. How helpful did you find this experiment to be?

1	2	3	4	5	6	7	8	9	10
not helpful					extremely				
at all									

APPENDIX F – Pre/Post-PANAS

Name: _____

Date: _____

This scale consists of a number of words and phrases that describe the different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you are feeling this way right now. Use the following scale to record your answers:

1 very slightly or not at all	2 a little	3 moderately	4 quite a bit	5 extremely
_____ cheerfully	_____ sad	_____ active	_____ angry at self	
_____ disgusted	_____ calm	_____ guilty	_____ enthusiastic	
_____ attentive	_____ afraid	_____ joyful	_____ downhearted	
_____ bashful	_____ tired	_____ nervous	_____ sheepish	
_____ sluggish	_____ amazed	_____ lonely	_____ distressed	
_____ daring	_____ shaky	_____ sleepy	_____ blameworthy	
_____ surprised	_____ happy	_____ excited	_____ determined	
_____ strong	_____ timid	_____ hostile	_____ frightened	
_____ scornful	_____ alone	_____ proud	_____ astonished	
_____ relaxed	_____ alert	_____ jittery	_____ interested	
_____ irritable	_____ upset	_____ lively	_____ loathing	
_____ delighted	_____ angry	_____ ashamed	_____ confident	
_____ inspired	_____ bold	_____ at ease	_____ energetic	
_____ fearless	_____ blue	_____ scared	_____ concentrating	
_____ disgusted with self	_____ shy	_____ drowsy	_____ dissatisfied with self	

APPENDIX G – Results for Additional Analyses/Constructs

This chapter presents the results for additional constructs that were examined from data from Experiments I and II. The constructs presented in this section include closeness, dominance and affiliation measures, number of turns.

Results – Experiment I

Interpersonal Problems Inventory (IIP-32)

Each participant completed an interpersonal problems inventory (IIP). The IIP was used to gather information about participants' personality relating to interpersonal distress. It consists of eight subscales that combine to identify a person's position in a two-dimensional graph of problems with dominance/submissive and problems with affiliation/distance. Individual t-scores were calculated for all eight scales represented in the inventory. T-scores greater than 70 indicate difficulty beyond an individual's overall level of interpersonal distress. Table A1 shows the number of male and female participants in each condition with dominance and affiliation scores greater than 70. More participants expressed a need for domination than a need for affiliation. Nineteen men and eighteen women reported no particular difficulties.

Table A1. Number of Male and Female Participants Having Raised Level of Interpersonal Distress, By Condition (Experiment I)

	Dominant		Affiliative	
	M	F	M	F
F2F	1	2	0	1
Phone	2	1	1	0
IM	1	3	0	0

Statistical tests (including correlation matrices and one-way ANOVAs) yielded insufficient analyses due to the small number of data due to the small sample size.

Global Outcomes

Closeness

Couples completed a pre-experiment questionnaire that asked them to rate how close they felt to each other. For couples in Experiment I, results are reported for fourteen couples, instead of 24, because the original format of the questionnaire was altered after the first 10 couples. Originally, the Affective Intimacy Scale (Aron & Aron, 1992) scale was used, which asks a series of questions each of which allows participants to choose one of five arrangements of Venn diagrams, representing the self and the other. At the distant end of the spectrum, the two circles do not overlap at all, while at the highly intimate end of the spectrum, the two are nearly entirely overlapped. However, as these displayed no variation, I substituted a 10-item Likert scale with the same questions and end point markers “As close as possible” and “Not at all close.”

The pre- and post-experiment questionnaires were both comprised of the same five questions. For question 1, participants were asked, ‘How close do you feel to your partner?’. For question 2, participants were asked, ‘How much do you like your partner?’, and for question 3 asked, ‘How satisfied are you with your partner?’. Question 4 asked, ‘How dissatisfied are you with your partner?’. Finally, question 5 asked, ‘How much time would you like to spend with your partner?’. The following graphs show pre- and post-closeness scores for the males and females, respectively (Figures A12-A15). For male participants, the mean score in closeness, pre-experiment, is 6.35, and the mean change in closeness, post-experiment, is 6.24. For females, the mean closeness score, pre-experiment, is 6.61, and the mean score, post-experiment, is 6.54. Figures A12 show the pre- and post-experiment mean closeness scores across conditions, for male and female participants, respectively. One-way ANOVAs were run to determine the significance of participants’ changes in closeness from before and after the argument. Results showed that these changes were not significant.

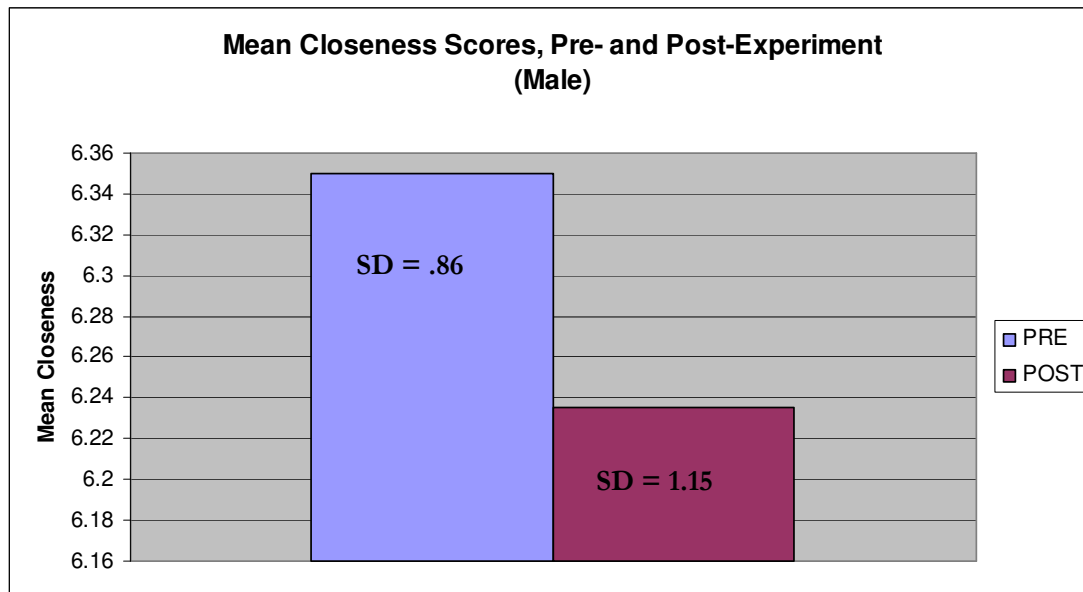


Figure A12. Mean Closeness Scores, All Conditions (Male) Experiment I

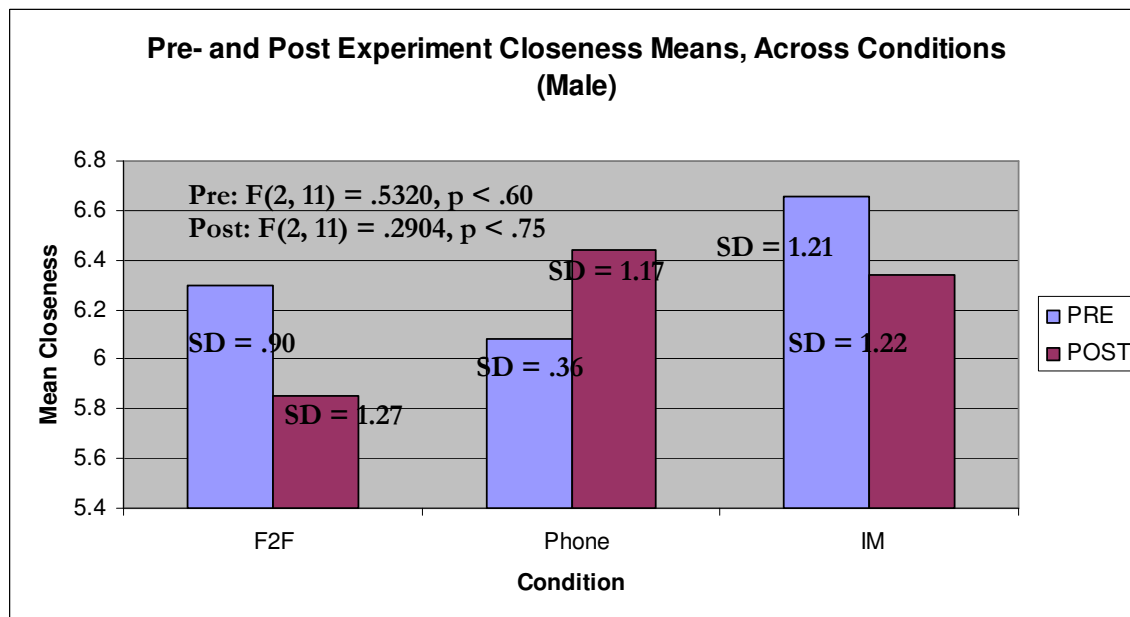


Figure A13. Mean Closeness Scores, By Conditions (Male) Experiment I,
 Pre: $F(2, 11) = .5320, p < .60$; Post: $F(2, 11) = .2904, p < .75$

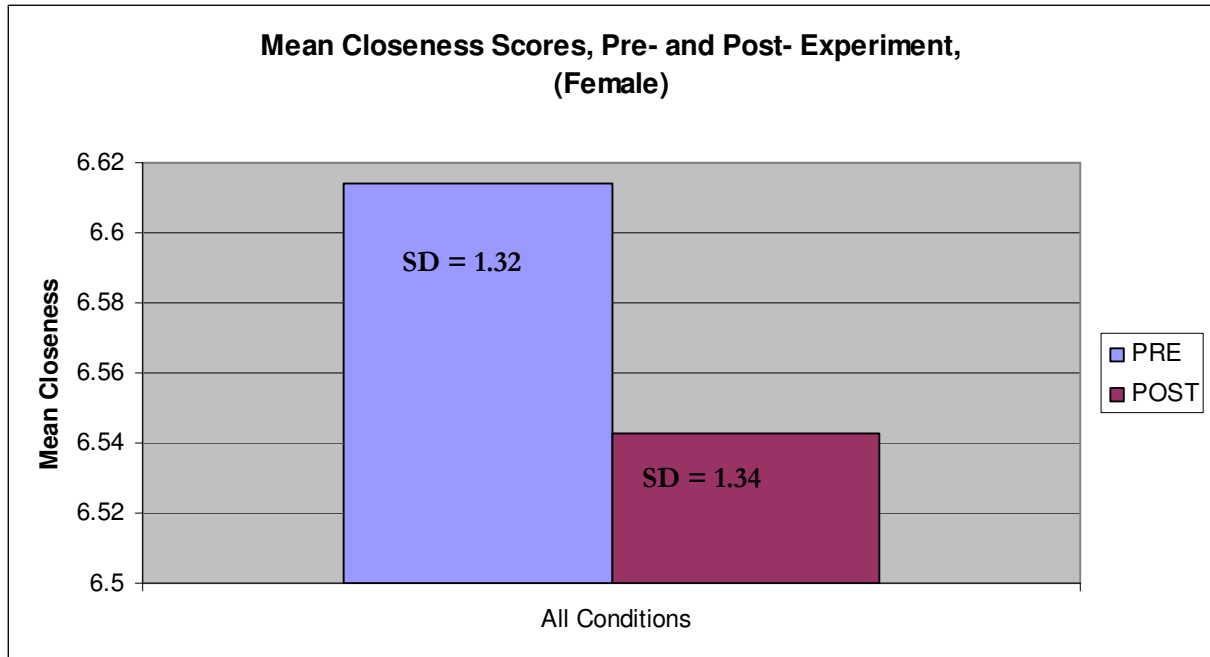


Figure A14. Mean Closeness Scores, All Conditions (Female) Experiment I

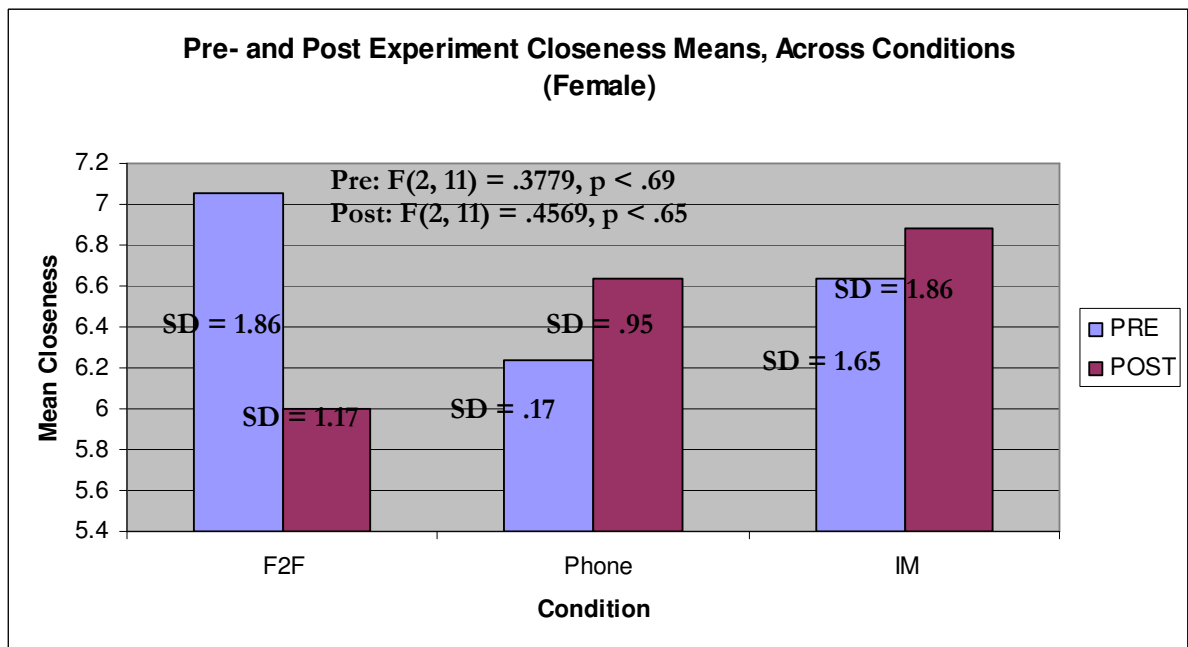


Figure A15. Mean Closeness Scores, Across Conditions (Female) Experiment I,
 Pre: $F(2, 11) = .3779, p < .69$; Post: $F(2, 11) = .4569, p < .65$

Behavior Outcomes

Number of Turns

Male number of turns ($M = 69.1$, $SD = 27.8$) and female number of turns ($M = 64.75$, $SD = 32.5$) were found to have no interaction effects with male number of apology and female apology (Table A2).

Table A2. Tests of Between Subject Effects, Male and Female Number of Turns, Experiment I

Source	Dependent Variable	F	Sig.
Male Num Turns	Male Num Apology	.009	.927
	Female Num Apology	.197	.669
Female Num Turns	Male Num Apology	.072	.795
	Female Num Apology	.109	.750

a R Squared = .653 (Adjusted R Squared = .046)

b R Squared = .930 (Adjusted R Squared = .808)

Additional analyses were performed to determine if there were interaction effects between male and female number of turns and other self-reports of closure and argument, as well as technology condition. The following table shows there were no significant effects.

Table A3. Tests of Between-Subjects Effects, Male and Female Number of Words, Experiment I

Source	Dependent Variable	Mean Square	F	Sig.
Self-Report Closure	Male Num Words	2386.315	.019	.892
	Male Num Turns	101.215	.134	.718
	Female Num Words	23368.509	.181	.676
	Female Num Turns	128.242	.152	.702
Self-Report Argument	Male Num Words	4383.201	.035	.854
	Male Num Turns	382.469	.508	.485
	Female Num Words	497685.553	3.848	.065
	Female Num Turns	415.541	.491	.492
Tech Condition	Male Num Words	632607.231	5.015	.019
	Male Num Turns	1642.535	2.181	.142
	Female Num Words	2154460.354	16.660	.000
	Female Num Turns	1921.974	2.271	.132

a R Squared = .360 (Adjusted R Squared = .218)
b R Squared = .358 (Adjusted R Squared = .216)
c R Squared = .231 (Adjusted R Squared = .060)
d R Squared = .665 (Adjusted R Squared = .591)
e R Squared = .237 (Adjusted R Squared = .068)

Results – Experiment II

Interpersonal Problems Inventory (IIP-32)

As with couples in Experiment I, t-scores > 70 indicate difficulty beyond an individual's overall level of interpersonal distress. Table A4 shows the number of male and female participants (for each condition) whose scores indicate interpersonal distress in the *dominant* and *affiliative* scales.

The proportion of participants with these two kinds of distress was comparable to those in Experiment I.

Table A4. Number of Male and Female Participants Having Raised Level of Interpersonal Distress, By Condition (Experiment II)

	Dominating		Affiliative	
	M	F	M	F
F2F	5	5	0	0
Phone	3	6	1	0
IM	2	2	1	0

Additional analysis shows several correlations (that are marginally significant) for male and female dominance and affiliation. Specifically, the higher the female need for dominance, the higher the need for male affiliation, and the higher the female need for affiliation, the higher the male need for affiliation.

Global Outcomes

Closeness

Figures A26 and A27 show pre- and post-closeness scores for the males and females, respectively. For male participants, the mean change in closeness, pre-experiment, is 8.31, and the mean change in closeness, post-experiment, is 8.28. For females, the mean change in closeness, pre-experiment, is 7.50, and the mean change in closeness, post-experiment, is 7.43. Figures A28 and A29 show the pre- and post- experiment mean closeness scores across conditions, for male and female participants, respectively. ANOVAs were run to determine the significance of participants' changes in closeness scores from before and after the argument. Results showed that these changes were not significant.

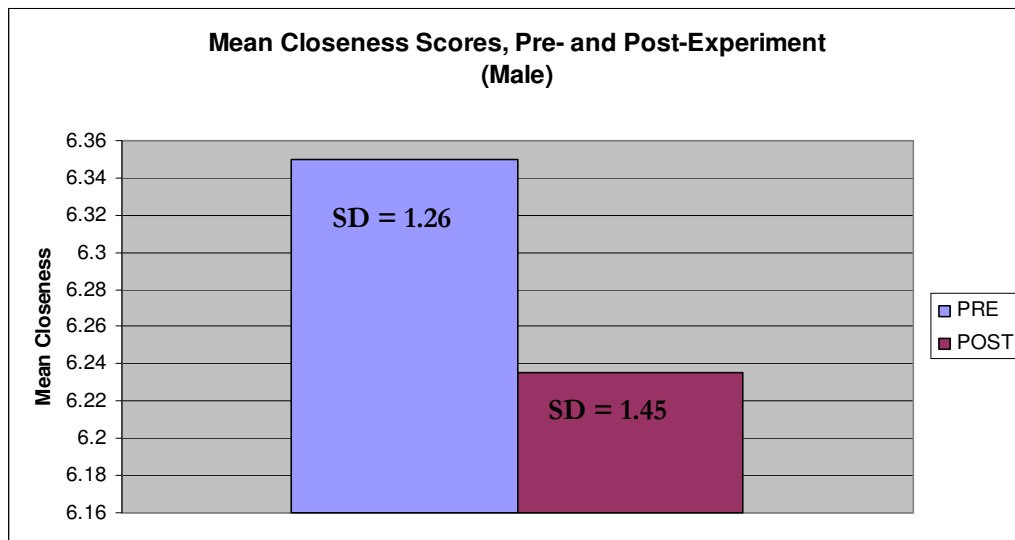


Figure A26. Mean Closeness Scores, All Conditions (Male) Experiment II

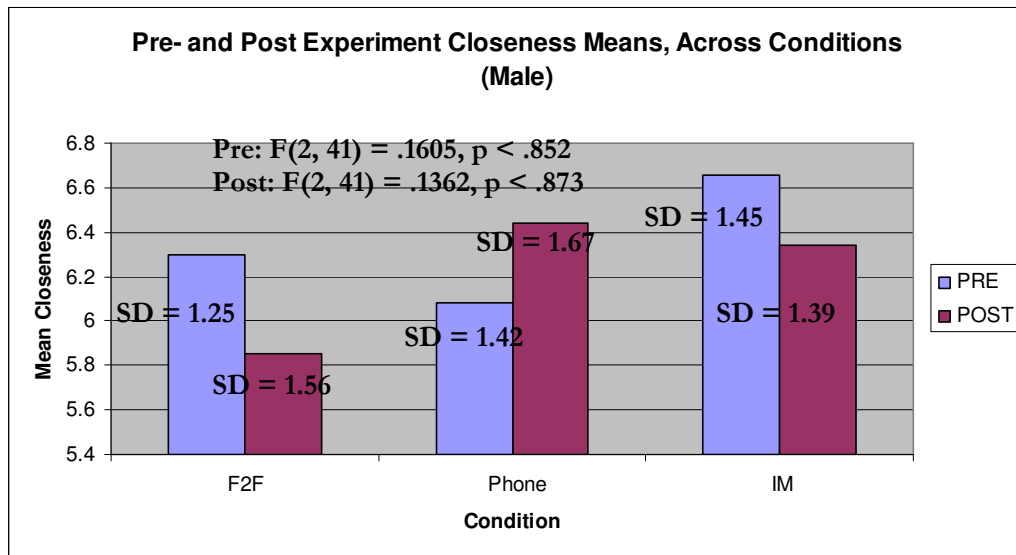


Figure A27. Mean Closeness Scores, Across Conditions (Male) Experiment II,
 Pre: $F(2, 41) = .1605, p < .852$; Post: $F(2, 41) = .1362, p < .873$

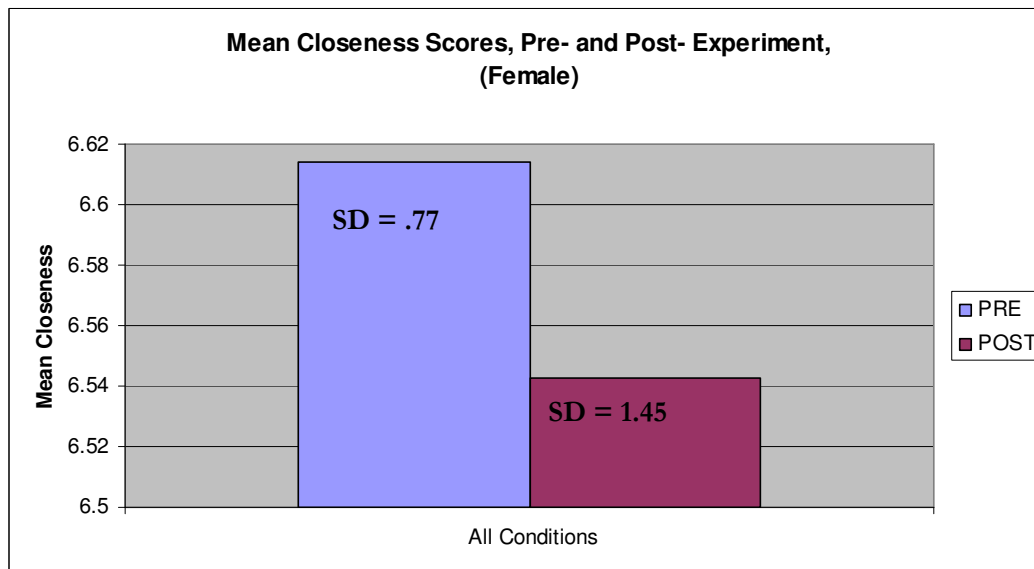


Figure A28. Mean Closeness Scores, All Conditions (Female) Experiment II

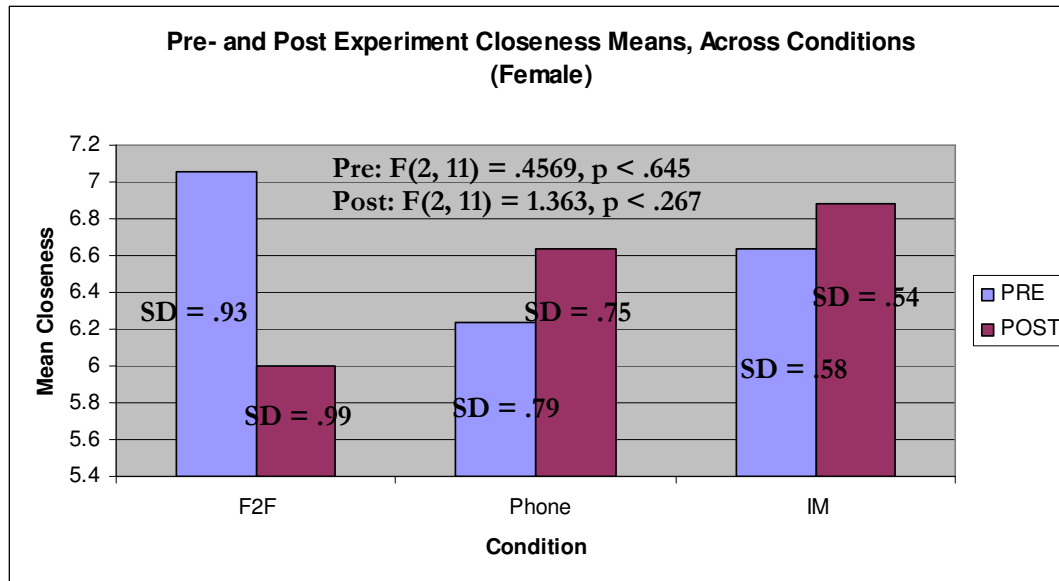


Figure A29. Mean Closeness Scores, Across Conditions (Female) Experiment II,
 Pre: $F(2, 11) = .4569, p < .645$; Post: $F(2, 11) = 1.363, p < .267$

Number of Turns

Male number of turns ($M = 91.2, SD = 45.5$) and female number of turns ($M = 92.6, SD = 47.2$) were found to have no interaction effects with male number of apology and female apology.

Additional analyses were performed to determine if there were interaction effects between male and female number of turns and other self-reports of closure and argument, as well as technology condition. Table A5 shows there were no significant effects.

Table A5. Tests of Between Subject Effects, Male and Female Number of Turns, Experiment II

Source	Dependent Variable	F	Sig.
Self-Report Closure	Repetition of topics	1.847	.183
	Male Number Turns	2.311	.138
	Female Number Turns	1.836	.185
	Male Number Words	3.193	.083
	Female Number Words	1.679	.204
Self-Report Argument	Repetition of topics	.819	.372
	Male Number Turns	1.732	.197
	Female Number Turns	1.813	.187
	Male Number Words	2.514	.122
	Female Number Words	.356	.555
Tech Condition	Repetition of topics	.295	.747
	Male Number Turns	.500	.611
	Female Number Turns	.594	.558
	Male Number Words	2.799	.075
	Female Number Words	2.125	.136

a R Squared = .099 (Adjusted R Squared = -.010)

b R Squared = .153 (Adjusted R Squared = .050)

c R Squared = .136 (Adjusted R Squared = .031)

d R Squared = .424 (Adjusted R Squared = .354)

e R Squared = .278 (Adjusted R Squared = .190)

APPENDIX H – Curriculum Vita

JAMIKA D. BURGE

Virginia Polytechnic Institute and State University

Department of Computer Science

Blacksburg, VA 24061

jamika@vt.edu

PhD, Computer Science, Summer 1, 2007

Virginia Polytechnic Institute and State University (Virginia Tech), Blacksburg, VA

Dissertation: My dissertation research focuses on the communication of emotion (under high-stakes situations) across various communication media: face-to-face, telephone, and instant messaging.

Advisor: Deborah Tatar, PhD.

MS, Computer Science, 1999

North Carolina A&T State University, Greensboro, NC

Thesis: Produced comprehensive specifications for uniformly modeling societies of human and non-human Agents using Epistemic and Deontic Logic.

Advisor: Albert C. Esterline, PhD.

BS, Computer Science, 1998

Fisk University, Nashville, TN

Senior Project: Programmed databases using MS Access to manipulate client database for an insurance subrogation company, including developing simple SQL queries.

Advisor: Horace N. Mann, III, PhD.

PROFESSIONAL EXPERIENCE

Virginia Tech
Blacksburg, VA

Graduate TA
Fall 2006, 2003-2004, Fall 2002

Computer-Supported Cooperative Work

Professionalism in Computing

Introduction to Problem Solving and Computing

- Assisted professors in developing, grading, presenting course materials
- Facilitated course discussions in seminar-style settings
- Solely responsible for student assignments and grades for a CS writing-intensive course (*Professionalism in Computing*)
- Studied how computer users (from youth to elderly) learn to program, using a visual programming language; studied how they interacted with each other

Almaden Research Center (IBM)
San Jose, CA

Research Intern
Summer 2004-2005

- Gathered, researched, documented the requirements for transforming physical board game into an online training simulation for project managers
- Developed thorough functional specifications and two (2) functional prototypes detailing the interactive components of this collaborative training system

- Supervised professional development of initial phase of full-implementation
- Conducted interviews that explored technology use in the context of workplace conflict and resolution
- Developed and conducted user studies that explored and captured users' techniques for resolving conflict using various communicative technology (email, IM, telephone)

**Spelman College
Atlanta, GA**

*Software Engineering
Artificial Intelligence
Foundations of Computer Science*

***Instructor
Fall 2000-Summer 2002***

*Computer Architecture and Design
Operating Systems*

- Extensively prepared, lectured, and graded material for five courses, including two labs
- Facilitated and led course discussion in seminar-style settings
- Supervised students in undergraduate research projects (Three students had their work accepted at international conferences.)

**T. J. Watson Research Laboratory (IBM)
Hawthorne, NY**

***Research Intern
Summer 2000***

- Researched possibilities of providing and capturing company information, via an Intranet system, that employees would find useful
- Developed storyboards for this system

**North Carolina A&T State University
Greensboro, NC**

Software Engineering

***Instructor, GRA
Spring 2000, Fall 1998-Fall 1999***

Operating Systems

- Extensively prepared, lectured, and graded material for two courses
- Facilitated and led course discussion in seminar-style settings
- Researched how systems could be modeled to foster collaboration of human and non-human agent systems
- Infused deontic and epistemic logics into a framework to produce sound specifications that uniformly modeled human and non-human agents (MAMP framework)

PROFESSIONAL SERVICE AND DEVELOPMENT

Referee/Judge, Spelman College Computer Science Olympiad for Undergraduate Students, Spelman College, Atlanta, GA (February 2007).

Reviewer, CHI 2007, San Jose, CA (April 2007).

Attendee, Transforming the Professoriate Conference, Virginia Tech, July 20-22nd, 2006. (Acceptance rate: ~18%)

Panelist, Engineering/Computer Science Graduate Student Recruiting Weekend, Graduate Student Dialogue Session (2005, 2006).

President, Virginia Tech Computer Science Graduate Student Council (2004-2005).

Graduate Program Committee (GPC) Representative, Virginia Tech Computer Science Graduate Student Council (2004).

PAPERS AND PUBLICATIONS

Burge, Jamika D. and Deborah Tatar. *Communications Media and Dyadic Conflict* (poster presentation). Society for Text and Discourse, Minneapolis, Minnesota (July 2006).

Burge, Jamika D., and Suarez, Tiki L., *Preliminary Analysis of Factors Affecting Women and African Americans in the Computing Sciences*. Proceedings of the 2005 conference on Diversity in computing, Albuquerque, New Mexico (October 2005).

Tatar, Deborah G. and Burge, Jamika D. Pragmatics of Emotional Computing: Emotion in Mediated Communication. *Presented at Human Computer Interaction Consortium, Fraser, Colorado (February 2005)*.

Burge, Jamika D. and Esterline, Albert C. *Using Modal Logics to Model Societies of Agents*. Proceedings of the 5th World Multiconference on Systemics, Cybernetics and Informatics (SCI 2001) and the 7th International Conference on Information Systems Analysis and Synthesis (ISAS 2001).

Burge, Jamika D. and Esterline, Albert C. *Uniform Modeling of Agents Using Modal Logics*. Proceedings of the 2000 IEEE Southeast Conference, Nashville, TN (April 2000).

Burge, Jamika D. and Esterline, Albert C. *Uniform Modeling of Human and Artificial Agents Using Epistemic and Deontic Logic*. Proceedings of the World Automation Congress, 2000, Maui, Hawaii (June 2000).

Burge, Jamika D. *Uniform Modeling of Societies of Human and Non-human Agents Using Epistemic and Deontic Logic*, MS Thesis, Dept. of Computer Science, NCA&TSU, 1999.

Toinette Rorie, Esterline, Albert C., and Burge, Jamika D. *Formal Modeling of Multi-agent Systems: An Application of the Pi-Calculus*. Proceedings of ACE-PURSUE Student Conference in Advances in Research and Education in Science, Math, and Engineering, Vol. 2, 1999.

PROFESSIONAL DISTINCTIONS AND PRESENTATIONS

Invited Talk, “Staking a Claim: Broadening the Landscape of Accomplishment”, The Institute for Student Development, Winston Salem State University, Winston Salem, NC (February 2007).

Invited Talk, “An Investigation of Interpersonal Communications across Different Media”, IBM, Almaden Research Center, San Jose, CA (December 2006).

Invited Talk, “Applying Interpersonal Theory and Psycholinguistics in Understanding Technology-Mediated Exchange”, UNCC Department of Software and Engineering Systems, Charlotte, NC (November 2005).

Panel Chair/Organizer, “Making the Journey of Graduate School Your Own: Success at Your Own Risk”, Diversity In Computing Conference, Albuquerque, NM (October 2005).

President, Graduate Council for the Computer Science Department at Virginia Tech, 2004-2006.

Moderator, Graduate School Panel, The Association of Departments of Computer/Information Sciences and Engineering at Minority Institutions (ADMI) (May 2002 & 2003).

Panelist, Grace Hopper Celebration 2002, *The “Culture” of Graduate School*. Vancouver, British

Columbia (October 2002).

Referee, SIGCSE: ACM International Student Research Competition, Northern Kentucky (February 2002).

Session Co-Chair: Formal Modeling of Agents, 5th World Multiconference on Systemics, Cybernetics and Informatics (SCI 2001) and the 7th International Conference on Information Systems Analysis and Synthesis (ISAS 2001), Orlando, FL (July 2001).

PROFESSIONAL MEMBERSHIPS

Association for Computing Machinery (ACM); Special Interest Groups: Computer Science Education (SIG-CSE), Computer-Human Interaction (SIG-CHI)

Upsilon Pi Epsilon (UPE), National Computer Science Honor Society

Beta Kappa Chi (BKX), National Scientific Honor Society

Institute for African American E-Culture (iAAEC)

AWARDS & HONORS

Pratt Engineering Scholar (Fall 2006, Spring 2007)

IBM PhD Fellowship Award & Research Fellow (2005-2006)

Graduate Research Assistant, Virginia Tech, 2003, 2004-2005

Graduate Teaching Assistant, Virginia Tech, 2002, 2003-2004

First Place Presentation Award, Association of Departments of Computer/Information Sciences and Engineering at Minority Institutions (ADMI) Conference, 2000

Third Place Research Presentation Award, ACM Mid-Southeast Conference, 2000

Engineering Scholarship Recipient, North Carolina A&T State University, 1998-1999

Graduate Research Assistant, North Carolina A&T State University, 1998-1999

Who's Who Among American Colleges and Universities, 1997-1998

Leota M. Dunn Education Scholarship Recipient, Fisk University, 1997

GTE/UNCF Summer Science Intern and Fellow, 1996

Full Tuition Scholarship for Prior Academic Achievement, Fisk University, 1994-1998

Magna Cum Laude Graduate, Fisk University

POPULAR PRESS

New York Times, 23 August 2005, <http://people.cs.vt.edu/~jaburge/nyTimes.pdf>

OTHER SERVICE ACTIVITIES

Alpha Kappa Alpha Sorority, Inc.,
International Community Service Organization

President, Local Chapter

After-School Tutoring Program, Blacksburg, VA and Christiansburg, VA area students

National Family Volunteer Day, Community Service Program promoting family and community development
