Communication and closeness

Computer-mediated communication and the maintenance of social relationships

by

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Abstract

Current literature suggests that social ties may be difficult to maintain when the parties involved are separated by great physical distance. The proliferation of computer-mediated communication (CMC) has created new opportunities for people to create and maintain friendships that they previously could not. Past literature has demonstrated the importance of proximity to the development and maintenance of friendships. Furthermore, the social support provided by social relationships has been linked to greater physical and mental well being. The research presented here explores the effect of CMC on perceived closeness within several relationships. Data on the social ties of 179 university freshmen were collected at two time periods, once before and once after arriving on the college campus. Subjects were asked to list kin and non-kin relationships before and after leaving home. Of interest is how access to and use of various media enhance or degrade social relationships.

The explosion in attention paid to the Internet and computing brings to mind questions about the implication these technologies have on social relationships. Computer-mediated communication holds the promise of expanding the pool of potential social ties we may engage in. The deindividuation and anonymity effects of CMC create opportunities to explore new social identities. Such “features” of CMC may also allow previously disenfranchised social groups to participate in social situations they may previously not have had access to. In addition, CMC also reduces the costs associated with maintaining relationships at a distance. Communication between distant friends and romantic partners may now be carried out on a more regular basis. Prior understanding about how we maintain our social networks may no longer hold in our increasingly connected world.

However, concern over channel effects observed in CMC suggest that there may be more than meets the eye in when it comes to using CMC to create and maintain social relationships. Theories have been created and evidence put forth that computer-mediated communication is not as capable of transmitting the range of social and emotional cues that face-to-face communication is capable of. A consequence of these channel effects is that CMC may not be able to provide the support needed to build and maintain social relationships. Partners attempting to sustain their relationship using CMC may find that they are limited in the non-verbal/non-textual messages that they can send. By reducing the social “bandwidth” available to participants, computer-mediated communication may change the nature of the conversations they carry out and, therefore, the quality of the relationship.

This paper attempts to bridge the gap between the research on long-distance relationships and that of computer-mediated communication. The final goal is to understand how various communication media moderate the effect of geographic separation on social relationships. The transition from high school to college provides a unique opportunity to study the same relationship both when it's partners are close to each other and when they are geographically separated. This situation leads naturally to the following questions: Does the content of conversation change over CMC? How does the use of computer-mediated communication affect closeness? Can computer-mediated communication aid in maintaining distant bonds? Do the effects of CMC on relationships differ between family and friends?

This paper is divided into sections delineating the issues involved when investigating communication with relationships. The effect of geographic separation on relationships is linked to the role of communication in social relationships. Continuing from there, the role of talk in maintaining and defining relationships is explored. Related to that is a discussion about the differences between kin and non-kin relationships. Finally, the effects of computer-mediated channels are discussed before an analysis of the data is presented.

Data on the relationships of CMU freshmen was gathered at two time periods: once before their arrival on campus, and once after their arrival. The analysis presented later in this paper suggests that computer-mediated communication has no effect on the growth or decline of relationships. The telephone emerges as the most effective channel for mitigating the effects of geographic separation. The type of relationship is found to have a significant influence both on the level of closeness within a relationship as well as how drastically relationships grow or disintegrate after geographic separation.

Relationships and distance

Relationship formation and maintenance is intertwined with the physical separation of social partners. Relationships require maintenance in the form of communication. Clearly, if one does not meet or cannot continue meeting someone else, it is unlikely that the pair will come to enjoy shared experiences or be able to communicate their intimacy to one another. By mediating the frequency with which people meet and communicate, distance either supports or represses relationship formation and maintenance.

Past literature has outlined the relationship between distance and friendship (Ebbesen, Kjos, & Konecni 1976; Latané et al. 1995, Nahemow, & Lawton 1975). In his study of Toronto social

networks, Wellman (1995) found that there was no instance in which intimate ties were conducted solely through telecommunications. Rather, telecommunications (specifically, the telephone) was used as a complement to face-to-face contact. Ebbesen, Kjos, and Konecni (1976) found that people in an apartment complex were more likely to be friends with people that occupied nearby units in the same complex than in units farther away. Nahemow and Lawton's study of relationships between people living in an apartment complex for the elderly found a similarity-distance interaction. In that study, friends tended to be those people who were similar to the subjects. Those friends that were cited as being dissimilar tended to live closer to the subjects. Aside from the implication that people prefer friends who are similar (they are willing to go to greater lengths to find similar friends), this finding also suggests that proximity plays a role in friendship formation, and possibly liking. In other words, proximity "makes up" for dissimilarity.

Proximity in and of itself does not cause liking. Although Ebbesen et al.'s study found a general inverse correlation between distance and friendship they also found that the very closest neighbors in an apartment were disliked more than those farther away. Ebbesen et al. cite this as support for Latané's social impact theory, which states that disliking is a function of another party's impinging on one's living environment. However, respondents were still more likely to name friends who lived closer. Wellman (1979) found that among a sample of residents of East York, Toronto, the majority of named social partners resided within the Metropolitan Toronto area. However, one quarter of named social partners resided outside Metropolitan Toronto. Wellman also found that distant kin ties outnumbered distant non-kin ties. Fischer (1982), on the other hand, found that more urban, more educated people named more distant non-kin than kin ties. However, these two contradictory results are not directly comparable. Wellman's population is made up of "upper-working-class/lower-middle-class" respondents, while Fischer's finding only holds for wealthier, better-educated people. Geographic separation is therefore intertwined not only with the probability of meeting someone, but also with the ability of people to maintain existing ties when they become distant. The wealthier people in Fischer's study are better able to maintain distant non-kin ties than do the less privileged in Wellman's study. Fischer's evidence clearly suggests that when one has the means, distant relationships may be just as fulfilling as local ties. The contradiction between the Wellman and Fischer evidence may be explained by accounting for the economic status of their respective subjects.

Implied in the socioeconomic status explanation above is the idea that people choose social partners based on what those partners have to offer, not the convenience with which they can be contacted. Proximity encourages or facilitates communication. Communication, in turn, affects closeness and friendship. Those who live or work in close physical proximity are more likely to communicate with each other. In their survey, Latané et al. (1995) asked 552 people on the streets of Boca Raton, Florida, "Please think of those people with whom you have discussed [matters important to you/the Gulf War] in the last 24 hours." For each respondent, respondents were also asked questions about the type, importance, duration, and distance over which the relationship was carried out. Their survey found that the length of a relationship is inversely correlated with the distance over which the relationship is carried out. Over the sample, the number of memorable interactions decreased as distance increased. In addition, the same relationship held when they replicated their study in China. Latané et al. also extend the argument to a group of social psychologists that had all attended an academic conference. Though the relations named by social psychologists in the study were generally more dispersed than those in the previous two general population studies; the same inverse relationship between distance and memorable interactions was observed. Though not a direct measure of closeness, Latané et al.'s memorable interactions measure at least gives us an idea of the importance a contact has relative to other contacts that might be in the respondent's memory.

Although these results suggest that people communicate most with partners who are close by, Wellman and Fischer find that sources of social support come from distant as well as local ties. People go to the ties most suited to their needs a particular time. Similarly, Van Horn et al. (1997) write of a similar finding. In their study of long distance romantic relationships between college students, frequency of visits (presumably correlated with distance) did not account for changes in relationship satisfaction. Support and closeness do not appear to be impacted by distance, especially if one differentiates the various types of support. Practical support such as watching the house while on vacation, or lending the use of a tool tends to be received from local ties. Social or emotional support, on the other hand, comes from those with whom an individual is most intimate. Physical distance in and of itself does not completely explain liking, but still plays a role. The weakness of this relationship suggests that there may be a mediating effect such that proximity does not directly affect closeness with a partner, or which partner one goes to for support. It doesn't matter how far away your best friend lives, rather it matters that he is willing to listen to your problems.

In a review of the literature on long distance friendships, Rohlfing (1995) found that women communicated infrequently (between once a month and once a year) with their distant friends, though they wished they could communicate frequently. These friends did not send cards or letters due to the time costs and the length of the delay in receiving a reply. This is in line with the assumption that relationships at a distance are more difficult because of the time and monetary costs of communication. Rohlfing also found that factors generally associated with geographic separation such as the cost of telephoning and visiting were frequent reasons cited for the disintegration of long-distance romantic relationships. Telecommunications may be able to help, but only to a certain extent when channel effects are taken into consideration. However, Rohlfing reports that many of the respondents in her survey reported as few as one communication per year with long-distance friends. These same subjects also reported a desire for more contact, but were deterred by the time and cost involved. Similarly, Guldner and Swenson (1995) found that there was no association between decreases in time spent together and relationship satisfaction. Both studies conclude that while some minimal amount of contact is required to maintain relationships, merely decreasing communication does not dissolve a relationship. Furthermore, studies presented by Wellman (1979) and Fischer (1982) suggest that shared history may partly or fully overcome reductions in closeness due to geographic separation. They present the case of "merely sentimental" friendships. These are relationships that continue to exist in the face of infrequent contact because of their rich shared histories.

Because these studies (Guldner and Swenson 1995, Rohlfing 1995) are cross sectional designs, they cannot truly determine effects over time. It is possible that the relationships observed in these studies are durable in the face of distance and reduced communication because they have been deemed worthy of such effort. That is, relationships that were once strong but became weak are not represented because they had already been "selected out" by their partners. In order to study long-distance relationships, longitudinal analysis is required in order to untangle these survivor effects. By observing relationships at multiple time points – both before and after they became distant relationships – the effects of distance can be better isolated.

The evidence presented suggests that proximity does not directly affect closeness in relationships, but may do so by influencing the amount of communication. In addition, the effect of distance may be entwined in the nature of the relationship. That is, the disintegrating effect of distance may vary according to the type of friendship being observed. There is very little evidence linking communication frequency to satisfaction. In the studies directly connecting

distance and relationship (Fischer 1982, Rohlfing 1992, Van Horn et al. 1997, Wellman 1979) distant relations tended to be what Fischer describes as “merely sentimental.” These relationships are carried on because of a sense of duty and shared experience. Finally, Wellman and Fischer both find that social support comes from the social partners best equipped to provide it, despite distance. The relationship between distance and closeness is entangled in issues relating to expectations about the roles of different types of relationships as well as with individual relationship histories. By supporting frequent communication, computer-mediated communication may be able to aid in the maintenance of long-distance relationships. However, the magnitude of this effect may depend on the strength of the tie, in addition to the type of the relationship.

Types of relationships

The primary division between relationship types is along kin/non-kin lines (Duck 1986, Fischer 1982). Kin relationships differ from non-kin relationships in that they are not chosen. People have no say in who their parents are. In addition, there are rules that society associates with the kin tie that are not associated with non-kin ties. Non-kin relationships, on the other hand, are often chosen. Those non-kin with which we are heavily involved with, are different in particular. Though our coworkers are to a certain extent “given” to us, we are able to choose which relationships we wish to foster and maintain. Furthermore, close non-kin relationships often do not have the social or institutional supports that kin and coworker relationships enjoy. These relationships are entirely maintained by choice. Because they are not supported by external factors, they may require more nurturing and effort to maintain than other kinds of relationships.

Kin/non-kin distinctions work themselves into the effects of distance on relationships. Whereas considerable amounts of energy and time need to be expended in order to maintain non-kin relationships, kin relationships appear to be relatively stable over time and distance. Fischer (1981) found that kin relationships were not as contingent on distance as non-kin relationships. That is, distant kin were just as likely to be named as part of the subjects’ social circles as were proximal kin. Though levels of closeness will change over time in any relationship (Collins 1997, Golish 2000), kin relationships may continue to exist despite major turning points because of social expectations (Fischer 1981, Golish 2000). Non-kin relationships, on the other hand, do not enjoy such structural supports and are dependent on the value the relationship gives to each

party. Communication with a non-kin partner, in the long run, will need to be deeper, more intimate, and more emotionally involving if the relationship is to continue and survive the ups and downs of life.

Once people have selected their social partners, they may grow those relationships by committing to, or restricting their social time to those partners; this in turn restricts the time one can spend with other partners. One might be forced to discard distant relationships that are too time consuming or costly to maintain once equivalent proximal relationships have been established. Social circles, then, are proscribed both by social context, and the time available for engaging in and maintaining relationships. Fischer finds that people with many friends have "relatively few restrictive commitments on the one hand and many resources on the other – both enabling one to tend one's garden of friendships."

Constituting relationships

What other factors should communication media support? In order to understand the answer to this question, it is important to understand how relationships are externalized in speech and shared experience. If media influences talk (by manipulating social bandwidth) and talk, in turn, characterizes the relationship, it is imperative that we understand the role of talk in relationships. We should first distinguish the various types of relationships and how relationships are constituted. Communication and shared experiences may be thought of as external realizations of the internal workings of relationships. That is, social partners may have internal, cognitive rules and conceptions about the nature of a relationship. These rules and conceptions are in turn externalized in the process of communication and the sharing of life experiences. In order to gain a complete picture of the role of communication within relationships, it is necessary to understand the structure or motivation underlying communication.

Fischer (1982) differentiates relationships by the "social contexts" in which they exist. By social context, Fischer means the social settings and terms of the relationship. Fischer cites kinship, work, neighborhood, voluntary organizations, and "unstructured 'friendship'" as examples of social context. Social situations constrain the relationships that a person may enter into. Some of these relationships are voluntary, as in the case of friends and romantic partners, while others are involuntary, as in the case of kin, neighbors, or coworkers. This sort of distinction is important because different kinds of relationships may require different levels or styles of communication.

Argyle et al. (1985) present this idea from a rules perspective. In their model, employing different sets of rules for each relationship type operationalizes differences between relationships. For example, we are expected to keep up kin relationships over time and to help kin who are in need independent of how close we might feel to those kin (Fischer, 1982). On a more subtle level, the same topics of conversation may have different meanings in a friendship than in a romantic relationship. Differences between relationship types can also be thought of in terms of expected adherence to rules. Married couples may endorse more rules than roommates, or just friends (Argyle et al., 1985). This view of relationship differentiation suggests that non-verbal as well as verbal communication plays a vital role. Rules describe communication and action protocols. Compliance may be through speech or through action. Rules, and therefore the communicative actions through which they are embodied or reinforced, "provide the framework in which the relationship is given stability. Within this stable framework other relation-specific goals may then be met by the participants." (Argyle et al., 1985) By understanding how relationships are externalized through talk and shared experiences, we will be in a better position to make inferences about the role of computer-mediated communication in social relationships.

Goldsmith and Baxter (1996) suggest that, for any relationship, "less close" and "more close" may not be adequate to describe a relationship. Rather, a relationship might be defined by the content of everyday talk and the place of that talk within the contexts in which it occurs. This is analogous to Argyle et al.'s (1985) view that rules bound the actions of social partners. Where we might describe relations as being bounded by rules – touching, for example – we can also describe relations as being bounded or constituted by talk. Different types of relationships may have talk about the same topic at different frequencies. Likewise, the same kind of talk in one type of relationship may have a different meaning or a different level of importance in another type of relationship. For example, smalltalk might be more important or constitutive in a relationship based only on chance encounters and "chit chat" than in a relationship based on intimate sharing of life events. Goldsmith and Baxter follow this line of thinking when they say "many speech events that share a similar dimensional profile cannot function as equivalents for one another." For example, gossip has different meanings in different relationships. Between intimate friends, gossip may be a way of sharing information. However, with an acquaintance, gossip may be seen as hostile or demeaning. According to Goldsmith and Baxter, gossip "presumes a certain degree of mutual knowledge and trust between parties."

Rules, determined by the nature of the relationship, bound the communication that occurs between participants. CMC imposes a transformational filter on the communication social partners have. Computer-mediated communication, by changing the way socioemotional information is passed between partners may make it difficult to communicate and come to agreement on these rules. By changing the talk that occurs between partners, CMC may change the nature of the relationship.

Computer-mediated communication

The promise of computer-mediated communication is that communication can happen *despite* those restrictive commitments. E-mail and instant messaging allow people to communicate at their leisure and at lower cost. In that way, they reduce the time and monetary costs of maintaining long-distance relationships. However, the increase in access to one's partners may be offset by the inability of CMC to communicate cues such as body language, or tone of voice. The mitigating effects of computer-mediated communication, if there are any, may not be as clear-cut as we would have hoped. Like distance, CMC effects may be entangled in the nature of the relationships in which it is employed.

Rohlfing's study found that, among the sample of women with long distance friendships, the intimacy of conversations did not decline, but satisfaction from those conversations did. Conversation at a distance was just as intimate as conversation when partners were close to each other. However, the satisfaction gained from those communications declined when partners were geographically separated. Rohlfing suggests that the infrequency of communication led to decreased satisfaction in the quality of the conversation. This is the sort of situation that computer-mediated communication promises to mitigate. Unlike the everyday or frequent face-to-face encounters that partners might have enjoyed before being separated, long-distance communication imposes media, cost, time, and even skill barriers. In the case of long distance telephone and Internet access, these costs have come down but may still present not-inconsiderable expenses to many users.

Letter writing, though far less costly in monetary terms, does not provide the immediacy of interactive media, and may even lack the expressiveness of other media depending on the proficiency of the writer. Asynchronous CMC analogues to these communication channels feature reduced time and monetary costs that should allow users to communicate more frequently with distant social partners. In addition, recently introduced instant messaging systems allow for

synchronous communication between partners, thus addressing the cost issues associated with telephone. These systems also emulate the interactivity, or instant feedback, of the telephone. Whereas electronic mail suffers from potentially long periods of delay between sending a message and getting a response, instant messaging allows partners to converse in real time.

However, computer-mediated communication may also bring with it effects that reduce it's efficacy as a communications medium when compared to face-to-face conversation. Past literature has posited that communication conducted over computer media suffers from a lack of bandwidth leading to reduced social cues. Verbal and non-verbal properties of conversation such as tone of voice and body posture cannot be easily communicated over the primarily text-based computer media. However, Walther (1992, 1993) has challenged the cues-filtered-out theory by presenting an information processing perspective on CMC channel effects.

Walther's social information processing perspective on CMC as a channel of interpersonal communication suggests that it takes longer to communicate socioemotional information using CMC channels (Walther, 1996, 1993). This is different from the cues-filtered-out models in that information takes longer to be communicated, but is not necessarily suppressed or removed. It takes time for people to get used to communicating over a given medium. Given time, however, those users may learn to communicate the necessary social and interpersonal information they normally communicate over more traditional channels. In his social information processing experiment, Walther (1993) compared work groups communicating solely through computer-mediated communication or in face-to-face (FtF) meetings. Initially, impressions were less developed in the CMC group than in the FtF group. However, over time, impression development in the CMC group approached the levels observed in the face-to-face group while that of the FtF group stayed relatively constant. The important point here is that it *is* possible to develop impressions of others through computer-mediated communication channels.

Reports and stories of online relationships constituted entirely of online talk are not uncommon (Walther, 1996; Lea, M. & Spears, R., 1995; Parks, M.R, & Floyd, K., 1996). However, these relationships were constructed online. In so being, they may be subject to different constraints than relationships constructed in the real world. Nevertheless, online relationships may be subject to the same basic social needs that relationships grounded in the physical world may be. That is, for equivalent categories of relationship, online only relationships may have the same requirements imposed on them as real-world relationships.

Communication and shared events may play the same supportive roles in online relationships that they do in real-world relationships.

However, relationships that have moved from real-world settings to on-line or distance settings have presumably already developed their own sets of rules and communicative patterns. People who have become used to "reading into" their partner's physical reactions and responding with their own will need to develop analogues in different media. Furthermore, moving a relationship from the proximal to the distal world, even if temporarily, may not be entirely feasible. Rohlfing (1995) found some gender effects in her review of the long-distance relationship literature. Males were more likely to frame their relationships in terms of shared activities while females were more likely to do so in terms of emotional involvement. Even if partners were able to emulate the full range of socioemotional communication over CMC that they do when conversing face-to-face, they may still lack the element of shared experiences. It is not clear how important shared experiences are relative to communication. Evidence suggests that it could be important in the sense that males may need extra time or aid in maintaining intimacy with long-distance partners.

Taken together, the evidence presented suggests that the effects of computer-mediated communication on relationships may be intertwined with the nature of the relationship. Romantic partners, for example, may have more need for shared activities and face-to-face interaction. One of the distinguishing features of romantic relationships is the role of physical interaction (Rohlfing, 1995). When discussing the effect of CMC on existing relationships, the effects that have previously been observed may no longer hold. Presumably, by the time that the relationship becomes a long-distance one, partners will already have formed impressions of each other. The primary concern in the case of relationships that move from being proximal to being long-distance is the maintenance of intimacy. Computer-mediated communication, by reducing the time and costs associated with long-distance communication, should allow partners to communicate more frequently and in so doing maintain their social bonds.

In this introduction, we have outlined the interactions between distance and communication in the maintenance of long-distance relationships. Distance either promotes or suppresses friendship by mediating frequency of contact, and therefore frequency of communication. Computer-mediated communication, while providing the means for increased frequency of communication may change the kinds of communication in a relationship by imposing

limitations on the sorts of messages that can be sent. By changing the nature of communication, CMC may thereby change the nature of the relationship.

Unfortunately, past research has been cross-sectional in nature. This has made it difficult to specify the effects of distance and communication, as well as the way in which they interact. By studying relationships at only one point in time, past studies have ignored the possibility that sustained long-distance relationships may have been durable because of the strength of the relationship prior to separation. The longitudinal data presented here allow for an analysis of distance and communication effects while controlling for prior levels of closeness and type of relationship. The mitigating effect of various communication channels will be compared within various relationship types. It is hoped that an understanding can be gained of how well various communication channels maintain intimacy and closeness within relationships.

Method

A longitudinal study was carried out in order to better understand how CMC differs from "traditional" methods of communication in maintaining closeness within various social relationships. Information about subjects' social networks and specific social partners was collected at two time periods in order to gain a picture of change within relationships. The longitudinal design was chosen so that changes in closeness could be measured. Cross sectional designs, such as those described in Fischer (1982) and Wellman (1979), are able to measure relationships at only one time point. It is not possible to identify relationships that may have been dropped before the time of measurement. The longitudinal study, however, allows us to measure the effects various covariates have on the path of a relationship.

The first survey was administered two weeks before freshmen arrived on campus. The second survey was administered approximately 10 weeks into the students' first semester. Respondents were given the option of completing the first survey using a traditional paper instrument or completing an online version of the paper survey. Only the online survey was offered for the second time period. Because it is the longitudinal data that are of interest in this study, only the 182 respondents who completed both surveys were considered for data analysis. Only these 182 respondents reported on relations both before and after they arrived at Carnegie Mellon.

The first survey asked respondents to name up to 7 household members and up to 42 other members of their social circles who did not reside in their household. Respondents were then

asked to answer more detailed questions about their mother, father, a sibling, and up to two male and two female social circle members who did not reside in the respondent's household. The aim of the detailed questions was to obtain measures of closeness, social support, and the nature of the relationship.

For the second questionnaire, respondents were again asked the detailed questions about the people they had named and described in the first questionnaire. In addition, respondents were asked to name any new members of their social circle who they had met since coming to Carnegie Mellon. Again, space was provided for detailed information about two male and two female new social circle members in addition to one roommate. As of this writing, a third survey has been administered, but too late for results to be included in this paper.

For this study, a sample of 500 freshmen was drawn from the incoming freshman population of Carnegie Mellon University. The sample was stratified by distance from Carnegie Mellon and included all local Pittsburgh residents as well as all foreign students. The remainder of the sample came from other non-local students. Subjects were chosen by picking random students from a list of all freshmen sorted by zip code. Students living within an hours drive of Pittsburgh and all 96 international students were included in the sample, with the remaining students originating within the United States. Of those 500 students, 248 completed the first questionnaire. Three rounds of follow-ups were conducted after the first wave of questionnaires arrived. The first round occurred approximately one week after the initial packets containing a cover letter and the questionnaire were mailed. Reminder cards sent through postal mail to the students' permanent home addresses. After that, two more reminders were sent to students' e-mail accounts at one-week intervals.

Only the 248 were then invited back to complete the second survey. Of those 248, 170 completed the second survey. Three rounds of follow-ups were conducted. The first two rounds occurred five days apart and consisted of reminder e-mails. These two rounds of follow-ups came one week after the survey was announced, also through e-mail. The third round of follow-up was done by telephone. However, this round did not reach all non-respondents.

Measurement

Closeness was measured on a scale consisting of three questions answered by selecting values from a five point likert scale as shown below. Cronbach's alpha for this scale is 0.84.

	Not very				Very
How comfortable are you communicating with him/her?	1	2	3	4	5
How close do you feel to him/her?	1	2	3	4	5
How similar are you to him/her in values and interests?	1	2	3	4	5

Frequency of channel usage was ranked on a similar scale. Survey respondents were asked, "How frequently do you communicate with [him/her] using these modes of communication?" Note that instant messaging and electronic mail have been separated. We have done this because instant messaging provides a synchronous channel and greater levels of interactivity than electronic mail.

How frequently do you communicate with [him/her] using these modes of communication?

	Many times per day	Daily	Weekly	Biweekly	Monthly	Less often	Never
a. In person	1	2	3	4	5	6	7
b. By phone	1	2	3	4	5	6	7
c. By e-mail	1	2	3	4	5	6	7
d. By instant messaging	1	2	3	4	5	6	7

Geographic separation was measured in a similar manner. Survey respondents were asked to identify how far away particular relationship partners resided. Distance was divided into a 6-point scale:

How close to you does she live?	1. Same building	2. Same neighborhood	3. Same town	4. Same state	5. Same country	6. Further away

Respondents were also asked to mark the kinds of talk they engaged in with specific partners. They told to, "Circle the types of communication you <u>regularly</u> have with your mother or stepmother. Circle as many as apply," from the list below:

a. Small talk	h. Joking around	o. Gossip/talking about others
b. Killing time	i. Catching up	p. Recapping the day
c. Getting to know her	j. Sharing experiences	q. Making plans & arrangements
d. Getting/giving advice	k. Discussing work/school	r. Discussing interests, hobbies
e. Reminiscing	l. Persuading	s. Talking about our relationship
f. Getting/giving support	m. Romantic talk	t. Talking about problems
g. Disagreeing or arguing	n. Complaining	u. Asking a favor

These 21 categories of talk were then reduced to five using factor analysis. This resulted in the following five categories of talk:

Major category	alpha	Components
Romantic talk	0.63	Romantic talk
		Talking about our relationship
Arguing	0.72	Disagreeing or arguing
		Persuading
		Complaining
		Asking favors
Smalltalk	0.54	Smalltalk
		Killing time
		Gossip/talking about others
Supportive talk	0.65	Getting/giving advice
		Getting/giving support
		Sharing experiences
		Discussing work/school
Reminiscing	0.48	Reminiscing
		Catching up

Table 1.

Respondents were presented with a wide array of relationship descriptors. These were eventually reduced to just 6 categories. The grouping is described in the following table:

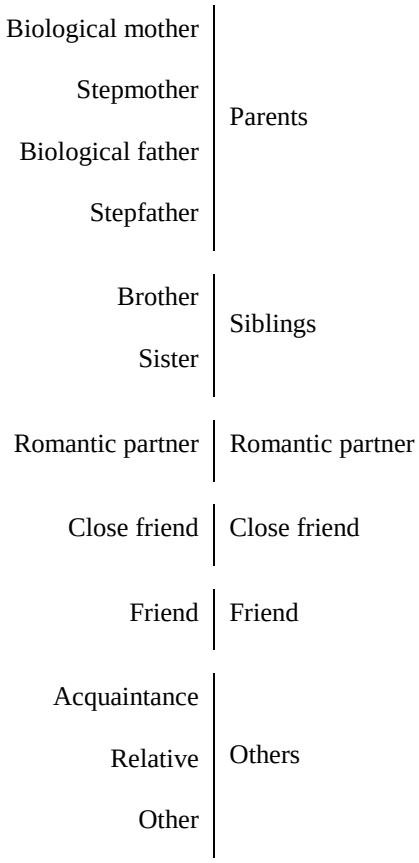

Figure 1.

In the analysis, relationship is treated as a categorical variable. The “others” category serves as a baseline relationship. Comparisons and coefficients involving the other categories are in relation to this category.

In addition to information about their social relationships, participants were also asked about themselves. Computer skill was estimated by a set of nine questions answered on a five point scale (see Appendix C).

Sample

Because of the nature of the school this research is being carried out at, it is expected that the sample will have some specific traits that may not be part of the general population. Nevertheless, it is still important to understand the demographic makeup of the sample, as well as other biases that may shed doubts on the applicability of the results to the real world.

The sample considered for analysis predominantly consisted of 60% females and 40% males. Racial makeup is as follows:

Race	Percent of Sample
White/Caucasion	59%
Black/African American	1%
Asian/Pacific Islander	28%
Hispanic/Mexican American	4%
Others	8%

Table 2.

Students in the sample also tended to come from wealthy backgrounds. 73% of the sample reported coming from households earning more than $50,000 per year.

Income	Percent of Sample
Under $25,000	9%
$25,000 - $49,999	18%
$50,000 or more	73%

Table 3.

In line with the socio-economic makeup of the sample, all respondents but one reported having a computer in their home. The median number of rooms containing a computer was reported to be 2 (N = 170). The most often cited room that contained a computer was the "study/office". Forty-six percent of the sample reported having a computer in a study or office area. The second and third most often cited rooms where the "child's bedroom" and "laptop (mobile)", 39% and 32% having, respectively, cited those rooms as containing a computer. This pattern of computer penetration continued at time 2 where 93% of the respondents reported having their own computer in their dorm room. Respondents' social partners were also well connected. On average, respondents reported their partners, on a scale of 1 to 5, as having easy access to the Internet (mean = 4.4, s.d. = 1.08).

In summary, computers and access to computers in this sample was not scarce. All but one respondent had access to at least one computer, with two computers per household being the median (assuming one computer per room). The sample also appears to be comfortable using computers. The median score on the computer skill scale was 4.1. Though not a formal scale of computer skill, the scale at least reflects the respondents' comfort level with regard to computer usage.

Clearly, the respondents in the sample under consideration tend to be female and come predominantly from affluent white families. Respondents are well connected, as are their social partners.

Distance, communication, and computer use

Respondents were asked to rate the amount of time they spent doing various activities on the Internet. For each activity, respondents were asked to rate, on a scale of 1 to 5 (1 = “never”, 3 = “sometimes”, 5 = “often”), the frequency with which they used their computer or the Internet for that activity.

Activity	Mean (time 1)	Mean (time 2)	Mean difference (time 2 – time1)	t	Pr > |t|
Keeping up with friends	3.41	3.58	0.172	2.30	0.0227
Being entertained	3.05	3.22	0.168	2.76	0.0065
Doing work	2.83	2.84	0.00147	0.02	0.981
Getting news	2.71	3.12	0.406	6.00	< 0.0001
Meeting new people	1.90	1.83	-0.0701	-1.34	0.181

Table 4.

Usage patterns changed significantly between time 1 and time 2. One possible reason for this is the increase in bandwidth (access) that participants are likely to have encountered upon arriving on campus. It was because of this change, in part, that we selected freshmen college participants. Not only would their proximal relationships become distant, but they would also be exposed to high degrees of connectivity. We had hoped that the sample would provide variability in connectivity at time 1. Unfortunately, this was not the case.

It is interesting to note that there was a significant difference between using the Internet to keep up and using the Internet to meet new people (mean difference = 1.506, $t = 20.49$, $p < 0.0001$) at time 1. The same pattern can be observed at time 2 (mean difference = 1.748, $t = 21.29$, $p < 0.0001$). This suggests that even before they arrived on campus, respondents had already been familiar with the concept of using the Internet to maintain long-distance relationships. Furthermore, the difference becomes greater at time 2. that is, after arriving on campus, the difference between time spent meeting new people on the Internet, and keeping up

with old relations increased. Presumably, this may be attributed to subjects no longer being geographically close to their former social ties.

As shown in Figure 1 below, the bulk of the reported relationships were parents, close friends, and "just friends." Furthermore, these relationships appear to be locally bounded. Within each non-kin relationship type, the majority of relationships live in the same town as the subject (see Figure 2).

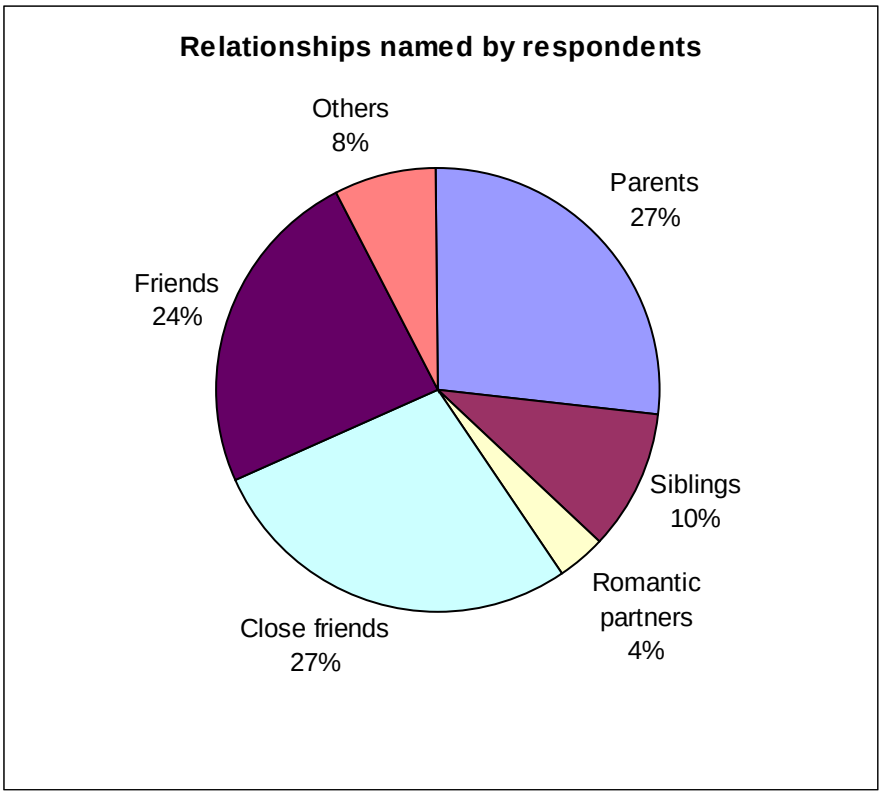

Figure 2.

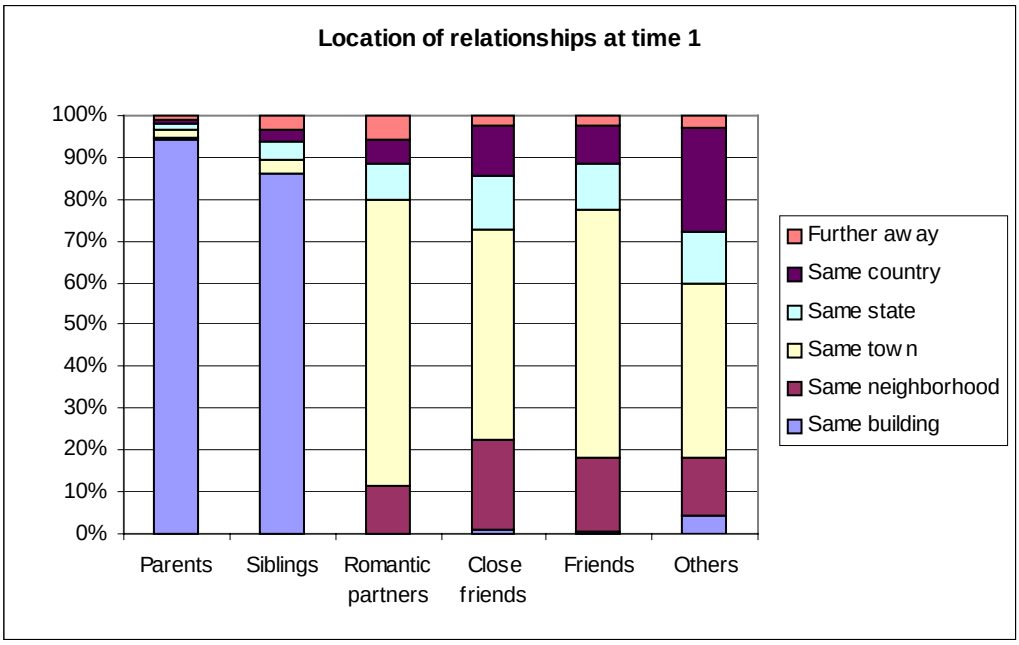

Figure 3.

	Mean (time 1)	Mean (time 2)	Mean difference (time 2 – time 1)	t	Pr > |t|
Distance from partner	2.525	4.371	1.846	32.31	< 0.0001

Table 5.

Respondents also tended to move away from their named social partners. The mean difference between time 1 and time 2 was 1.85, as shown above. Because of this, we expect that face-to-face communication will become too costly to carry out on a regular basis. This should be observed as a decrease in face-to-face communication and an increase in the use of other channels. It turns out that this is case. The table below summarizes the differences between communication channel usage. All of the differences are significant. As expected, face-to-face and telephone communication decline while e-mail and instant messaging increase.

Medium	Mean (time 1)	Mean (time 2)	Mean difference (time 2 – time 1)	t	Pr > |t|
Face-to-Face	4.371	2.644	-2.727	-43.27	< 0.0001
Telephone	4.182	3.057	-1.125	-18.75	< 0.0001
Electronic mail	2.930	3.130	0.200	2.97	0.0031

Medium	Mean (time 1)	Mean (time 2)	Mean difference (time 2 – time 1)	t	Pr > |t|
Instant messaging	2.524	2.950	0.426	6.36	< 0.0001

Table 6.

Though only representative of a small segment of the population, the sample provides data relevant to the research questions outlined in the preceding sections. Respondents whose social networks had been primarily local are now faced with maintaining those same bonds at a distance.

Models of relationship change

Because of the design of this study, ordinary multiple regression may not be appropriate. The assumption of independent observations does not hold when each subject has described multiple partners. Hierarchical and multilevel models are able to take into account the nesting of relationships within subjects (Bryk & Raudenbush, 1992; Singer, 1998). For this analysis, the method for fitting individual growth models described in Singer (1998) will be used.

In this study, participants twice described their relationships with between 1 and 7 social partners. There were 895 distinct relationships reported, and 1790 observations (895 relationships x 2 time periods). We will begin by checking for variability in initial closeness (random intercepts) and growth in closeness over time (random slopes) by fitting the unconditional model. The effects of communication channel and relationship will be identified by sequentially adding covariates to the model and identifying the resulting changes. A summary of the structure of the proposed analysis is provided below:

Model	Covariates
Unconditional model	time
Communication model(s)	time + channel + (time x channel)
	time + channel + access + distance + (time x channel) + (time x access) + (time x distance)
Relationship model(s)	time + channel + access + distance + relationship + (time x channel) + (time x access) + (time x distance) + (time x relationship)
	time + channel + access + distance + relationship + (relationship x channel)

Model	Covariates
	+ (time x channel) + (time x access) + (time x distance) + (time x relationship) + (time x relationship x channel)

Table 7.

Beginning with the unconditional model, we find that there is significant between-relationship variability for both the intercepts (0.715, $p < 0.0001$) and slopes (0.871, $p < 0.0001$). Variability in the intercepts indicates that levels of initial closeness are significantly different between relationships. Similarly, variation in the slopes indicates that not all relationships grow stronger or weaker at the same rate. In other words, intercepts indicate initial levels of closeness, while slopes indicate change in closeness between time 1 and time 2.

Random Effects (Unconditional model):

	Variability	Standard error	P
Intercepts	0.715	0.034	< 0.0001
Slopes	0.871	0.041	< 0.0001

Table 8.

Turning our attention to the fixed effects, we find that the intercept is estimated to be 3.93. This value is equivalent to the mean level of closeness among all relationships at time 1. The time coefficient is estimated to be –0.042. Like the intercept, this is a measure of the mean change in closeness among all relationships between time 1 and time 2. The time coefficient, therefore, indicates a small but reliable drop in closeness between time 1 and time 2. These effects are summarized in the tables below.

Fixed Effects (Unconditional model):

	Estimate	Standard error	DF	t	P
Intercept	3.935	0.028	894	139.24	< 0.0001
time	-0.042	0.024	894	-1.75	0.0811

Table 9.

Adding measures of channel use to the model explains 20.4% of the variability in intercepts and 29.3% of the variability in slopes. Controlling for frequency of communication, the effect of time (-0.018, p = 0.843) is not only much smaller, but becomes indistinguishable from 0. In other words, controlling for the frequency of communication explains almost all of the negative main effect of time observed in the unconditional model.

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Random Effects (Communication model 1):

	Variability	Standard error	P	Variance explained
Intercepts	0569	0.027	< 0.0001	20.4%
Slopes	0.616	0.030	< 0.0001	29.3%

Table 10.

All Effects (Communication model 1):

	Estimate	Standard error	DF	t	P
Intercept	2.913	0.088	894	32.81	< 0.0001
time	-0.018	0.092	894	-0.20	0.843
face-to-face	0.052	0.014	894	3.69	0.0002
telephone	0.120	0.013	894	8.89	< 0.0001
e-mail	0.056	0.015	894	3.71	0.0002
instant messaging	0.030	0.013	894	2.31	0.021
face-to-face x time	-0.066	0.022	894	-3.05	0.0024
telephone x time	0.051	0.019	894	2.62	0.0090
e-mail x time	0.020	0.019	894	0.99	0.323
im x time	0.063	0.015	894	4.09	< 0.0001

Table 11.

All of the main effects for communication channel are positive and significant. Telephone usage has the greatest effect on initial level of closeness. This is followed by electronic mail, face-to-face communication, and finally, instant messaging. The main telephone effect dominates the other effects of the other communication channels. The size of the telephone effect

is over twice that of the next largest effect, electronic mail. It is unclear why this might be. Perhaps there is something intrinsic to the closest relationships that encourage phone use. One could imagine that the telephone might be used to coordinate activities, resulting in high frequency, but low content usage. Another reason might be a property of the telephone itself. Social partners may find the interactivity and richness of the phone to be rewarding or comfortable. Unfortunately, we do not have data to test this hypothesis.

The table below replicates the longitudinal effects of show above. These effects describe the interaction between communication channel and time.

Longitudinal Effects (Communication model 1):

	Estimate	Standard error	DF	T	P
face-to-face x time	-0.066	0.022	894	-3.05	0.0024
Telephone x time	0.051	0.019	894	2.62	0.0090
e-mail x time	0.020	0.019	894	0.99	0.323
im x time	0.063	0.015	894	4.09	< 0.0001

Table 12. Values extracted from Table 11.

Except for the effect of e-mail, all longitudinal effects were significant. The positive coefficient estimates for telephone and instant messaging indicate that more frequent usage of those communication media may mitigate declines in closeness resulting from changes in respondents' social and physical environs in the period between the first and second survey periods. E-mail shows a non-significant positive effect (0.020, $p = 0.323$), while the face-to-face channel shows a significant negative effect (-0.066, $p = 0.0024$). One might be tempted to read this as indicating that greater face-to-face contact results in a steepening of the reduction in closeness due to time. However, the direction of the effect may be opposite. That is, people communicate with their close friends using telephone and instant messaging.

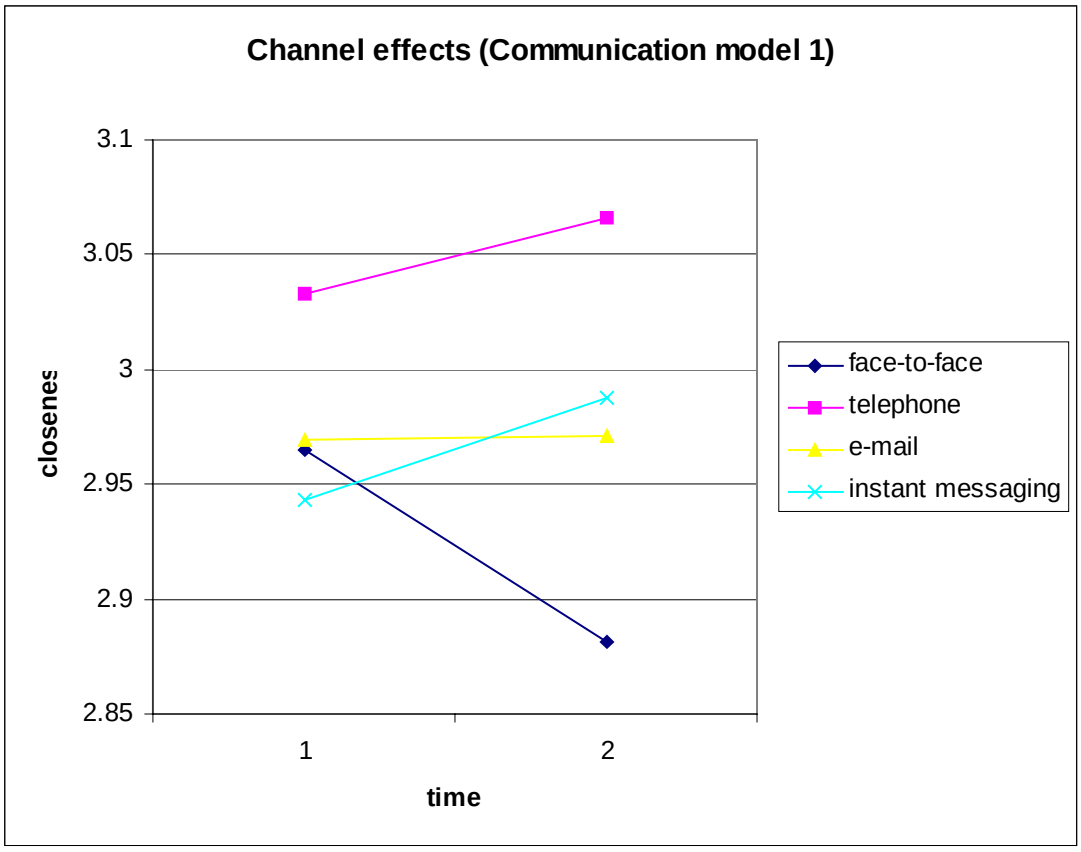

Figure 4.

Choice of channel may also be contingent upon geographic distance and the partner's access to communication media. After all, one cannot send an e-mail to someone who does not have access to electronic mail. Likewise, if a friend lives next door, it may be more enjoyable to go next door instead of sending an e-mail. Taking into account geographical separation and access to the Internet explains part of the initial level of closeness. Specifically, controlling for geographical separation and access to the Internet explains 0.3% of the variability in initial closeness and 0.9% of the variability in change between time 1 and time 2.

Random Effects (Communication model 2):

	Variability	Standard error	P	Variance explained
Intercepts	0567	0.027	< 0.0001	0.3%
Slopes	0.610	0.029	< 0.0001	0.9%

Table 13.

There are small but reliable main effects of distance and partner's access. The positive and significant effect of distance is most likely due to the majority of close relationships having become long-distance relationships. That is, relationships that subjects previously thought of as being close, are still considered close but are now carried out at a distance.

All Effects (Communication models 1 and 2):

	Communication model 1	**Communication model 2**
Intercept	2.913*** (0.0888)	2.490*** (0.160)
time	-0.018 (0.0915)	-0.142 (0.207)
face-to-face	0.052*** (0.0142)	0.074*** (0.0175)
telephone	0.120*** (0.0135)	0.120*** (0.0196)
e-mail	0.056*** (0.0152)	0.048** (0.0154)
instant messaging	0.030* (0.0131)	0.021 (0.0134)
partner's access		0.050* (0.0215)
distance		0.050* (0.0207)
face-to-face x time	-0.066** (0.0217)	-0.049 (0.0269)
telephone x time	0.051** (0.0195)	0.049** (0.0196)
e-mail x time	0.020 (0.0197)	0.022 (0.0203)
im x time	0.063*** (0.0155)	0.067*** (0.0158)
dist x time		0.019

	Communication model 1	Communication model 2
		(0.0288)
access x time		-0.010 (0.0273)

Table 14. * = p < 0.05, ** = p < 0.01, *** p < 0.001

Shown below are summaries of the interaction effects in the communication models. Controlling for distance and partner's access to the Internet does not change previously observed effects. Neither partner's access nor distance from partner interacts with time. While distance and access have effects on initial closeness, they do not have an effect on the rate of growth or decline in closeness.

Longitudinal Effects (Communication models 1 and 2):

	Communication model 1	Communication model 2
face-to-face x time	-0.066** (0.0217)	-0.049 (0.0269)
telephone x time	0.051** (0.0195)	0.049** (0.0196)
e-mail x time	0.020 (0.0197)	0.022 (0.0203)
im x time	0.063*** (0.0155)	0.067*** (0.0158)
dist x time		0.019 (0.0288)
access x time		-0.010 (0.0273)

Table 15. Values extracted from Table 14.

As previously discussed in this paper, different types of relationships may have different maintenance requirements. Furthermore, some relationships may be more "durable" than others, meaning that they can withstand substantial turning points such as the move from high school to

college. In line with this notion, controlling for relationship type explains only an additional 6% of the variance in initial closeness but a much more substantial 13% of the variance in change rate.

Random Effects (Relationship model 1):

	Variability	Standard error	P	Variance explained
Intercepts	0.532	0.025	< 0.0001	6%
Slopes	0.536	0.026	< 0.0001	13%

Table 16.

All Effects (Relationship model 1 vs. Communication model 2):

	Communication model 2	Relationship model 1
Intercept	2.490*** (0.160)	2.53*** (0.183)
time	-0.142 (0.207)	-0.297 (0.219)
face-to-face	0.074*** (0.0175)	0.066*** (0.0175)
telephone	0.120*** (0.0196)	0.102*** (0.0139)
e-mail	0.048** (0.0154)	0.040** (0.0151)
instant messaging	0.021 (0.0134)	0.011 (0.0137)
partner's access	0.050* (0.0215)	0.0531** (0.0210)
distance	0.050* (0.0207)	0.0098 (0.0239)
parents		0.104 (0.113)

	Communication model 2	Relationship model 1
siblings		0.246* (0.126)
romantic partners		0.660*** (0.159)
close friends		0.519*** (0.103)
friends		0.013 (0.101)
parents x time		0.427*** (0.114)
siblings x time		0.306 (0.120)
romantic partners x time		0.024 (0.161)
close friends x time		0.320*** (0.0970)
friends x time		-0.0067 (0.0939)
face-to-face x time	-0.049 (0.0269)	-0.0534* (0.0262)
telephone x time	0.049** (0.0196)	0.0195 (0.0218)
e-mail x time	0.022 (0.0203)	0.00776 (0.0196)
im x time	0.067*** (0.0158)	0.0648*** (0.0161)
dist x time	0.019 (0.0288)	0.0293 (0.0304)
access x time	-0.010 (0.0273)	0.00568 (0.0264)

Table 17.

Note that distance is no longer significant in the relationship model. Most likely, this is because relationship is correlated with distance. Parents are likely to live in the same building much like close friends are more likely to be nearby. The remaining analyses will be carried out without the distance variable. The coefficients for the relationship variable (represented here as five dummies) are in relation to the "others" category. *Compared to relationships in the "others" category*, romantic partners and close friends are reported to be closer. The remaining relationships do not differ markedly from "others" in terms of initial closeness.

In relation to the "other" category of relationships, only parents and close friends had a significant impact on change in closeness.

Longitudinal Effects (Relationship model 1):

	Relationship model 1
parents x time	0.427*** (0.114)
siblings x time	0.306 (0.120)
romantic partners x time	0.024 (0.161)
close friends x time	0.320*** (0.0970)
friends x time	-0.0067 (0.0939)

Table 18. Values extracted from Table 17.

Shown below, in Figure 4, is a plot of the effects of different relationship types on closeness over time. The effect of the "close friends" and "parents" relationship types are most apparent in this plot. Note that the effects of relationship are with respect to the "other" category of relationships.

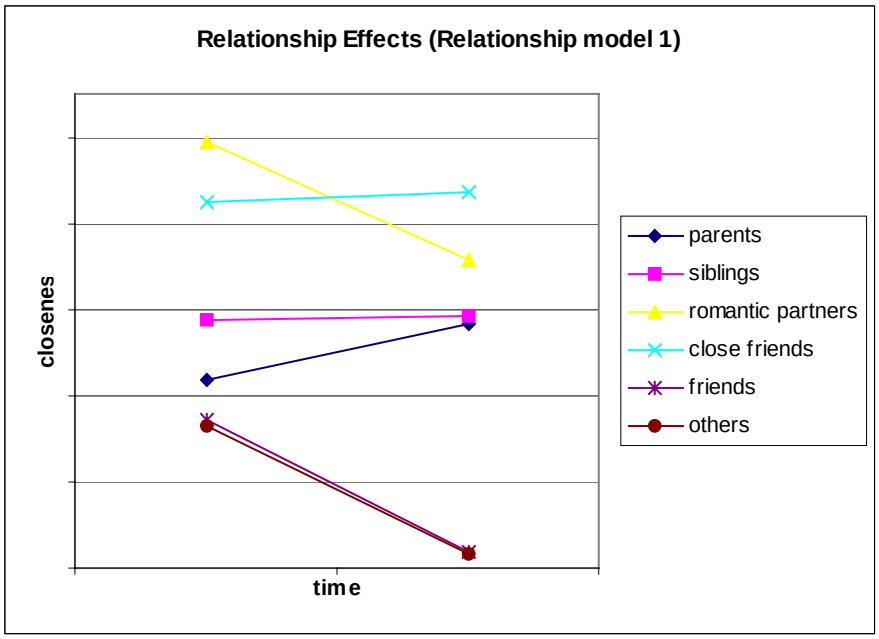

Figure 5. Relationship effects, controlling for communication channel usage, distance, and partner's access.

We have presented some evidence that indicates that there are differences between relationships in terms of maintaining closeness. It follows that the effect of communication channel may also be influenced by relationship. To look at this, we add a relationship x channel factor into the relationship model.

Once the relationship-channel interactions have been added in, there are very few significant main effects terms. Furthermore, there are no significant relationship-channel interaction terms, nor are their any significant relationship-channel-time interaction terms. Adding relationship-channel interaction terms also reduce the goodness of fit (as measured by Akaike's Information Criterion). For full output, please see Appendix A.6.

The preceding models have established a picture of how communication channels are associated with change in closeness controlling for relationship type. The fixed effects for channel (impact on initial closeness) associate greater phone usage with greater closeness. The telephone is followed by face-to-face, e-mail, and instant messaging in terms of the magnitude of their effects on closeness. Longitudinal effects were also observed. Instant messaging had the greatest positive effect over time, followed by the telephone, and finally electronic mail. An effects plot is shown below. Of note is how the slope of the instant messaging line is such that, after time, it ends above face-to-face *and* electronic mail in terms of closeness. Also note the dominance of the telephone. However, if the lines are extended, as in the extrapolated plot

below, we find that instant messaging overcomes the telephone in the long run. The synchronous, "highly interactive" media win out in the long run.

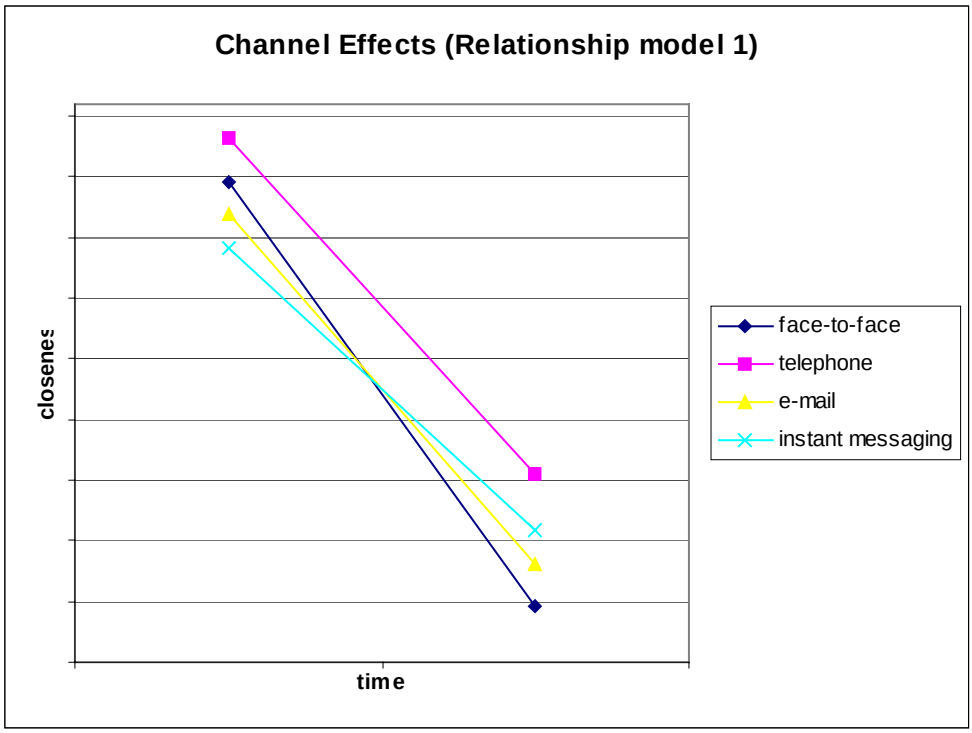

Figure 6. Channel effects, controlling for relationship type, distance, and partner's access.

Face-to-face communication was associated with greater *negative* change in closeness. However, the effect may actually run in the opposite direction. It is not necessarily the case that greater levels face-to-face communication cause lower levels of closeness. A more likely explanation is that subjects are looking to other means to keep up with their close relationships since those relationships are now geographically distant. "Shallow" or undeveloped relationships would tend to be closer and more likely to be the conversational partner in face-to-face encounters. In general, higher frequency of communication is associated with higher levels of closeness. In addition, there is a channel effect in which telephone communication is associated with the highest levels of closeness, followed by face-to-face, e-mail, and the instant messaging. Instant messaging has the greatest longitudinal effect, meaning that more usage of instant messaging is associated with lower rates of decline in closeness over time.

Models of talk

Relationship type may also be important in studying the effect of communication on long-distance social relationships. In the previous section, longitudinal effects of relationship type were observed. Parent and close friend relationships were associated with less reduction in closeness over time compared to "other" relationships. In Figure 4, note the stability of the parent, sibling, and close friend relationships.

A review of some of the literature concerning talk has also suggested that relationships may be constituted in talk. If computer-mediated communication changes the kinds of talk we engage in, then it may also change the nature of relationships. Unfortunately, the data gathered over the course of this study do not allow a channel by channel analysis of talk. However, it is still possible to model tendencies to talk about various topics, controlling for channel usage. In this section, the same techniques used to model relationship changes will be used to model talk and changes in talk.

Respondents in this study were asked to mark the kinds of talk that they engage in with specific partners. A list of 21 categories was provided and respondents were told to circle all categories of talk they engage in. These 21 categories were reduced 5 using factor analysis (see Table 1). Scores on each category of talk are therefore really "proportions of talk." They represent the proportion of each category of talk that the respondent engages in.

The following table summarizes the variances in slopes and intercepts for each category of talk modeled. These are estimates of how variable initial levels of talk and change in talk (over time) are.

Random effects:

	Reminiscing	**Romantic**	**Arguing**	**Smalltalk**	**Supportive**
Intercepts	0.150	0.0678	0.0916	0.103	0.0918
Slopes	0.136	0.0499	0.0840	0.107	0.0930

Table 19. Shown above are random intercept and slope variances for each of five separate models for each type of talk.

All of the variance components are significant at the 0.01 level, indicating that there is significant variation between relationships in initial levels of talk and in changes in talk when controlling for relationship type and communication channel. Having established that, we now turn to predictors of talk. Shown in the table below are intercepts and time coefficients for each talk category.

Initial levels of talk and fixed time effects:

	Reminiscing	Romantic	Arguing	Smalltalk	Supportive
Intercept	0.160**	-0.00172	0.0693	0.303***	0.335***
	(0.0628)	(0.0417)	(0.0476)	(0.0516)	(0.0485)
Time	0.124	-0.0168	-0.0879	-0.00617	-0.113*
	(0.0745)	(0.0456)	(0.0519)	(0.0612)	(0.0568)
Parents	-0.00818	-0.0269	0.281***	-0.105*	-0.00744
	(0.0590)	(0.0394)	(0.0455)	(0.0487)	(0.0459)
Siblings	0.123	-0.00896	0.227***	-0.00251	-0.0121
	(0.0658)	(0.0441)	(0.0510)	(0.0544)	(0.0513)
Romantic partners	0.218**	0.696***	0.115	0.117	0.200**
	(0.0853)	(0.0572)	(0.0662)	(0.0706)	(0.0665)
Close friends	0.272***	0.0878*	0.0844*	0.128**	0.114**
	(0.0550)	(0.0369)	(0.0427)	(0.0455)	(0.0429)
Friends	0.145**	-0.0113	-0.0413	0.0946*	-0.0281
	(0.0539)	(0.0362)	(0.0421)	(0.0447)	(0.0422)
Face-to-face	-0.00108	-0.00098	0.0117	0.0378***	0.00815
	(0.00945)	(0.00615)	(0.00682)	(0.00765)	(0.00715)
Telephone	0.0409***	0.0197***	0.0262***	0.0119	0.0360***
	(0.00839)	(0.00546)	(0.00606)	(0.00679)	(0.00635)
E-mail	-0.00521	0.00989	-0.00671	-0.00884	0.0138*
	(0.00889)	(0.00580)	(0.00644)	(0.00720)	(0.00674)
Instant messaging	-0.00356	0.000793	-0.00333	0.00476	0.00864
	(0.00812)	(0.00530)	(0.00589)	(0.00658)	(0.00616)
Face-to-face x time	-0.0162	0.00355	0.0231**	-0.00520	-0.00346
	(0.0131)	(0.00806)	(0.00934)	(0.0109)	(0.0101)
Telephone x time	0.00773	-0.0175*	-0.0165	0.0244*	0.0177
	(0.0132)	(0.00799)	(0.00937)	(0.0111)	(0.0103)
E-mail x time	0.00926	0.00399	0.00721	-0.0104	0.000407
	(0.0116)	(0.00712)	(0.00817)	(0.00962)	(0.00893)

	Reminiscing	Romantic	Arguing	Smalltalk	Supportive
Instant messaging x time	0.00784 (0.00981)	0.00480 (0.00608)	0.00746 (0.00691)	0.000165 (0.00807)	-0.00062 (0.00750)
Parents x time	-0.0560 (0.0708)	0.0109 (0.0430)	-0.0809 (0.0490)	0.0424 (0.0583)	0.0978 (0.0540)
Siblings x time	0.0120 (0.0759)	0.0158 (0.0461)	-0.401 (0.0522)	0.105 (0.0623)	0.169** (0.0577)
Romantic partners x time	-0.0901 (0.103)	0.0664 (0.0621)	0.120 (0.0707)	0.0690 (0.0848)	0.00284 (0.0785)
Close friends x time	0.0257 (0.0642)	0.0356 (0.0389)	0.0483 (0.0440)	0.0773 (0.0527)	0.149** (0.0488)
Friends x time	0.0317 (0.0635)	0.0192 (0.0383)	0.0389 (0.0435)	0.0226 (0.0522)	0.0882 (0.0483)

Table 20.

There is "substantial" activity in the reminiscing, smalltalk, and supportive talk categories. Non-zero intercepts in these categories indicate that on average and controlling for relationship and communication channel, there is a significant amount of talk in those categories. Among all categories, only the supportive talk model contains a significant (at the .05 level) coefficient for time. On the whole, categories of talk appear to be stable from time 1 to time 2.

The general trends now out of the way, we turn our attention to the effect of relationship on talk. As shown by the main effects of the parent and sibling relationships, arguing comprises almost all of the talk between parents and siblings. Close friends, at the opposite extreme, have a rich mix of conversation encompassing all five categories of talk. Romantic partners engage in reminiscing, romantic (of course!), and supportive talk. Conversation with just friends tends to include just reminiscing and smalltalk.

Main Channel Effects:

	Reminiscing	Romantic	Arguing	Smalltalk	Supportive
Face-to-face	-0.00108 (0.00945)	-0.00098 (0.00615)	0.0117 (0.00682)	0.0378*** (0.00765)	0.00815 (0.00715)

Telephone	0.0409*** (0.00839)	0.0197*** (0.00546)	0.0262*** (0.00606)	0.0119 (0.00679)	0.0360*** (0.00635)
E-mail	-0.00521 (0.00889)	0.00989 (0.00580)	-0.00671 (0.00644)	-0.00884 (0.00720)	0.0138* (0.00674)
Instant messaging	-0.00356 (0.00812)	0.000793 (0.00530)	-0.00333 (0.00589)	0.00476 (0.00658)	0.00864 (0.00616)

Table 21. Values extracted from Table 20.

The telephone had the greatest effect on initial closeness in the models fitted in the previous section. The data above indicate that the telephone is the most "diverse" communication channel in that it is positively and significantly associated with all but one type of talk. Face-to-face communication was associated only with smalltalk, electronic mail only with supportive talk. Instant messaging was not associated with any particular topic of conversation.

Longitudinal Channel Effects:

	Reminiscing	**Romantic**	**Arguing**	**Smalltalk**	**Supportive**
Face-to-face x time	-0.0162 (0.0131)	0.00355 (0.00806)	0.0231** (0.00934)	-0.00520 (0.0109)	-0.00346 (0.0101)
Telephone x time	0.00773 (0.0132)	-0.0175* (0.00799)	-0.0165 (0.00937)	0.0244* (0.0111)	0.0177 (0.0103)
E-mail x time	0.00926 (0.0116)	0.00399 (0.00712)	0.00721 (0.00817)	-0.0104 (0.00962)	0.000407 (0.00893)
Instant messaging x time	0.00784 (0.00981)	0.00480 (0.00608)	0.00746 (0.00691)	0.000165 (0.00807)	-0.00062 (0.00750)

Table 22. Values extracted from Table 20.

The table above models how talk changes from time 1 to time 2 with respect to communication channel. Greater levels of face-to-face communication increase the amount of arguing over time. Similarly, greater levels of telephone use are associated with decreases in romantic talk and smalltalk. Those who tend to use the phone more do less smalltalk and romantic talk. Likewise, those relationships with higher levels of face-to-face communication

tend to have higher levels of arguing. Neither of the computer-mediated channels significantly contributes to changes in any of the talk categories.

Longitudinal Relationship Effects:

	Reminiscing	Romantic	Arguing	Smalltalk	Supportive
Parents x time	-0.0560 (0.0708)	0.0109 (0.0430)	-0.0809 (0.0490)	0.0424 (0.0583)	0.0978 (0.0540)
Siblings x time	0.0120 (0.0759)	0.0158 (0.0461)	-0.401 (0.0522)	0.105 (0.0623)	0.169** (0.0577)
Romantic partners x time	-0.0901 (0.103)	0.0664 (0.0621)	0.120 (0.0707)	0.0690 (0.0848)	0.00284 (0.0785)
Close friends x time	0.0257 (0.0642)	0.0356 (0.0389)	0.0483 (0.0440)	0.0773 (0.0527)	0.149** (0.0488)
Friends * time	0.0317 (0.0635)	0.0192 (0.0383)	0.0389 (0.0435)	0.0226 (0.0522)	0.0882 (0.0483)

Table 23. Values extracted from Table 20.

For the most part, relationship type does not affect changes in talk (see Appendix B.1 for a set of effects plots). The only two exceptions are siblings and close friends. Both relationship categories are associated with increases in supportive talk. In previous parts of this analysis, however, we have seen that communication channel does interact with talk (see Appendix B.2 for a set of effects plots). Whether this is an effect of usage of certain channels, or of social rules linked to the appropriateness of different channels for different kinds of talk, we cannot be sure. One would not expect that a particular communication channel forces partners into a certain topic. However, particular channels may shape conversation topics. For example, supportive talk may best be done in person, where comforting gestures can be made. Similarly, people may prefer to "catch up" in a letter or e-mail where large amounts of information can be sent cheaply, and the partner has time to form a coherent response.

In this section, we have tried to link talk to communication channel and relationship. Few effects of relationship were found. However, different kinds of talk *do* appear to be associated with different communication channels.

Discussion

The growth of computer-mediated communication has produced many theories concerning channel effects in CMC. Foremost among these are the cues-filtered-out approach and the competing social information processing approach. It is the latter model, put forth by Walther (1993, 1996) that holds promise for the role of CMC in the maintenance of long-distance relationships. Social information processing theory suggests that socioemotional cues simply take longer to be passed over CMC than over traditional media. This is in contrast to the cues-filtered-out approach that posits that CMC channels lack sufficient bandwidth to pass such cues at all. Finally, computer-mediated communication channels come in a variety of forms. Some, such as electronic mail, are asynchronous. Others, such as instant messaging, are synchronous and can be done in real time. CMC holds the promise of allowing more people to communicate more frequently with each other at lower costs in time and money.

Channel effects, however, are not the only factor influencing communication at a distance. Relationship type and history may also play a part by proscribing the content and purpose of talk. That is, one kind of talk in one relationship may not carry the same importance or meaning in another relationship. By changing the kinds of talk that social partners may engage in, CMC may change the nature of their relationship.

Unfortunately, research into social networks has been cross-sectional in nature, leaving the issue of survivor effects untouched. The literature exploring long-distance relationships may be describing effects that after the fact. The long-distance relationships studied by Wellman (1995) and Rohlfing (1995) may be the strongest ties among their respective survey subjects; weaker ties having been previously weeded out. It is therefore difficult to untangle the effects of distance and communication without observing relationships as they happen over time; particularly at the times before and after they become geographically separated.

The analysis presented in this paper attempts to fill this gap. Models of closeness and talk are presented. Consistent with the idea that frequency of contact and rich communication may play a role in maintaining relationships, there was an observed general decline in face-to-face and telephone communication as well as closeness over time. Significant relationship by time interactions in the closeness models support the idea that relationship type and (implicitly) prior history play a role in shaping the path of relationships as they move from being proximal to being distant. Of note, kin and close friend relationships appear to be stable despite the general decline (see Figure 5).

Supporting the hypothesis that different communication channels may perform differently, significant channel by time effects were discovered. Most notable of these are the effects of the telephone and instant messaging channels. Though, over time, the telephone, electronic mail, and instant messaging channels all mitigated the general decline in closeness, instant messaging and telephone communication outperformed electronic mail. In particular, instant messaging, though associated with the lowest levels of closeness at time 1, surpassed both e-mail and face-to-face communication at time 2. In addition, the nature of the instant messaging effect is such that its mitigation of relationship decline is greater than that of the telephone.

However, telephone was associated with the widest variety of talk. This suggests that the telephone is well suited to communicating a wide range of socioemotional cues, and may be one of the most useful tools for maintaining relationships at a distance. Telephone's failing, however, is its associated costs in time and money. Long-distance telephone calls cost much more than instant messaging and electronic mail in terms of marginal cost per message. Instant messaging appears to combine the low cost of electronic mail with some of the interactivity of the telephone. However, unlike the telephone, instant messaging is not associated with any category of talk. This calls into question the role of talk in maintaining relationships. Unfortunately, as we will discuss below, the data do not allow any deeper analysis of this effect. The point, however, is that there are differences between communication channels. Some may be better for proximal partners while others may be better for distant partners.

Relationship also plays a role in our analysis. There is support for the idea that relationships may be constituted in talk. In particular, there are some strong main effects of relationship on the likelihood of talk in certain categories (see Table 20). Talk with parents and siblings consist mainly of arguing and smalltalk. Talk within romantic relationships consists of reminiscing and romantic talk. Interestingly, close friend relationships exhibited associations with all five categories of talk, possibly explaining their durability. In conjunction with the finding that certain communication channels are associated with certain kinds of talk, this finding reinforces the idea that the best choice of communication channel may have implications for the successful continuation of long-distance relationships.

It should be pointed out, however, that the data on talk presented here does not necessarily nest within communication channel. The analysis of talk in this paper only claims to make associations between frequency of channel usage and frequency of talk in specific categories. In order to adequately explore the relationship between communication channels and categories of

talk, a data would need to be collected at the level of individual communication events. In addition, the relationship data presented here only consists of observations at two time periods. A wider ranging study with observations over a longer period of time would be able to make more valid conclusions about the growth or decline of relationships. Nonetheless, the analysis presented in this study suggests that computer-mediated communication may, in fact, aid in the maintenance of long-distance relationships.

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Appendix A

The following pages contain SAS V8.1 (The SAS Institute) code and output.

Note that the relationship variables are categorical and are coded as follows:

Relationship	Coding
Parents	1
Siblings	2
Romantic partners	3
Close friends	4
Friends	5
Others	6

See Figure 1 for an illustration of how these categories were constructed.

Appendix A.1 – Unconditional model

```
proc mixed data=all noclprint covtest;
      class idnum partid upartid wave;
      model c_close = time / solution ddfm=bw;
      repeated wave / type=un subject=partid(idnum);
run;
```

Covariance Parameter Estimates

Cov Parm	Subject	Estimate	Standard Error	Z Value	Pr Z
UN(1,1)	partid(idnum)	0.7147	0.03381	21.14	<.0001
UN(2,1)	partid(idnum)	0.5286	0.03177	16.64	<.0001
UN(2,2)	partid(idnum)	0.8714	0.04122	21.14	<.0001

Fit Statistics

Res Log Likelihood	-2066.1
Akaike's Information Criterion	-2069.1
Schwarz's Bayesian Criterion	-2076.3
-2 Res Log Likelihood	4132.1

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
2	541.10	<.0001

Solution for Fixed Effects

Effect	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept	3.9348	0.02826	894	139.24	<.0001
time	-0.04246	0.02431	894	-1.75	0.0811

Appendix A.2 – Communication model 1

```
proc mixed data=all noclprint covtest;
      class idnum partid relate_ wave;
      model c_close = time|com_ftf time|com_ph time|com_em time|com_im
                      / solution ddfm=bw;
      repeated wave / type=un subject=partid(idnum) r;
run;
```

Covariance Parameter Estimates

Cov Parm	Subject	Estimate	Standard Error	Z Value	Pr Z
UN(1,1)	partid(idnum)	0.5687	0.02723	20.88	<.0001
UN(2,1)	partid(idnum)	0.3449	0.02370	14.55	<.0001
UN(2,2)	partid(idnum)	0.6157	0.02953	20.85	<.0001

Fit Statistics

Res Log Likelihood	-1912.4
Akaike's Information Criterion	-1915.4
Schwarz's Bayesian Criterion	-1922.6
-2 Res Log Likelihood	3824.8

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
2	343.28	<.0001

Solution for Fixed Effects

Effect	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept	2.9129	0.08879	894	32.81	<.0001
time	-0.01807	0.09151	894	-0.20	0.8435
com_ftf	0.05228	0.01416	894	3.69	0.0002
time*com_ftf	-0.06625	0.02174	894	-3.05	0.0024
com_ph	0.1195	0.01345	894	8.89	<.0001
time*com_ph	0.05104	0.01949	894	2.62	0.0090
com_em	0.05638	0.01520	894	3.71	0.0002
time*com_em	0.01954	0.01974	894	0.99	0.3226
com_im	0.03019	0.01308	894	2.31	0.0212
time*com_im	0.06322	0.01546	894	4.09	<.0001

Appendix A.3 – Communication model 2

```
proc mixed data=all noclprint covtest;
      class idnum partid relate_ wave;
      model c_close = time|com_ftf time|com_ph time|com_em time|com_im
                      time|access_ time|dist / solution ddfm=bw;
      repeated wave / type=un subject=partid(idnum) r;
run;
```

Covariance Parameter Estimates

Cov Parm	Subject	Estimate	Standard Error	Z Value	Pr Z
UN(1,1)	partid(idnum)	0.5668	0.02717	20.86	<.0001
UN(2,1)	partid(idnum)	0.3447	0.02363	14.59	<.0001
UN(2,2)	partid(idnum)	0.6099	0.02930	20.82	<.0001

Fit Statistics

Res Log Likelihood	-1913.8
Akaike's Information Criterion	-1916.8
Schwarz's Bayesian Criterion	-1924.0
-2 Res Log Likelihood	3827.7

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
2	346.06	<.0001

Solution for Fixed Effects

Effect	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept	2.4899	0.1601	894	15.56	<.0001
time	-0.1402	0.2067	894	-0.68	0.4976
com_ftf	0.07415	0.01748	894	4.24	<.0001
time*com_ftf	-0.04858	0.02686	894	-1.81	0.0708
com_ph	0.1203	0.01342	894	8.96	<.0001
time*com_ph	0.04873	0.01955	894	2.49	0.0129
com_em	0.04790	0.01539	894	3.11	0.0019
time*com_em	0.02151	0.02028	894	1.06	0.2892
com_im	0.02143	0.01335	894	1.61	0.1088
time*com_im	0.06688	0.01579	894	4.24	<.0001
access_	0.05039	0.02149	894	2.34	0.0192
time*access_	-0.00953	0.02728	894	-0.35	0.7269
dist	0.04982	0.02067	894	2.41	0.0161
time*dist	0.01862	0.02880	894	0.65	0.5181

Appendix A.4 – Relationship model 1

```
proc mixed data=all noclprint covtest;
      class idnum partid relate_ wave;
      model c_close = time|com_ftf time|com_ph time|com_em time|com_im
                      time|access_ time|dist
                      time|relate_ / solution ddfm=bw;
      repeated wave / type=un subject=partid(idnum) r;
run;
```

Covariance Parameter Estimates

Cov Parm	Subject	Estimate	Standard Error	Z Value	Pr Z
UN(1,1)	partid(idnum)	0.5320	0.02542	20.93	<.0001
UN(2,1)	partid(idnum)	0.3071	0.02110	14.55	<.0001
UN(2,2)	partid(idnum)	0.5355	0.02570	20.84	<.0001

Fit Statistics

Res Log Likelihood	-1847.0
Akaike's Information Criterion	-1850.0
Schwarz's Bayesian Criterion	-1857.2
-2 Res Log Likelihood	3694.1

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
2	336.79	<.0001

Solution for Fixed Effects

Effect	Relationship	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept		2.5282	0.1829	889	13.82	<.0001
time		-0.2968	0.2192	889	-1.35	0.1761
com_ftf		0.06554	0.01747	889	3.75	0.0002
time*com_ftf		-0.05341	0.02617	889	-2.04	0.0415
com_ph		0.1017	0.01390	889	7.32	<.0001
time*com_ph		0.01950	0.02179	889	0.89	0.3711
com_em		0.04013	0.01508	889	2.66	0.0079
time*com_em		0.007764	0.01964	889	0.40	0.6927
com_im		0.01072	0.01365	889	0.79	0.4324
time*com_im		0.06475	0.01614	889	4.01	<.0001
access_		0.05313	0.02104	889	2.53	0.0117
time*access_		0.005676	0.02637	889	0.22	0.8296
dist		0.009766	0.02393	889	0.41	0.6833
time*dist		0.02925	0.03035	889	0.96	0.3354
relate_	1	0.1036	0.1128	889	0.92	0.3587
relate_	2	0.2456	0.1258	889	1.95	0.0511
relate_	3	0.6601	0.1593	889	4.14	<.0001
relate_	4	0.5185	0.1027	889	5.05	<.0001
relate_	5	0.01301	0.1013	889	0.13	0.8978
relate_	6	0	.	.	.	.
time*relate_	1	0.4270	0.1136	889	3.76	0.0002
time*relate_	2	0.3064	0.1202	889	2.55	0.0110

time*relate_	3	0.02374	0.1605	889	0.15	0.8825
time*relate_	4	0.3188	0.09702	889	3.29	0.0011
time*relate_	5	-0.00669	0.09391	889	-0.07	0.9432
time*relate_	6	0	.	.	.	.

Appendix A.5 – Relationship model 2

```
proc mixed data=all noclprint covtest;
      class idnum partid relate_ wave;
      model c_close = time|com_ftf|relate_ time|com_ph|relate_
                      time|com_em|relate_ time|com_im|relate_
                      time|access_ / solution ddfm=bw;
      repeated wave / type=un subject=partid(idnum) r;
run;
```

Covariance Parameter Estimates

Cov Parm	Subject	Estimate	Standard Error	Z Value	Pr Z
UN(1,1)	partid(idnum)	0.5230	0.02532	20.65	<.0001
UN(2,1)	partid(idnum)	0.2982	0.02116	14.09	<.0001
UN(2,2)	partid(idnum)	0.5232	0.02549	20.52	<.0001

Fit Statistics

Res Log Likelihood	-1892.0
Akaike's Information Criterion	-1895.0
Schwarz's Bayesian Criterion	-1902.2
-2 Res Log Likelihood	3784.1

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
2	306.85	<.0001

Solution for Fixed Effects

Effect	Relationship	Estimate	Standard Error	DF	t Value
Intercept		2.4171	0.2521	889	9.59
time		-0.2920	0.2716	889	-1.08
com_ftf		0.08770	0.05597	889	1.57
time*com_ftf		-0.03758	0.08686	889	-0.43
relate_	1	-0.6200	0.3696	889	-1.68
relate_	2	0.6458	0.3716	889	1.74
relate_	3	1.0564	0.9411	889	1.12
relate_	4	0.7943	0.2945	889	2.70
relate_	5	0.3342	0.2805	889	1.19
relate_	6	0	.	.	.
time*relate_	1	1.0868	0.3834	889	2.83
time*relate_	2	0.6063	0.4097	889	1.48
time*relate_	3	0.6292	0.9975	889	0.63
time*relate_	4	0.4247	0.3140	889	1.35
time*relate_	5	-0.1972	0.3016	889	-0.65
time*relate_	6	0	.	.	.
com_ftf*relate_	1	0.08170	0.06827	889	1.20
com_ftf*relate_	2	-0.03039	0.06928	889	-0.44
com_ftf*relate_	3	-0.1148	0.1068	889	-1.08
com_ftf*relate_	4	-0.05425	0.06345	889	-0.86
com_ftf*relate_	5	-0.04269	0.06368	889	-0.67
com_ftf*relate_	6	0	.	.	.
time*com_ftf*relate_	1	-0.1541	0.09890	889	-1.56
time*com_ftf*relate_	2	-0.02686	0.1085	889	-0.25

Solution for Fixed Effects

Effect	Relationship	Pr > |t|

Intercept			<.0001
time			0.2826
com_ftf			0.1175
time*com_ftf			0.6654
relate_	1		0.0938
relate_	2		0.0826
relate_	3		0.2620
relate_	4		0.0071
relate_	5		0.2339
relate_	6		.
time*relate_	1		0.0047
time*relate_	2		0.1393
time*relate_	3		0.5283
time*relate_	4		0.1766
time*relate_	5		0.5133
time*relate_	6		.
com_ftf*relate_	1		0.2317
com_ftf*relate_	2		0.6610
com_ftf*relate_	3		0.2826
com_ftf*relate_	4		0.3927
com_ftf*relate_	5		0.5028
com_ftf*relate_	6		.
time*com_ftf*relate_	1		0.1196
time*com_ftf*relate_	2		0.8046
time*com_ftf*relate_	3	0.01525	0.1332 889 0.11
time*com_ftf*relate_	4	-0.01556	0.09671 889 -0.16
time*com_ftf*relate_	5	-0.02227	0.09833 889 -0.23
time*com_ftf*relate_	6	0	. . .
com_ph		0.09171	0.06268 889 1.46
time*com_ph		0.07035	0.08749 889 0.80
com_ph*relate_	1	0.04007	0.06704 889 0.60
com_ph*relate_	2	-0.05857	0.07338 889 -0.80
com_ph*relate_	3	0.08593	0.1667 889 0.52
com_ph*relate_	4	0.01687	0.06928 889 0.24
com_ph*relate_	5	-0.00180	0.06954 889 -0.03
com_ph*relate_	6	0	. . .
time*com_ph*relate_	1	0.05028	0.09534 889 0.53
time*com_ph*relate_	2	-0.09464	0.1050 889 -0.90
time*com_ph*relate_	3	-0.1576	0.1829 889 -0.86
time*com_ph*relate_	4	-0.1178	0.09674 889 -1.22
time*com_ph*relate_	5	-0.1186	0.1055 889 -1.12
time*com_ph*relate_	6	0	. . .
com_em		0.06677	0.06287 889 1.06
time*com_em		0.07919	0.09976 889 0.79
com_em*relate_	1	-0.02009	0.06912 889 -0.29
com_em*relate_	2	-0.00764	0.08249 889 -0.09
com_em*relate_	3	-0.07837	0.09094 889 -0.86
com_em*relate_	4	0.009241	0.06828 889 0.14
com_em*relate_	5	-0.06224	0.07039 889 -0.88
com_em*relate_	6	0	. . .
time*com_em*relate_	1	-0.1347	0.1054 889 -1.28
time*com_em*relate_	2	-0.08824	0.1191 889 -0.74
time*com_em*relate_	3	-0.04445	0.1328 889 -0.33
time*com_em*relate_	4	-0.06410	0.1059 889 -0.61
time*com_em*relate_	5	0.03176	0.1092 889 0.29
time*com_em*relate_	6	0	. . .
com_im		0.03125	0.05455 889 0.57
time*com_im		-0.02220	0.07493 889 -0.30
com_im*relate_	1	0.02149	0.07723 889 0.28
com_im*relate_	2	-0.01005	0.07997 889 -0.13
com_im*relate_	3	-0.00010	0.07794 889 -0.00
com_im*relate_	4	-0.04620	0.05852 889 -0.79
com_im*relate_	5	0.01133	0.06042 889 0.19
com_im*relate_	6	0	. . .
time*com_im*relate_	1	0.05219	0.09356 889 0.56
time*com_im*relate_	2	0.06615	0.1000 889 0.66
time*com_im*relate_	3	0.01325	0.1005 889 0.13
time*com_im*relate_	4	0.1020	0.07929 889 1.29
time*com_im*relate_	5	0.1044	0.08132 889 1.28
time*com_im*relate_	6	0	. . .
access_		0.04534	0.02123 889 2.14

time*access_		0.02337	0.02706	889	0.86

Solution for Fixed Effects

Effect	Relationship	Pr > |t|
time*com_ftf*relate_	3	0.9089
time*com_ftf*relate_	4	0.8722
time*com_ftf*relate_	5	0.8209
time*com_ftf*relate_	6	.
com_ph		0.1438
time*com_ph		0.4216
com_ph*relate_	1	0.5502
com_ph*relate_	2	0.4250
com_ph*relate_	3	0.6064
com_ph*relate_	4	0.8076
com_ph*relate_	5	0.9794
com_ph*relate_	6	.
time*com_ph*relate_	1	0.5981
time*com_ph*relate_	2	0.3678
time*com_ph*relate_	3	0.3890
time*com_ph*relate_	4	0.2236
time*com_ph*relate_	5	0.2613
time*com_ph*relate_	6	.
com_em		0.2885
time*com_em		0.4275
com_em*relate_	1	0.7713
com_em*relate_	2	0.9262
com_em*relate_	3	0.3890
com_em*relate_	4	0.8924
com_em*relate_	5	0.3769
com_em*relate_	6	.
time*com_em*relate_	1	0.2014
time*com_em*relate_	2	0.4588
time*com_em*relate_	3	0.7379
time*com_em*relate_	4	0.5450
time*com_em*relate_	5	0.7713
time*com_em*relate_	6	.
com_im		0.5669
time*com_im		0.7671
com_im*relate_	1	0.7809
com_im*relate_	2	0.9000
com_im*relate_	3	0.9990
com_im*relate_	4	0.4300
com_im*relate_	5	0.8513
com_im*relate_	6	.
time*com_im*relate_	1	0.5771
time*com_im*relate_	2	0.5086
time*com_im*relate_	3	0.8951
time*com_im*relate_	4	0.1987
time*com_im*relate_	5	0.1995
time*com_im*relate_	6	.
access_		0.0330
time*access_		0.3882

Appendix A.6 – Models of talk, Reminiscing

```
proc mixed data=all noclprint covtest;
      class relate_ wave partid idnum;
      model t_rem = time|relate_ time|com_ftf time|com_ph time|com_em
                    time|com_im / s ddfm=bw;
      repeated wave / type=un subject=partid(idnum) r;
run;
```

Covariance Parameter Estimates

Cov Parm	Subject	Estimate	Standard Error	Z Value	Pr Z
UN(1,1)	partid(idnum)	0.1501	0.007152	20.99	<.0001
UN(2,1)	partid(idnum)	0.05112	0.005207	9.82	<.0001
UN(2,2)	partid(idnum)	0.1357	0.006614	20.52	<.0001

Fit Statistics

Res Log Likelihood	-769.5
Akaike's Information Criterion	-772.5
Schwarz's Bayesian Criterion	-779.7
-2 Res Log Likelihood	1538.9

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
2	117.12	<.0001

Solution for Fixed Effects

Effect	Relationship	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept		0.1599	0.06284	887	2.54	0.0111
time		0.1235	0.07445	887	1.66	0.0975
relate_	1	-0.00818	0.05902	887	-0.14	0.8898
relate_	2	0.1231	0.06583	887	1.87	0.0617
relate_	3	0.2185	0.08529	887	2.56	0.0106
relate_	4	0.2723	0.05497	887	4.95	<.0001
relate_	5	0.1445	0.05393	887	2.68	0.0075
relate_	6	0	.	.	.	.
time*relate_	1	-0.05598	0.07082	887	-0.79	0.4295
time*relate_	2	0.01899	0.07591	887	0.25	0.8025
time*relate_	3	-0.09005	0.1029	887	-0.87	0.3818
time*relate_	4	0.02572	0.06420	887	0.40	0.6889
time*relate_	5	0.03167	0.06352	887	0.50	0.6182
time*relate_	6	0	.	.	.	.
com_ftf		-0.00108	0.009453	887	-0.11	0.9088
time*com_ftf		-0.01615	0.01306	887	-1.24	0.2165
com_ph		0.04087	0.008388	887	4.87	<.0001
time*com_ph		0.007734	0.01321	887	0.59	0.5585
com_em		-0.00521	0.008892	887	-0.59	0.5581
time*com_em		0.009255	0.01161	887	0.80	0.4258
com_im		-0.00356	0.008121	887	-0.44	0.6611
time*com_im		0.007835	0.009807	887	0.80	0.4246

Appendix A.7 – Models of talk, Romantic talk

```
proc mixed data=all noclprint covtest;
      class relate_ wave partid idnum;
      model t_roman = time|relate_ time|com_ftf time|com_ph time|com_em
                      time|com_im / s ddfm=bw;
      repeated wave / type=un subject=partid(idnum) r;
run;
```

Covariance Parameter Estimates

Cov Parm	Subject	Estimate	Standard Error	Z Value	Pr Z
UN(1,1)	partid(idnum)	0.06779	0.003228	21.00	<.0001
UN(2,1)	partid(idnum)	0.02515	0.002146	11.72	<.0001
UN(2,2)	partid(idnum)	0.04988	0.002419	20.62	<.0001

Fit Statistics

Res Log Likelihood	30.8
Akaike's Information Criterion	27.8
Schwarz's Bayesian Criterion	20.6
-2 Res Log Likelihood	-61.5

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
2	197.87	<.0001

Solution for Fixed Effects

Effect	Relationship	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept		-0.00172	0.04172	887	-0.04	0.9672
time		-0.01676	0.04563	887	-0.37	0.7135
relate_	1	-0.02689	0.03943	887	-0.68	0.4955
relate_	2	-0.00896	0.04410	887	-0.20	0.8391
relate_	3	0.6964	0.05716	887	12.18	<.0001
relate_	4	0.08779	0.03686	887	2.38	0.0174
relate_	5	-0.01127	0.03623	887	-0.31	0.7559
relate_	6	0	.	.	.	.
time*relate_	1	0.01087	0.04299	887	0.25	0.8004
time*relate_	2	0.01578	0.04607	887	0.34	0.7320
time*relate_	3	0.06637	0.06207	887	1.07	0.2852
time*relate_	4	0.03559	0.03885	887	0.92	0.3598
time*relate_	5	0.01920	0.03834	887	0.50	0.6168
time*relate_	6	0	.	.	.	.
com_ftf		-0.00098	0.006151	887	-0.16	0.8739
time*com_ftf		0.003552	0.008058	887	0.44	0.6595
com_ph		0.01974	0.005463	887	3.61	0.0003
time*com_ph		-0.01750	0.007988	887	-2.19	0.0287
com_em		0.009891	0.005796	887	1.71	0.0883
time*com_em		0.003994	0.007124	887	0.56	0.5752
com_im		0.000793	0.005296	887	0.15	0.8810
time*com_im		0.004796	0.006078	887	0.79	0.4303

Appendix A.8 – Models of talk, Arguing

```
proc mixed data=all noclprint covtest;
      class relate_ wave partid idnum;
      model t_argue = time|relate_ time|com_ftf time|com_ph time|com_em
                      time|com_im / s ddfm=bw;
      repeated wave / type=un subject=partid(idnum) r;
run;
```

Covariance Parameter Estimates

Cov Parm	Subject	Estimate	Standard Error	Z Value	Pr Z
UN(1,1)	partid(idnum)	0.09163	0.004360	21.02	<.0001
UN(2,1)	partid(idnum)	0.04533	0.003351	13.53	<.0001
UN(2,2)	partid(idnum)	0.08399	0.004074	20.61	<.0001

Fit Statistics

Res Log Likelihood	-277.8
Akaike's Information Criterion	-280.8
Schwarz's Bayesian Criterion	-288.0
-2 Res Log Likelihood	555.6

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
2	266.26	<.0001

Solution for Fixed Effects

Effect	Relationship	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept		0.06934	0.04764	887	1.46	0.1459
time		-0.08792	0.05185	887	-1.70	0.0903
relate_	1	0.2805	0.04547	887	6.17	<.0001
relate_	2	0.2265	0.05104	887	4.44	<.0001
relate_	3	0.1152	0.06622	887	1.74	0.0822
relate_	4	0.08440	0.04271	887	1.98	0.0485
relate_	5	-0.04126	0.04209	887	-0.98	0.3272
relate_	6	0	.	.	.	.
time*relate_	1	-0.08090	0.04896	887	-1.65	0.0988
time*relate_	2	-0.04007	0.05215	887	-0.77	0.4424
time*relate_	3	0.1204	0.07072	887	1.70	0.0891
time*relate_	4	0.04826	0.04404	887	1.10	0.2735
time*relate_	5	0.03887	0.04354	887	0.89	0.3723
time*relate_	6	0	.	.	.	.
com_ftf		0.01173	0.006816	887	1.72	0.0856
time*com_ftf		0.02306	0.009343	887	2.47	0.0138
com_ph		0.02624	0.006061	887	4.33	<.0001
time*com_ph		-0.01650	0.009367	887	-1.76	0.0786
com_em		-0.00671	0.006439	887	-1.04	0.2978
time*com_em		0.007208	0.008174	887	0.88	0.3781
com_im		-0.00333	0.005887	887	-0.57	0.5714
time*com_im		0.007461	0.006906	887	1.08	0.2803

Appendix A.9 – Models of talk, Smalltalk

```
proc mixed data=all noclprint covtest;
      class relate_ wave partid idnum;
      model t_talk = time|relate_ time|com_ftf time|com_ph time|com_em
                     time|com_im / s ddfm=bw;
      repeated wave / type=un subject=partid(idnum) r;
run;
```

Covariance Parameter Estimates

Cov Parm	Subject	Estimate	Standard Error	Z Value	Pr Z
UN(1,1)	partid(idnum)	0.1032	0.004921	20.96	<.0001
UN(2,1)	partid(idnum)	0.04363	0.003933	11.09	<.0001
UN(2,2)	partid(idnum)	0.1065	0.005200	20.48	<.0001

Fit Statistics

Res Log Likelihood	-480.0
Akaike's Information Criterion	-483.0
Schwarz's Bayesian Criterion	-490.2
-2 Res Log Likelihood	960.1

Null Model Likelihood Ratio Test

DF	Chi-Square	Pr > ChiSq
2	155.80	<.0001

Solution for Fixed Effects

Effect	Relationship	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept		0.3034	0.05161	887	5.88	<.0001
time		-0.00617	0.06124	887	-0.10	0.9197
relate_	1	-0.1045	0.04871	887	-2.15	0.0322
relate_	2	-0.00251	0.05444	887	-0.05	0.9633
relate_	3	0.1167	0.07056	887	1.65	0.0985
relate_	4	0.1275	0.04549	887	2.80	0.0052
relate_	5	0.09464	0.04469	887	2.12	0.0345
relate_	6	0	.	.	.	.
time*relate_	1	0.04245	0.05833	887	0.73	0.4669
time*relate_	2	0.1047	0.06228	887	1.68	0.0931
time*relate_	3	0.06892	0.08478	887	0.81	0.4165
time*relate_	4	0.07734	0.05273	887	1.47	0.1428
time*relate_	5	0.02264	0.05222	887	0.43	0.6647
time*relate_	6	0	.	.	.	.
com_ftf		0.03782	0.007647	887	4.94	<.0001
time*com_ftf		-0.00520	0.01089	887	-0.48	0.6332
com_ph		0.01193	0.006790	887	1.76	0.0793
time*com_ph		0.02443	0.01108	887	2.20	0.0278
com_em		-0.00884	0.007203	887	-1.23	0.2202
time*com_em		-0.01037	0.009616	887	-1.08	0.2813
com_im		0.004763	0.006581	887	0.72	0.4694
time*com_im		0.000165	0.008070	887	0.02	0.9837

Appendix A.10 – Models of talk, Supportive talk

```
proc mixed data=all noclprint covtest;
      class relate_ wave partid idnum;
      model t_supp = time|relate_ time|com_ftf time|com_ph time|com_em
                     time|com_im / s ddfm=bw;
      repeated wave / type=un subject=partid(idnum) r;
run;
```

Covariance Parameter Estimates

Cov Parm	Subject	Estimate	Standard Error	Z Value	Pr Z
UN(1,1)	partid(idnum)	0.09177	0.004374	20.98	<.0001
UN(2,1)	partid(idnum)	0.04003	0.003479	11.50	<.0001
UN(2,2)	partid(idnum)	0.09302	0.004544	20.47	<.0001

Fit Statistics

Res Log Likelihood	-364.2
Akaike's Information Criterion	-367.2
Schwarz's Bayesian Criterion	-374.4
-2 Res Log Likelihood	728.5

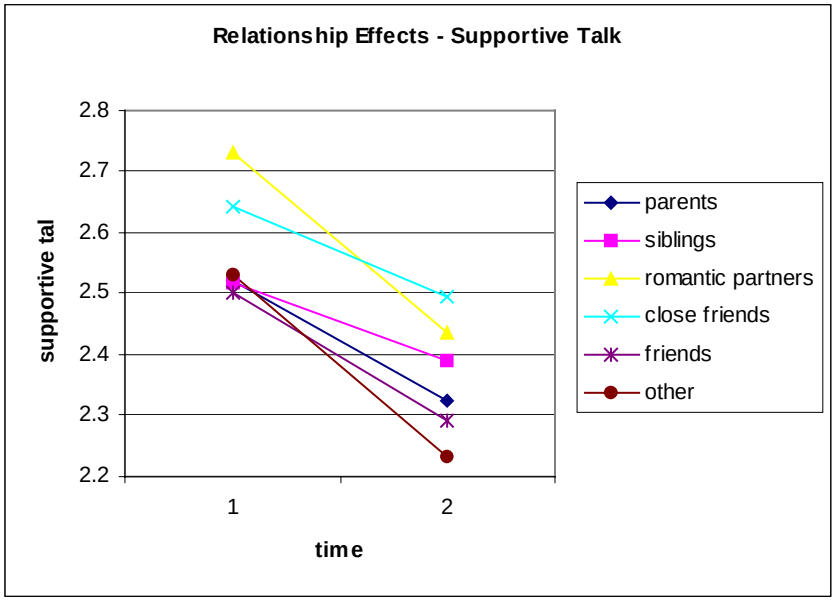
Null Model Likelihood Ratio Test

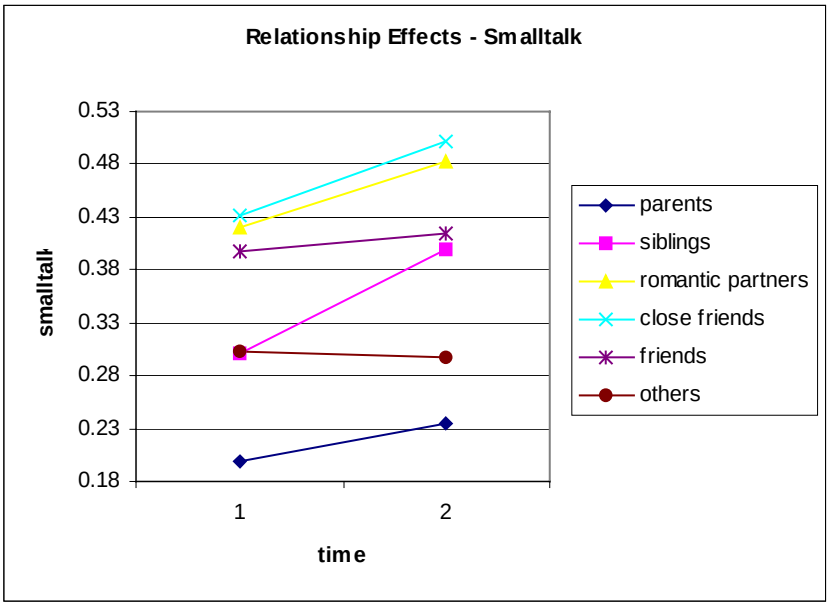
DF	Chi-Square	Pr > ChiSq
2	170.71	<.0001

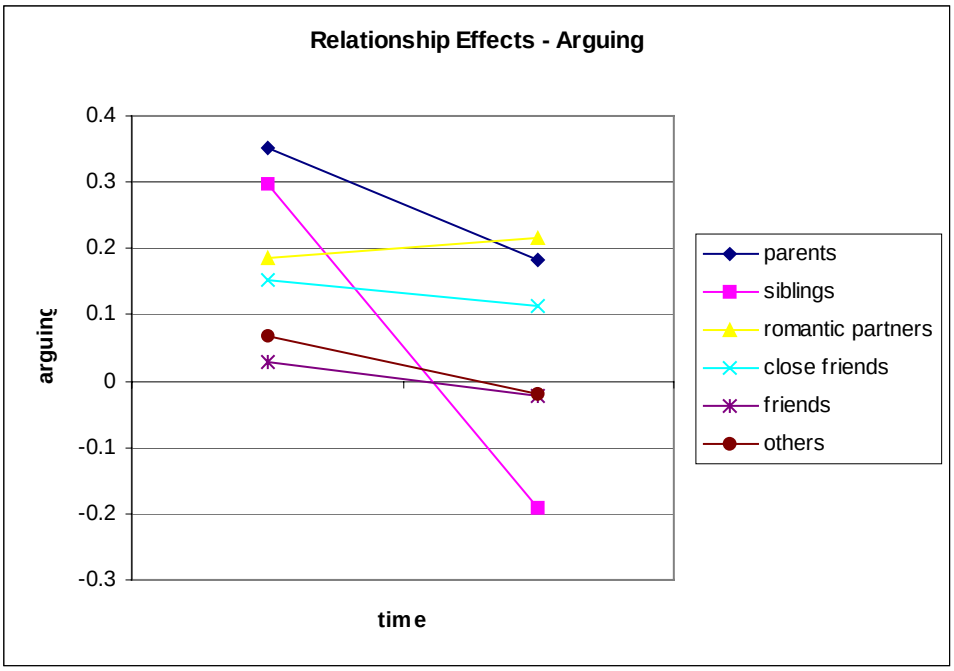
Solution for Fixed Effects

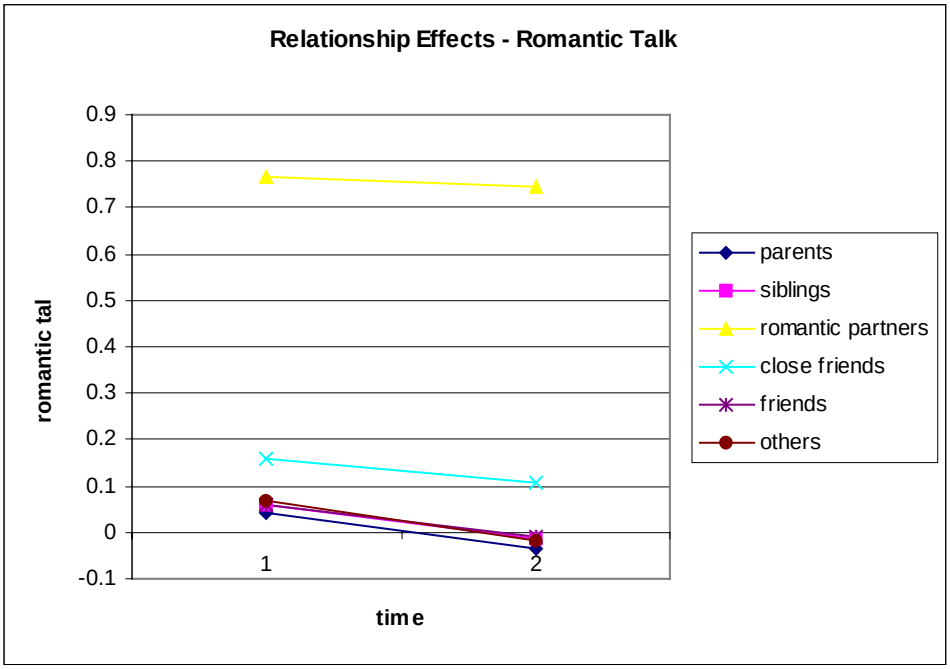
Effect	Relationship	Estimate	Standard Error	DF	t Value	Pr > |t|
Intercept		0.3352	0.04853	887	6.91	<.0001
time		-0.1125	0.05680	887	-1.98	0.0480
relate_	1	-0.00744	0.04587	887	-0.16	0.8713
relate_	2	-0.01210	0.05131	887	-0.24	0.8137
relate_	3	0.2000	0.06651	887	3.01	0.0027
relate_	4	0.1141	0.04288	887	2.66	0.0079
relate_	5	-0.02814	0.04215	887	-0.67	0.5045
relate_	6	0	.	.	.	.
time*relate_	1	0.09775	0.05403	887	1.81	0.0708
time*relate_	2	0.1690	0.05766	887	2.93	0.0035
time*relate_	3	0.002840	0.07845	887	0.04	0.9711
time*relate_	4	0.1490	0.04880	887	3.05	0.0023
time*relate_	5	0.08815	0.04831	887	1.82	0.0684
time*relate_	6	0	.	.	.	.
com_ftf		0.008149	0.007154	887	1.14	0.2550
time*com_ftf		-0.00346	0.01012	887	-0.34	0.7329
com_ph		0.03597	0.006354	887	5.66	<.0001
time*com_ph		0.01766	0.01028	887	1.72	0.0862
com_em		0.01378	0.006742	887	2.04	0.0412
time*com_em		0.000407	0.008927	887	0.05	0.9637
com_im		0.008642	0.006160	887	1.40	0.1610
time*com_im		-0.00062	0.007499	887	-0.08	0.9346

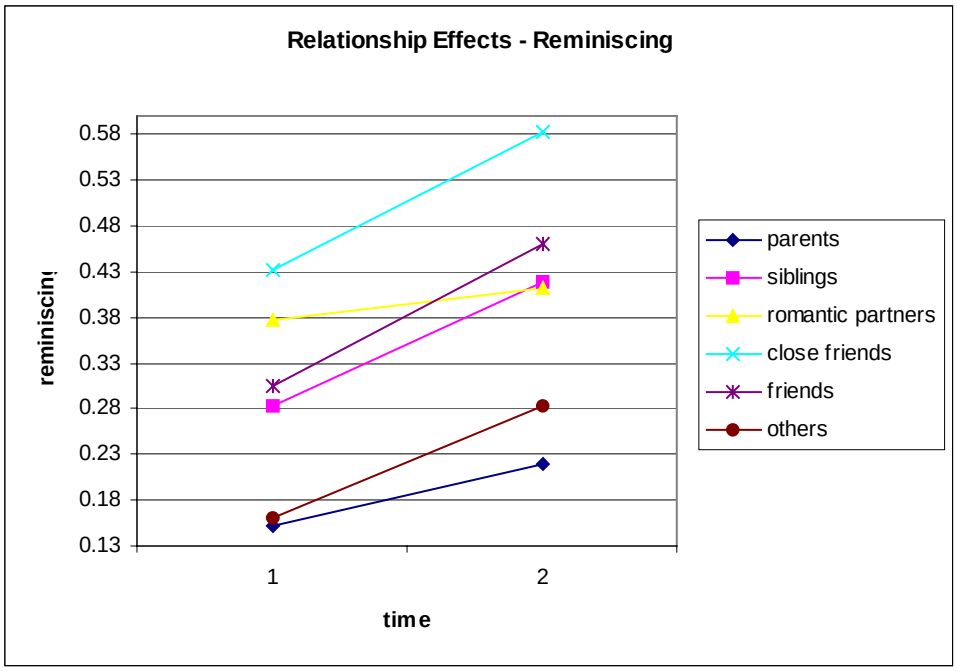
Appendix B.1 – Relationship effects plots for models of talk



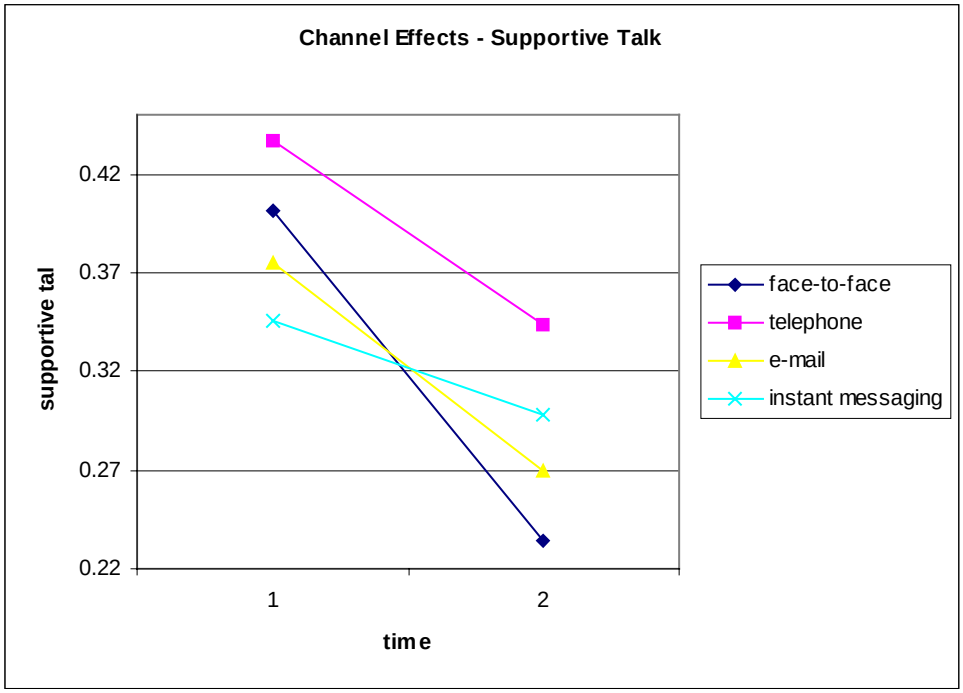


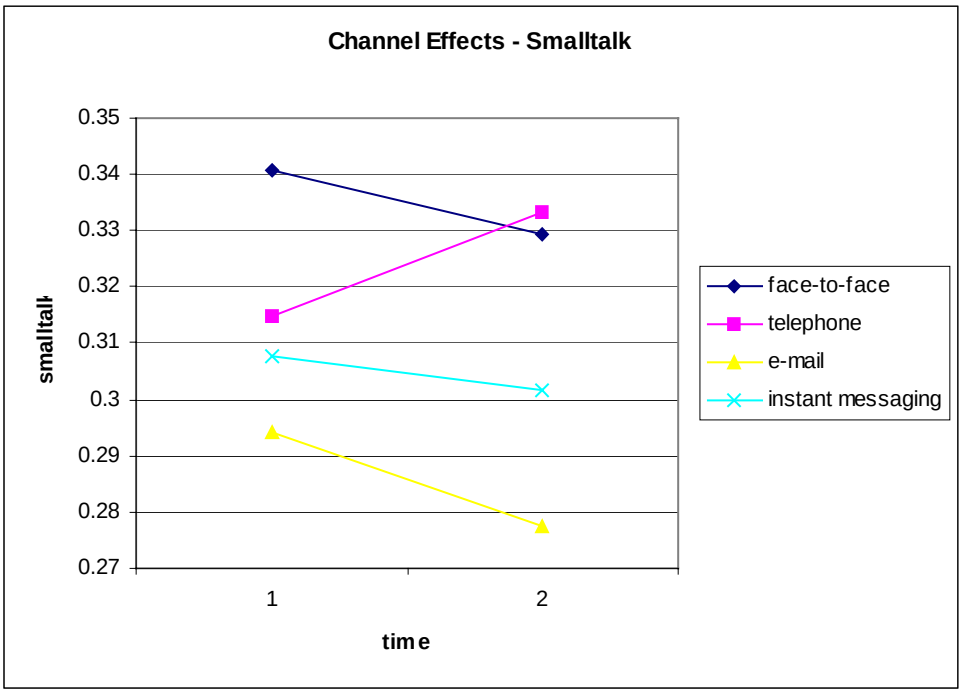

Relationship Effects - Arguing
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
arguing
time
parents
siblings
romantic partners
close friends
friends
others

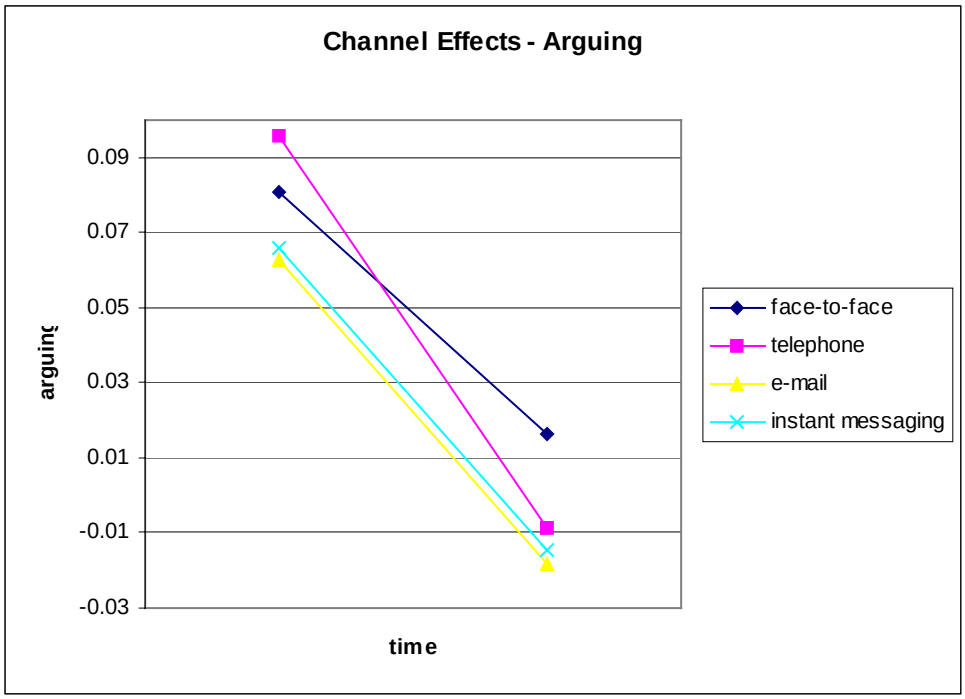

Relationship Effects - Romantic Talk
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
romantic tal
1
2
time
parents
siblings
romantic partners
close friends
friends
others

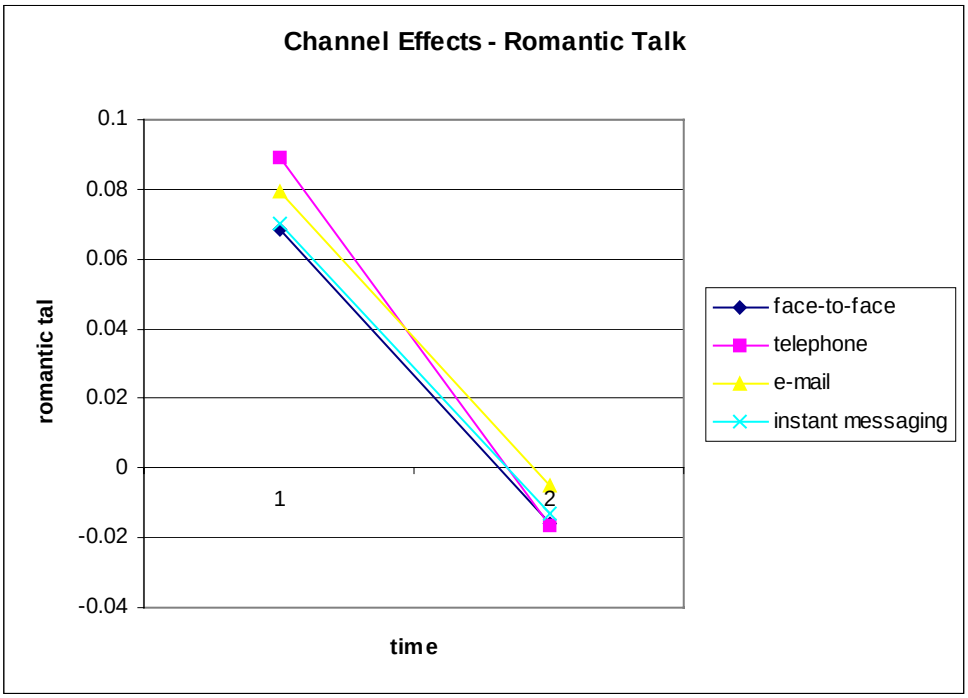

Relationship Effects - Reminiscing
0.58
0.53
0.48
0.43
0.38
0.33
0.28
0.23
0.18
0.13
1
2
time
parents
siblings
romantic partners
close friends
friends
others

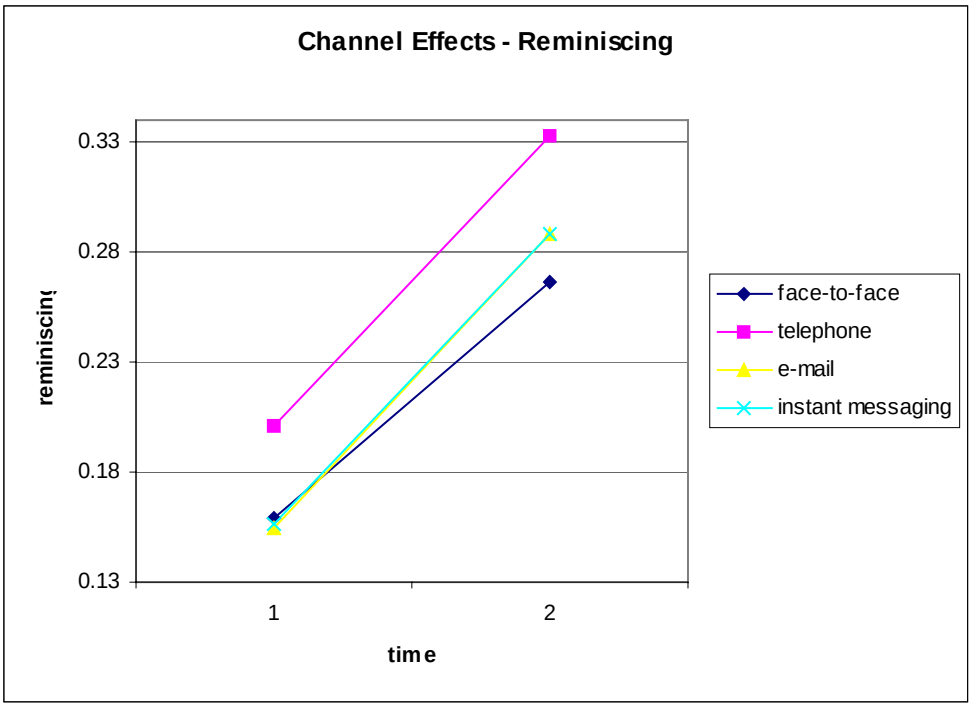
Appendix B.2 – Channel effects plots for models of talk






Channel Effects - Arguing
0.09
0.07
0.05
0.03
0.01
-0.01
-0.03
arguing
time
face-to-face
telephone
e-mail
instant messaging


Channel Effects - Romantic Talk
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
romantic tal
1
2
time
face-to-face
telephone
e-mail
instant messaging


Channel Effects - Reminiscing
0.33
0.28
0.23
0.18
0.13
reminiscin
1
2
time
face-to-face
telephone
e-mail
instant messaging

Appendix C – Survey

Carnegie Mellon

Survey on Technology and Social Relationships

August, 2000

Please fill this out independently.
It is confidential.

Please return the questionnaire in the enclosed pre-addressed envelope.

Today's date _____

Section 1. Using Computers and the Internet

1. In what rooms in your house do you have a computer? Please mark all that apply.

a. ___ No computer
b. ___ Living room
c. ___ Dining room
d. ___ Kitchen
e. ___ Adult's bedroom
f. ___ Child's bedroom
g. ___ Study or office
h. ___ Family room
i. ___ Spare room
j. ___ Laptop (mobile)
k. ___ Other _____

2. To what extent do you agree with the following statements? Please circle the number between 1 and 5 that best indicates your level of agreement with each statement.

		Strongly disagree		Neutral		Strongly agree
a.	I am very skilled at using computers.....	1	2	3	4	5
b.	I know a computer language….....	1	2	3	4	5
c.	I would feel at ease in a computer class.....	1	2	3	4	5
d.	I have a lot of self-confidence when it comes to using computers.....	1	2	3	4	5
e.	I am not the type to do well with computers.....	1	2	3	4	5
f.	Figuring out computer problems does not appeal to me.....	1	2	3	4	5
g.	I feel comfortable using a computer.....	1	2	3	4	5
h.	I use computers almost every day.....	1	2	3	4	5
i.	I don't know much about using computers.....	1	2	3	4	5

Section 2. Leisure time and community involvement

1. How much do you agree with the following statements about yourself? Please circle your response.

		Strongly disagree		Neutral		Strongly agree
a.	I watch TV very frequently.....	1	2	3	4	5
b.	I use a personal computer very frequently.....	1	2	3	4	5
c.	I use the World Wide Web very frequently.....	1	2	3	4	5
d.	I use electronic mail very frequently.....	1	2	3	4	5
e.	I use instant messaging (e.g., ICQ, AOL Instant Messenger) very frequently.....	1	2	3	4	5
f.	I use MUDs on the Internet very frequently.....	1	2	3	4	5
g.	I spend a lot of time participating in school or community activities.....	1	2	3	4	5
h.	I spend a lot of time with friends.....	1	2	3	4	5
i.	I belong to many organizations….....	1	2	3	4	5
j.	I spend a lot of time working alone.....	1	2	3	4	5
k.	I spend a lot of time by myself.....	1	2	3	4	5

2. What school activities were you involved with in high school? Please circle all that apply

a. ___ Yearbook/Publications
b. ___ Student government
c. ___ Sports/Athletics
d. ___ Art/Art appreciation
e. ___ Music/Instrument/Voice
f. ___ Science/Engineering projects
g. ___ Academic teams/competitions
h. ___ Political groups
i. ___ Model UN, Model Congress
j. ___ Games and hobby groups
k. ___ Religious groups
l. ___ Volunteer groups

Section 3. Spending time

Approximately how much time do you spend on the following activities on a typical weekday? Estimate the number of hours and minutes per weekday you spend on each activity. Please fill in "0" if you spent no time on an item.

		Hours	Minutes
a.	Communicating with friends	_____	_____
b.	Communicating with family	_____	_____
c.	Using a computer at work or school	_____	_____
d.	Using a computer at home	_____	_____
e.	Using the World Wide Web	_____	_____
f.	Using electronic mail	_____	_____
g.	Using instant messaging (e.g., AOL Instant Messenger, ICQ)	_____	_____
h.	Talking on the telephone	_____	_____
i.	Watching television	_____	_____
J	Studying	_____	_____
j.	Reading	_____	_____
k.	Being alone	_____	_____

Section 4. Computers and the Internet

There are many different ways to use computers and the Internet. How frequently do you use a computer or the Internet for the following purposes? Circle any number between 1 and 5 where 1 represents "never", 3 represents "sometimes", and 5 represents "often."

		Never		Sometimes		Often
a.	Finding information about local events	1	2	3	4	5
b.	Finding information about national or international events	1	2	3	4	5
c.	Being entertained	1	2	3	4	5
d.	Finding out about the news	1	2	3	4	5
e.	Getting the feeling that I'm involved in important events	1	2	3	4	5
f.	Keeping up with the way the government is doing its job	1	2	3	4	5
g.	Killing time	1	2	3	4	5
h.	Releasing tension	1	2	3	4	5
i.	Overcoming loneliness	1	2	3	4	5
j.	Obtaining information about daily life	1	2	3	4	5
k.	Finding out product information	1	2	3	4	5
l.	Buying a product or service	1	2	3	4	5
m.	Selling a product or service	1	2	3	4	5
n.	Downloading software	1	2	3	4	5
o.	Viewing sexually oriented materials	1	2	3	4	5
p.	Playing games	1	2	3	4	5
q.	Listening to music	1	2	3	4	5
r.	Getting help for a personal problem	1	2	3	4	5
s.	Doing work for your job	1	2	3	4	5
t.	Doing schoolwork	1	2	3	4	5
u.	Finding information relevant to a hobby	1	2	3	4	5
v.	Finding information relevant to your education	1	2	3	4	5
w.	Finding information relevant to your job	1	2	3	4	5
x.	Meeting someone new	1	2	3	4	5
y.	Spending time with friends online	1	2	3	4	5
z.	Visiting chat rooms	1	2	3	4	5
aa.	Learning about myself	1	2	3	4	5
bb.	Communicating with friends in your local area	1	2	3	4	5
cc.	Communicating with friends far away	1	2	3	4	5

Section 5. Communication in your household

1. Please list the first names and last initial of up to seven people who now live in your household or who have lived there within the past four years. Answer the questions about each person you have listed.

First name and last initial	Age	Relationship to you (Please mark one)	
______________________	____	1. Mother 2. Father 3. Brother 4. Sister 5. Other __________	
		Does this person have an electronic mail account?	1. Yes 2. No
		Does this person currently live in your household?	1. Yes 2. No
First name and last initial	Age	Relationship to you (Please mark one)	
______________________	____	1. Mother 2. Father 3. Brother 4. Sister 5. Other __________	
		Does this person have an electronic mail account?	1. Yes 2. No
		Does this person currently live in your household?	1. Yes 2. No
First name and last initial	Age	Relationship to you (Please mark one)	
______________________	____	1. Mother 2. Father 3. Brother 4. Sister 5. Other __________	
		Does this person have an electronic mail account?	1. Yes 2. No
		Does this person currently live in your household?	1. Yes 2. No
First name and last initial	Age	Relationship to you (Please mark one)	
______________________	____	1. Mother 2. Father 3. Brother 4. Sister 5. Other __________	
		Does this person have an electronic mail account?	1. Yes 2. No
		Does this person currently live in your household?	1. Yes 2. No
First name and last initial	Age	Relationship to you (Please mark one)	
______________________	____	1. Mother 2. Father 3. Brother 4. Sister 5. Other __________	
		Does this person have an electronic mail account?	1. Yes 2. No
		Does this person currently live in your household?	1. Yes 2. No
First name and last initial	Age	Relationship to you (Please mark one)	
______________________	____	1. Mother 2. Father 3. Brother 4. Sister 5. Other __________	
		Does this person have an electronic mail account?	1. Yes 2. No
		Does this person currently live in your household?	1. Yes 2. No
First name and last initial	Age	Relationship to you (Please mark one)	
______________________	____	1. Mother 2. Father 3. Brother 4. Sister 5. Other __________	
		Does this person have an electronic mail account?	1. Yes 2. No
		Does this person currently live in your household?	1. Yes 2. No

Section 5a. Communication with mother

This section asks about your communication with your mother, stepmother or female guardian. If you have more than one, answer about the one with whom you have lived most recently.

1. Is she still living, 1. Yes 2. No (If no, please skip to the next page).

2. What is her first name and last initial?

_____

3. What is her relation to you? 1. Biological mother 2. Step mother 3. Other

4. How close to you does she live?	1. Same building	2. Same neighborhood	3. Same town	4. Same state	5e. Same country	6. Further away

5. How frequently do you communicate with her using these modes of communication?

	Many times per day	Daily	Weekly	Biweekly	Monthly	Less often	Never
a. In person	1	2	3	4	5	6	7
b. By phone	1	2	3	4	5	6	7
c. By e-mail	1	2	3	4	5	6	7
d. By instant messaging	1	2	3	4	5	6	7

	Not very				Very
6. How easy is it for her to access the Internet at home or work?	1	2	3	4	5
7. How comfortable are you communicating with her?	1	2	3	4	5
8. How close do you feel to her?	1	2	3	4	5
9. How similar are you to her in values and interests?	1	2	3	4	5

10. How frequently do you do the following with your mother or stepmother?

	Infrequently				Frequently
a. Receive practical support?	1	2	3	4	5
b. Receive economic assistance?	1	2	3	4	5
c. Discuss hobbies or spare time interests?	1	2	3	4	5
d. Socialize with her?	1	2	3	4	5
e. Receive emotional support?	1	2	3	4	5
f. How frequently do you expect to keep up with her in the future?	1	2	3	4	5

11. Circle the types of communication you <u>regularly</u> have with your mother or stepmother. Circle as many as apply.

h. Small talk	o. Joking around	v. Gossip/talking about others
i. Killing time	p. Catching up	w. Recapping the day
j. Getting to know her	q. Sharing experiences	x. Making plans & arrangements
k. Getting/giving advice	r. Discussing work/school	y. Discussing interests, hobbies
l. Reminiscing	s. Persuading	z. Talking about our relationship
m. Getting/giving support	t. Romantic talk	aa. Talking about problems
n. Disagreeing or arguing	u. Complaining	bb. Asking a favor

	Grew weaker				Grew stronger
12. Over the past six months, has your relationship with her grown weaker, grown stronger, or remained the same?	1	2	3	4	5

Section 5b. Communication with father or stepfather

This section asks about your communication with your father, stepfather, or male guardian. If you have more than one, answer about the one with whom you have lived most recently.

1. Is this person still living, 1. Yes 2. No (If no, please skip to the next page).

2. What is his first name and last initial?

_____

3. What is his relation to you? 1. Biological father 2. Stepfather 3. Other

4. How close to you does he live?	a. Same building	b. Same neighborhood	c. Same town	d. Same state	e. Same country	f. Further away

5. How frequently do you communicate with him using these modes of communication?

	Many times per day	Daily	Weekly	Biweekly	Monthly	Less often	Never
a. In person	1	2	3	4	5	6	7
b. By phone	1	2	3	4	5	6	7
c. By e-mail	1	2	3	4	5	6	7
d. By instant messaging	1	2	3	4	5	6	7

	Not very				Very
6. How easy is it for him to access the Internet at home or work?	1	2	3	4	5
7. How comfortable are you communicating with him?	1	2	3	4	5
8. How close do you feel to him?	1	2	3	4	5
9. How similar are you to him in values and interests?	1	2	3	4	5

10. How frequently do you do the following with your father or stepfather?

	Infrequently				Frequently
a. Receive practical support?	1	2	3	4	5
b. Receive economic assistance?	1	2	3	4	5
c. Discuss hobbies or spare time interests?	1	2	3	4	5
d. Socialize with her?	1	2	3	4	5
e. Receive emotional support?	1	2	3	4	5
f. How frequently do you expect to keep up with her in the future?	1	2	3	4	5

11. Circle the types of communication you <u>regularly</u> have with your father or stepfather. Circle as many as apply.

a. Small talk	h. Joking around	o. Gossip/talking about others
b. Killing time	i. Catching up	p. Recapping the day
c. Getting to know him/her	j. Sharing experiences	q. Making plans & arrangements
d. Getting/giving advice	k. Discussing work/school	r. Discussing interests, hobbies
e. Reminiscing	l. Persuading	s. Talking about our relationship
f. Getting/giving support	m. Romantic talk	t. Talking about problems
g. Disagreeing or arguing	n. Complaining	u. Asking a favor

	Grew weaker				Grew stronger
12. Over the past six months, has your relationship with him grown weaker, grown stronger, or remained the same?	1	2	3	4	5

Section 5c. Communication with brothers and sisters

This section asks about your communication with your brothers and sister. If you have more than one, answer about the one with whom you are closest in age.

1. Is this person still living, 1. Yes 2. No (If no, please skip to the next page).

2. What is her first name and last initial?

_____

3. What is her relation to you? 1. Brother 2. Sister

4. How close to you does this person live?	a. Same building	b. Same neighborhood	c. Same town	d. Same state	e. Same country	f. Further away

5. How frequently do you communicate with this person using these modes of communication?

	Daily	Weekly	Biweekly	Monthly	Less often	Never
a. In person	1	2	3	4	5	6
b. By phone	1	2	3	4	5	6
c. By e-mail	1	2	3	4	5	6
d. By instant messaging	1	2	3	4	5	6

	Not very				Very
6. How easy is it for this person to access the Internet at home or work?	1	2	3	4	5
7. How comfortable are you communicating with this person ?	1	2	3	4	5
8. How close do you feel to this person ?	1	2	3	4	5
9. How similar are you to this person in values and interests?	1	2	3	4	5

10. How frequently do you do the following with your brother or sister?

	Infrequently				Frequently
a. Receive practical support?	1	2	3	4	5
b. Receive economic assistance?	1	2	3	4	5
c. Discuss hobbies or spare time interests?	1	2	3	4	5
d. Socialized with her?	1	2	3	4	5
e. Receive emotional support?	1	2	3	4	5
f. How frequently do you expect to keep up with her in the future?	1	2	3	4	5

11. Circle the types of communication you <u>regularly</u> have with this person. Circle as many as apply.

o. Small talk	v. Joking around	cc. Gossip/talking about others
p. Killing time	w. Catching up	dd. Recapping the day
q. Getting to know him/her	x. Sharing experiences	ee. Making plans & arrangements
r. Getting/giving advice	y. Discussing work/school	ff. Discussing interests, hobbies
s. Reminiscing	z. Persuading	gg. Talking about our relationship
t. Getting/giving support	aa. Romantic talk	hh. Talking about problems
u. Disagreeing or arguing	bb. Complaining	ii. Asking a favor

	Grew weaker				Grew stronger
12. Over the past six months, has your relationship with this person grown weaker, grown stronger, or remained the same?	1	2	3	4	5

Section 6. Your social circle

The following sections ask about your relationship with specific people in your social circle who are not in your immediate family.

Please list the first name and last initial of one or more people for each type of relationship. Please use names and initials you will recognize later, because we will ask you questions about some of these people in a later questionnaire. If more than one person has the same name and initial, give the first two or three letters of their last name.

Include a person in only one of these lists—the first list that applies to him or her..

1. People who provide you with practical assistance. For example, these are people who help you with tasks that need an extra pair of hands, who would give you a ride to the airport if you needed it, or who would run small errands for you.

1)	2)	3)	4)	5)	6)

2. People who provide you with financial assistance. For example, these are people who you would feel comfortable going to for a small loan for food, gas, rent, etc.

7)	8)	9)	10)	11)	12)

3. People with whom you discuss hobbies, sports, movies, and other spare-time interests.

13)	14)	15)	16)	17)	18)

4. People whom you socialize with. For example, these are people you go out with, chat online with, or go to lunch with.

19)	20)	21)	22)	23)	24)

5. People who give you emotional support. For example, these are people who you confide in, discuss personal matters with, or calm you down when you are upset.

25)	26)	27)	28)	29)	30)

6. People who give you advice about important issues. For example, these are people who give you advice about purchases, work, school, or personal relationships

31)	32)	33)	34)	35)	36)

7. People who are in the same organization(s) as you. For example, these would be people who are on the same sports teams or in the same clubs as you.

37)	38)	39)	40)	41)	42)

Section 6a. Communication with four friends

First female friend: Think about the girls and women you listed in the social circle list in Section 6. Please answer the following questions about the one whose **first initial is closest to the *beginning* of the alphabet**.

1. What is her first name and last initial? _____

2. How old is she? _____ yrs.

3. How close to you does she live? 1) Same building 2) Same neigh-borhood 3) Same town 4) Same state 5) Same country 6) Further away

4. How long have you known her? < 1 month < 3 months < 6 months < 1 year < 2 years < 3 years 3+ years

5. What is her relation to you? 1. Romantic partner 2. Close friend 3. Friend 4. Acquaintance 5. Relative 6. Other _____

6. How did you meet her? 1. Is a neighbor 2. Through school or work 3. Is a relative 4. Through mutual friend 5. Through club/hobby 6. Met online

7. How frequently do you communicate with her using these modes of communication?

	Many times per day	Daily	Weekly	Biweekly	Monthly	Less often	Never
a. In person	1	2	3	4	5	6	7
b. By phone	1	2	3	4	5	6	7
c. By e-mail	1	2	3	4	5	6	7
d. By instant messaging	1	2	3	4	5	6	7

	Not very				Very
9. How easy is it for her to access the Internet at home or work?	1	2	3	4	5
10. How comfortable are you communicating with her?	1	2	3	4	5
11. How close do you feel to her?	1	2	3	4	5
12. How similar are you to her in values and interests?	1	2	3	4	5

13. How frequently do you do the following with her?

	Infrequently				Frequently
a. Receive practical support?	1	2	3	4	5
b. Receive economic assistance?	1	2	3	4	5
c. Discuss hobbies or spare time interests?	1	2	3	4	5
d. Socialize with her?	1	2	3	4	5
e. Receive emotional support?	1	2	3	4	5
f. How frequently do you expect to keep up with her in the future?	1	2	3	4	5

14. Circle the types of communication you <u>regularly</u> have with her. Please mark all that apply.

a. Small talk	h. Joking around	o. Gossip/talking about others
b. Killing time	i. Catching up	p. Recapping the day
c. Getting to know him/her	j. Sharing experiences	q. Making plans & arrangements
d. Getting/giving advice	k. Discussing work/school	r. Discussing interests, hobbies
e. Reminiscing	l. Persuading	s. Talking about our relationship
f. Getting/giving support	m. Romantic talk	t. Talking about problems
g. Disagreeing or arguing	n. Complaining	u. Asking a favor

	Grew weaker				Grew stronger
15. Over the past six months, has your relationship with her grown weaker, grown stronger, or remained the same?	1	2	3	4	5

Second female friend: Think about the girls or women you listed in the social circle list in Section 6. Please answer the following questions about the one whose **first initial is closest to the *end* of the alphabet**.

1. What is her first name and last initial? _____

2. How old is she? _____ yrs.

3. How close to you does she live? 1) Same building | 2) Same neigh-borhood | 3) Same town | 4) Same state | 5) Same country | 6) Further away

4. How long have you known her? < 1 month | < 3 months | < 6 months | < 1 year | < 2 years | < 3 years | 3+ years

5. What is her relation to you? 1. Romantic partner | 2. Close friend | 3. Friend | 4. Acquaintance | 5. Relative | 6. Other _____

6. How did you meet her? 1. Is a neighbor | 2. Through school or work | 3. Is a relative | 4. Through mutual friend | 5. Through club/hobby | 6. Met online

7. How frequently do you communicate with her using these modes of communication?

	Many times per day	Daily	Weekly	Biweekly	Monthly	Less often	Never
a. In person	1	2	3	4	5	6	7
b. By phone	1	2	3	4	5	6	7
c. By e-mail	1	2	3	4	5	6	7
d. By instant messaging	1	2	3	4	5	6	7

	Not very				Very
9. How easy is it for her to access the Internet at home or work?	1	2	3	4	5
10. How comfortable are you communicating with her?	1	2	3	4	5
11. How close do you feel to her?	1	2	3	4	5
12. How similar are you to her in values and interests?	1	2	3	4	5

13. How frequently do you do the following with her?

	Infrequently				Frequently
a. Receive practical support?	1	2	3	4	5
b. Receive economic assistance?	1	2	3	4	5
c. Discuss hobbies or spare time interests?	1	2	3	4	5
d. Socialize with her?	1	2	3	4	5
e. Receive emotional support?	1	2	3	4	5
f. How frequently do you expect to keep up with her in the future?	1	2	3	4	5

14. Circle the types of communication you <u>regularly</u> have with her. Please mark all that apply.

a. Small talk	h. Joking around	o. Gossip/talking about others
b. Killing time	i. Catching up	p. Recapping the day
c. Getting to know him/her	j. Sharing experiences	q. Making plans & arrangements
d. Getting/giving advice	k. Discussing work/school	r. Discussing interests, hobbies
e. Reminiscing	l. Persuading	s. Talking about our relationship
f. Getting/giving support	m. Romantic talk	t. Talking about problems
g. Disagreeing or arguing	n. Complaining	u. Asking a favor

	Grew weaker				Grew stronger
15. Over the past six months, has your relationship with her grown weaker, grown stronger, or remained the same?	1	2	3	4	5

First male friend: Think about the boys or men you listed in the social circle list in Section 6. Please answer the following questions about the one whose **first initial is closest to the *beginning* of the alphabet**.

1. What is his first name and last initial? _____

2. How old is he? _____ yrs.

3. How close to you does he live? 1) Same building 2) Same neigh-borhood 3) Same town 4) Same state 5) Same country 6) Further away

4. How long have you known him? < 1 month < 3 months < 6 months < 1 year < 2 years < 3 years 3+ years

5. What is his relation to you? 1. Romantic partner 2. Close friend 3. Friend 4. Acquaintance 5. Relative 6. Other _____

6. How did you meet him? 1. Is a neighbor 2. Through school or work 3. Is a relative 4. Through mutual friend 5. Through club/hobby 6. Met online

7. How frequently do you communicate with him using these modes of communication?

	Many times per day	Daily	Weekly	Biweekly	Monthly	Less often	Never
a. In person	1	2	3	4	5	6	7
b. By phone	1	2	3	4	5	6	7
c. By e-mail	1	2	3	4	5	6	7
d. By instant messaging	1	2	3	4	5	6	7

	Not very				Very
9. How easy is it for him to access the Internet at home or work?	1	2	3	4	5
10. How comfortable are you communicating with him?	1	2	3	4	5
11. How close do you feel to him?	1	2	3	4	5
12. How similar are you to him in values and interests?	1	2	3	4	5

13. How frequently do you do the following with him?

	Infrequently				Frequently
a. Receive practical support?	1	2	3	4	5
b. Receive economic assistance?	1	2	3	4	5
c. Discuss hobbies or spare time interests?	1	2	3	4	5
d. Socialize with him?	1	2	3	4	5
e. Receive emotional support?	1	2	3	4	5
f. How frequently do you expect to keep up with him in the future?	1	2	3	4	5

14. Circle the types of communication you <u>regularly</u> have with him. Please mark all that apply.

a. Small talk	h. Joking around	o. Gossip/talking about others
b. Killing time	i. Catching up	p. Recapping the day
c. Getting to know him/her	j. Sharing experiences	q. Making plans & arrangements
d. Getting/giving advice	k. Discussing work/school	r. Discussing interests, hobbies
e. Reminiscing	l. Persuading	s. Talking about our relationship
f. Getting/giving support	m. Romantic talk	t. Talking about problems
g. Disagreeing or arguing	n. Complaining	u. Asking a favor

	Grew weaker				Grew stronger
15. Over the past six months, has your relationship with him grown weaker, grown stronger, or remained the same?	1	2	3	4	5

Second male friend: Think about the boys or men you listed in the social circle list in Section 6. Please answer the following questions about the one whose **first initial is closest to the *beginning* of the alphabet**.

1. What is his first name and last initial? _____

2. How old is he? _____ yrs.

3. How close to you does he live?	1) Same building	2) Same neigh-borhood	3) Same town	4) Same state	5) Same country	6) Further away

4. How long have you known him?	< 1 month	< 3 months	< 6 months	< 1 year	< 2 years	< 3 years	3+ years

5. What is his relation to you? 1. Romantic partner 2. Close friend 3. Friend 4. Acquaintance 5. Relative 6. Other _____

6. How did you meet him? 1. Is a neighbor 2. Through school or work 3. Is a relative 4. Through mutual friend 5. Through club/hobby 6. Met online

7. How frequently do you communicate with him using these modes of communication?

	Many times per day	Daily	Weekly	Biweekly	Monthly	Less often	Never
a. In person	1	2	3	4	5	6	7
b. By phone	1	2	3	4	5	6	7
c. By e-mail	1	2	3	4	5	6	7
d. By instant messaging	1	2	3	4	5	6	7

	Not very				Very
9. How easy is it for him to access the Internet at home or work?	1	2	3	4	5
10. How comfortable are you communicating with him?	1	2	3	4	5
11. How close do you feel to him?	1	2	3	4	5
12. How similar are you to him in values and interests?	1	2	3	4	5

13. How frequently do you do the following with him?

	Infrequently				Frequently
a. Receive practical support?	1	2	3	4	5
b. Receive economic assistance?	1	2	3	4	5
c. Discuss hobbies or spare time interests?	1	2	3	4	5
d. Socialize with him?	1	2	3	4	5
e. Receive emotional support?	1	2	3	4	5
f. How frequently do you expect to keep up with him in the future?	1	2	3	4	5

14. Circle the types of communication you <u>regularly</u> have with him. Please mark all that apply.

a. Small talk	h. Joking around	o. Gossip/talking about others
b. Killing time	i. Catching up	p. Recapping the day
c. Getting to know him/her	j. Sharing experiences	q. Making plans & arrangements
d. Getting/giving advice	k. Discussing work/school	r. Discussing interests, hobbies
e. Reminiscing	l. Persuading	s. Talking about our relationship
f. Getting/giving support	m. Romantic talk	t. Talking about problems
g. Disagreeing or arguing	n. Complaining	u. Asking a favor

	Grew weaker				Grew stronger
15. Over the past six months, has your relationship with him grown weaker, grown stronger, or remained the same?	1	2	3	4	5

Section 7. About you

1. Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who *likes to spend time with others*? Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement.

1. Disagree strongly
2. Disagree a little
3. Neither agree nor disagree
4. Agree a little
5. Agree strongly

I see myself as someone who…

a. ___ Is talkative
b. ___ Tends to find fault with others
c. ___ Does a thorough job
d. ___ Is depressed, blue
e. ___ Is original, comes up with new ideas
f. ___ Is reserved
g. ___ Is helpful and unselfish with others
h. ___ Can be somewhat careless
i. ___ Is relaxed, handles stress well
j. ___ Is curious about many different things
k. ___ Is full of energy
l. ___ Starts quarrels with others
m. ___ Is a reliable worker
n. ___ Can be tense
o. ___ Is ingenious, a deep thinker
p. ___ Generates a lot of enthusiasm
q. ___ Has a forgiving nature
r. ___ Tends to be disorganized
s. ___ Worries a lot
t. ___ Has an active imagination
u. ___ Tends to be quiet
v. ___ Is generally trusting
w. ___ Tends to be lazy
x. ___ Is emotionally stable, not easily upset
y. ___ Is inventive
z. ___ Has an assertive personality
aa. ___ Can be cold and aloof
bb. ___ Perseveres until the task is finished
cc. ___ Can be moody
dd. ___Values artistic, aesthetic experiences
ee. ___ Is sometimes shy, inhibited
ff. ___ Is considerate and kind to almost everyone
gg. ___ Does things efficiently
hh. ___ Remains calm in tense situations
ii. ___ Prefers work that is routine
jj. ___ Is outgoing, sociable
kk. ___ Is sometimes rude to others
ll. ___ Makes plans and follows through with them
mm. ___ Gets nervous easily
nn. ___ Likes to reflect, play with ideas
oo. ___ Has few artistic interests
pp. ___ Likes to cooperate with others
qq. ___ Is easily distracted
rr. ___ Is sophisticated in art, music, or literature

2. To what extent do you agree with the statements below about the dealings you have with others? Please circle the number that best indicates how you feel about each statement below.

	Strongly disagree		Neutral		Strongly agree
a. I often feel nervous in casual get-togethers.....	1	2	3	4	5
b. I usually feel uncomfortable when I am in a group of people I don't know.....	1	2	3	4	5
c. I am usually at ease when speaking to a member of the opposite sex.....	1	2	3	4	5
d. I get nervous when I must talk to a teacher or boss.....	1	2	3	4	5
e. Parties often make me feel anxious and uncomfortable.....	1	2	3	4	5
f. I am probably less shy in social interactions than most people.....	1	2	3	4	5
g. I sometimes feel tense when talking to people of my own sex if I don't know them very well.....	1	2	3	4	5
h. I would be nervous if I was being interviewed for a job.....	1	2	3	4	5
i. I wish I had more confidence in social situations.....	1	2	3	4	5
j. I seldom feel anxious in social situations.....	1	2	3	4	5
k. In general, I am a shy person.....	1	2	3	4	5
l. I often feel nervous when talking to an attractive member of the opposite sex.....	1	2	3	4	5
m. I often feel nervous when calling someone I don't know very well on the telephone.....	1	2	3	4	5
n. I get nervous when I speak to someone in a position of authority.....	1	2	3	4	5

Section 9. Dealings with others

1. To what extent do you agree with the statements below about the dealings you have with others? Please circle the number that best indicates how you feel about each statement below.

	Strongly disagree		Neutral		Strongly agree
a. There are several people whom I trust to help solve my problems	1	2	3	4	5
b. I am more satisfied with my life than most people are with theirs	1	2	3	4	5
c. There is someone I can turn to for advice about making career plans or about academic decisions.....	1	2	3	4	5
d. Most of my friends are more interesting than I am.....	1	2	3	4	5
e. I often meet or talk with family or friends.....	1	2	3	4	5
f. I don't often get invited to do things with others.....	1	2	3	4	5
g. If I wanted to have lunch with someone, I could easily find someone to join me.....	1	2	3	4	5
h. Most people I know think highly of me.....	1	2	3	4	5
i. If I need a ride to someplace very early in the morning, I would have a hard time finding someone to take me.....	1	2	3	4	5
j. If I needed an emergency loan of $100, I know someone I can turn to.....	1	2	3	4	5
k. If I needed help fixing an appliance or repairing my car, there is someone who could help me.....	1	2	3	4	5
l. There is someone who takes pride in my accomplishments.....	1	2	3	4	5
m. I feel like I'm not always included by my circle of friends.....	1	2	3	4	5
n. When I feel lonely, there are several people I can talk to.....	1	2	3	4	5
o. In general, people do not have much confidence in me.....	1	2	3	4	5
p. There is no one that I feel comfortable talking to about intimate personal problems.....	1	2	3	4	5
q. I usually feel relaxed around other people, even people who are quite different from me.....	1	2	3	4	5

Section 10. Background

What is your name? First name _____ Last name _____

What is your gender? M / F

What is your birthdate? (mm/dd/yyyy) _____

What was your high school grade point average? _____

What were you SAT scores: Verbal _____ Math _____

What is your expected major?_____

What is your race or ethnic background?

___ White/Caucasian
___ Asian/Pacific Islander
___ Black/African American
___ Hispanic/Mexican American
___ Other (please describe) _____

Do you currently have a boyfriend or girlfriend?

Y / N

If yes, how long? _____ mos.

How many hours do you work for pay per week?

_____ hrs

What is your household's approximate annual income?

___ Under $10,000
___ $10,000 to $14,999
___ $15,000 to $24,999
___ $25,000 to $34,999
___ $35,000 to $49,000
___ $50,000 to $74,999
___ $75,000 or more

Thank you for filling out this questionnaire.
Please return it in the enclosed envelope