

Group and Interpersonal Effects in International Computer-Mediated Collaboration

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Drawing on two recent theories, this article proposes interaction hypotheses involving the joint effects of salient group versus individual identity and long-term versus short-term group membership on the social, interpersonal, and intellectual responses of group members collaborating via computer-mediated communication. Participants from institutions in two countries used computer-mediated communication under various conditions. Results indicate that some conditions of computer-mediated communication use by geographically dispersed partners render effects systematically superior to those obtained in other mediated conditions and greater or lesser than effects obtained through face-to-face interaction.

The use of global computer networks affects significant aspects of many of our professional and personal lives. Computer-mediated communication (CMC) traversing these networks offers communities in which to take part, educational opportunities to join, information to glean, expertise on which to draw, coordination never before possible with such little expense, and new challenges to the way we manage our interpersonal and professional relationships. Although work proceeds in building what U.S. Vice President Gore (1994) calls the National Data Superhighway, others remind us that the networks do not end at national borders ("*£15bn Plan*," 1995) and that a more worldly sounding term, *Infobahn*, may be a more appropriate nickname for the worldwide digital matrix. The Infobahn is hoped by many to become a highway creating the electronic global village that Marshall McLuhan (1964) envisioned. Koji Kobayashi, head of NEC computer corporation, would use the Infobahn "to help create a situation that would make it

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possible for anyone in the world to communicate with any other person at any place and any time. . . . Communication is the most powerful tool for deepening mutual understanding among nations" (Brand, 1987, p. 167; Kobayashi, 1986).

The first stretches of the Infobahn appear, though, to have incurred some hazards and collisions, and researchers have already posted some important traffic signs. Although the capability for communication with others may be necessary for positive social and professional international relations, it is not sufficient to sustain positive relations and may even induce negative relations under some circumstances. Indeed, widely reported research on CMC has demonstrated antisocial outcomes from the use of these media in comparison with face-to-face (FtF) discussion. These effects have ranged from inability to reach group consensus, to impersonalization, task orientation, and outright verbal hostility, or "flaming" (see Siegel, Dubrovsky, Kiesler, & McGuire, 1986, p. 161), effects that are widely repeated throughout the research literature as attributable to the medium of computer communication (see Lea, O'Shea, Fung, & Spears, 1992). Such findings suggest that CMC may be as likely to thwart international understanding as to promote it.

Despite such frequent characterizations of the medium, it is important to recognize two countervailing factors. First, the use of electronic mail and computer conferencing continues to grow at exponential rates, and the medium is obviously not being adopted so widely under duress. Second, many research comparisons that have yielded impersonal effects offered little variability within CMC conditions. Their implications are limited to what relative risks and benefits might accompany the use of CMC. Although such studies aspire to greater generalizability, other studies have found that as often as not, these effects only hold up in certain limited settings. They say little regarding the proactive management of CMC when it is in fact needed.

Whereas other research demonstrates that CMC is clearly not inherently inhospitable (e.g., Lea & Spears, 1992; Parks & Floyd, 1996; Rice & Love, 1987; Steinfield, 1986; Walther & Burgoon, 1992), we should not expect that it is universally rewarding either. A worthwhile challenge is to find how CMC properties interact with social and cognitive factors in predictable and potentially controllable ways, leading to variable behaviors and judgments. Such research will, in the long run, afford us instruction not just in choosing whether or not to use CMC but to plan and design CMC applications with social engineering factors as they might most effectively combine. Such efforts are especially important if they can overcome the potential effects of intergroup differences (see, for review, Franco & Maass, 1996), affecting satisfying and productive partnerships among users separated by distance and by culture.

This article reports the findings from a field experiment designed to address this challenge. In the experiment, student groups from two universities—one in the United States and one in England—worked together using e-mail to develop essays based on readings relevant to both their courses. The results confirm and extend several aspects of theories regarding the identities of group participants and the temporal factors surrounding their work, under mediated and nonmediated communication conditions. Implications are drawn for the management of distributed CMC and collaboration on an international scale.

BACKGROUND

As is the case in any field of inquiry, varying approaches to CMC research not only differ in the kinds of theoretical questions they address but they also differ in their insights into the kinds of prediction, explanation, and control of the phenomenon of interest. The earliest systematic social research in CMC may be characterized as adopting a between-conditions approach, exploring gross differences between CMC and FtF group meetings. Theoretically, this research assumed that CMC use inherently instantiates certain social psychological phenomena that affected users' perceptions of others and, consequently, their communication behaviors. This research suggested certain gains and losses when using CMC, generally relative to FtF communication, at the interpersonal and group level (see, for review, Garton & Wellman, 1995; Spears & Lea, 1992; Sproull & Kiesler, 1991; Walther, 1996).

A second paradigm has explored the various social and psychological factors that predict when potential users choose to use CMC or other communication media. This research originated with the prescriptive dictum of information richness theory (Daft & Lengel, 1986), which suggested that users might productively and rationally match media richness to task equivocality. Subsequent research examined what social influences affect actual media choice as well as the extent to which these real choices differ from rational models (e.g., Daft, Lengel, & Trevino, 1987; Fulk, Schmitz, & Ryu, 1995; Fulk, Steinfield, Schmitz, & Power, 1987; Kraut, Galegher, & Egido, 1988; Markus, 1987, 1994; Rice, 1993; Rice, Chang, & Torobin, 1992; Rice, Grant, Schmitz, & Torobin, 1990; Russ, Daft, & Lengel, 1990; Schmitz & Fulk, 1991) or match media selection to users' relational goals (Kayani, Wotring, & Forrest, 1996; Markus, 1994). Methodologically, much of this research has examined technology users *in situ* within ongoing organizations, with a primary focus on electronic mail systems, a setting to which much of the previous research espoused to generalize. By and large, this research has not, however, examined the effect of these

choices on users' subsequent on-line behaviors or the outcomes associated with such uses apart from their projective or actual media choices.

Although the field has been active in each of these directions, we are nevertheless left with very little advice from these efforts about how to use CMC effectively. Those who have challenged one research paradigm have often done so by forging new trails in a different, but not necessarily competing, direction. Media *selection* research has studied people for whom CMC was a useful, not arbitrary, tool but does not speak to the effects of its use. Media *effects* laboratory research is potentially limited by aspects of laboratory research that may ambiguate medium effects from conditions of the experimental settings, including the arbitrary assignment of CMC use, little incentive to use CMC effectively beyond non-contingent rewards, or limited time periods in which to use it. In other words, the effects studies do not capture an important dynamic that media choice research does quite well, namely, the use of CMC by people for whom it is an economically or pragmatically advantageous medium. The implications of the media effects and media selection paradigms tell us only *when* CMC might be used or what might occur *if* it is used. But even under the best of research conditions, these efforts do not directly address the question, given CMC, what can be done to manage the interpersonal, group, and outcome dynamics of using the systems?

One way to approach this question is to draw on two recent theories and CMC research that have attempted to determine the conditions that predict antisocial, prosocial, and even hyperpersonal (exceedingly friendly) relations in CMC. These theories in particular address the interpersonal and group nature of CMC by specifying variables surrounding CMC use that predict variable social outcomes. Although the models differ in their assumptions and mechanisms, they share a focus on the prediction of group interaction and interpersonal attributions. Moreover, there are elements of these approaches that complement one another theoretically as well as topically, and their mutual consideration may offer greater insight into CMC processes. The following work outlines two CMC theories and derived hypotheses from their potential intersection, and describes a field study testing these predictions.

The SIDE Model Of Mediated Communication

One theory that explains how CMC partners come to perceive and act toward each other developed from the cognitively based social identity/self-categorization theory of group behavior (Tajfel & Turner, 1986; Turner, Hogg, Oakes, Reicher, & Wetherell, 1987). Adopting these principles and adding notions about the deindividuation that occurs as persons interact without being in each others' physical presence, Lea and Spears (1992; Spears & Lea, 1992) refer to the model by the acronym, SIDE, for Social

Identification/Deindividuation. The SIDE model predicts that, in the absence of individuating cues about others, communicators judge one another on the basis of group similarity or difference. In contrast with FtF communication in which individuating information is abundant (through physical appearance cues and other interactive behaviors), CMC renders users relatively anonymous. Consequently, whatever subtle social context cues do appear in CMC take on particularly great value. CMC users build stereotypical impressions of their partners based on language, typographic, and contextual cues. They engage in an *overattribution* process without tempering their impressions in light of the relatively meager information base on which they are built (Lea & Spears, 1992). This tendency to project stereotypical attributes on others occurs precisely because of the lack of individuating information communicated by the medium and is promoted by the deindividuating conditions of CMC, such as physical isolation and the nonverbal masking that accompanies it.

The results of these overattributions may be positive or negative in nature, and SIDE theory is very valuable in offering this distinction. Early articulations of SIDE theory suggested that valence of social evaluations of CMC partners depend directly on the nature of the identity that is salient to the participant during interaction. (Valence refers to the positive or negative direction of an affective evaluation, as in likable versus dislikable.) If a social identification is salient—that is, when participants identify with each other as a valued group or wider social category—this group identity leads one to assume similarity among members and experience social attraction to the group and, derivationally, to its members: One's operant identity "promotes individuals' attraction to others at the level of identity that is made salient by that membership . . . (and if identity with the group is valued, then liking and feelings of interdependence toward a particular other individual are increased to the extent that the other is seen to be prototypical of the group" (Lea & Spears, 1995, p. 227; Spears & Lea, 1992).

When individual identity is salient, however, participants are motivated to experience each other based on whatever individuating information about others is available through CMC, rather than the biasing filter of a group membership. Early SIDE research proposed that such individuating impressions lead to negatively valenced evaluations because there is a propensity to denigrate others who are dissimilar to ourselves. For example, when operating with a salient individual identity and other participants' electronic conversations contained typographic or paralinguistic anomalies, subjects seemed to perceive these as deviations and denigrated their source. When a social identity was salient, however, the same behaviors were interpreted as manifesting group norms and others were evaluated more favorably (Lea & Spears, 1992).

Recent articulations of the SIDE perspective have refined these expectations and, in so doing, appear to account for a wider variety of CMC phenomena. It is now argued that the group versus individual identity does not necessarily affect the valence of the judgments made by group members. Rather, it intensifies (if a group identity) or ameliorates (if individual) the magnitude—the strength or extent—of groups' norms on participants' perceptions and behavior, whatever the evaluative valence of the norms may be. Specifically, when a group identity is salient in CMC (and thus it is not undermined by the individuating information as presented in FtF interaction), whatever norms develop in the group will be more likely to be adopted and replicated than when an individual identity is salient. When a group identity is salient, the corresponding intensification of group norms may be positive or negative.

In contrast, where an individuating identity is salient, rather than denigrate others automatically, CMC participants are expected to interpret individuating information in a less polarized manner—that is, without the systematic favorable or unfavorable overattribution prompted by the group identity. Thus, because most people are average on most characteristics, perceptions of them should be average. Although some partners may deviate from average on some characteristics, assuming the random dispersion of positive and negatively valued deviations that may exist, the accumulation of such deviations should average into neutral evaluations for the group as a whole: Positive and negative impressions of individuals will cancel each other out. Thus the effect of CMC may now be said not to cause more positive versus negative intermember evaluations and attractions. Rather, a salient group identity within CMC may lead to systematically more extreme evaluations of group members, positive or negative, compared with a salient individual identity in CMC. FtF interaction is posited to lead to the same kind of processing as individuated CMC. That is, provided a plethora of individuating information about each other FtF, interaction partners judge and act toward one another based on personal impressions rather than through a group-based bias.

This focus on magnitude allows SIDE to be more comprehensive than its earlier formulation, covering a broader range of CMC phenomena. For instance, its approach to the adherence to negative norms fruitfully explains some of the research evidence regarding the propagation of hostile and insulting remarks in CMC known as flaming (see Lea et al., 1992). Some studies on flaming, when decomposed, show that flaming may not be a widespread phenomenon across experimental CMC groups, as tends to be reported. Rather, it tends to appear in only *some* CMC groups, while other groups within CMC show no flaming at all. However, it is initiated and reciprocated to such an extent in these few cells that between-condition

assessments show higher flaming means for CMC (Walther, Anderson, & Park, 1994; see, e.g., Hiltz, Turoff, & Johnson, 1989; Siegel et al., 1986).

Although the greater theoretical power to describe positive or negative outcomes is valuable, the SIDE reformulation leaves open an important issue it formerly addressed: the ability to specify precisely what valence or direction, or what particular norms, are likely to be amplified by group identification in CMC. Another approach to the kinds of presentations and interpretations likely to emerge in CMC, which portends strongly to the question of valence, is the hyperpersonal perspective of CMC interaction.

Social Information Processing in CMC

The hyperpersonal CMC perspective (Walther, 1996) and its predecessor, social information processing (SIP) theory (Walther, 1992), focus on developmental processes in CMC. SIP focused on the adaptive use of those cue systems that are available in CMC to transmit and garner interpersonal and social information to develop impressions and foster relational communication. The hyperpersonal CMC approach extends this notion. Also assuming that partners exchange and interpret social cues in CMC, this perspective recognizes unique affordances of the medium that allow users to achieve more favorable impressions and greater levels of intimacy than those in parallel FtF activities. Participants are posited to seek and reveal information about their personalities, proclivities, positions, attitudes, and regard for others through verbal, linguistic, and chronemic behaviors in CMC (see Walther & Tidwell, 1995).

The SIP approach held that because all social information, as well as all task information, travels through one code system—a system in which even verbal messages travel slower than they do in oral speech—the expression and processing of information is retarded in CMC relative to FtF communication. As such information accumulates, however, participants reduce uncertainty about their partners and develop interpersonal relationships.

Tests of the SIP provided mixed support, leading to further empirical and conceptual developments. For instance, a meta-analysis examined whether temporal restrictions accounted for the difference between the impersonal and task-oriented interaction in many early CMC experiments versus the more varied or socially oriented findings of other, longitudinal and cross-sectional, studies. Using time restriction as a break variable in previously published studies, the analysis was significant. Restricted interaction times were associated with task-oriented communication, including studies in which subjects thought they would have a limited time but were in fact unrestricted. Truly and apparently unrestricted time frames saw more socioemotionally positive behavior (Walther, Anderson, & Park, 1994).

In another study, Walther and Burgoon (1992) examined relational development over time in CMC and FtF communication. Hypotheses predicted differences between conditions after initial discussions resembling the differences found in one-shot studies of CMC—that is, with CMC's being less socially oriented than FtF groups. However, SIP also predicted convergence in relational communication levels between media over time. Subjects' ratings actually revealed few initial differences between conditions, but participants in both conditions increased over time to similarly affiliative levels of intimacy and affection, reduced dominance, and greater social (versus task) orientation.

Further research provided a significant addendum, especially for the present concerns over factors within CMC use that make a difference. In exploring the absence of initial CMC/FtF differences in the longitudinal relational research, it was reasoned that such groups have, at their inception, something that one-shot groups do not have: the anticipation of future interaction. Research on unmediated interpersonal interaction suggests that the anticipation of future interaction prompts communicators to seek more information about one another, to act more friendly, to cooperate in negotiations, to more highly value self-disclosure—in essence, to enact more relationally positive communication (see, for review, Kellermann & Reynolds, 1990). Some anticipation of future encounters seems to be present in much FtF interaction but not necessarily in CMC, in which invisible partners might never recognize each other again.

An experiment testing this contingency found that assignment of long-term versus short-term partnerships made a larger difference to computer-mediated than FtF partners on their reports of anticipated future interaction (Walther, 1994). Further analyses revealed that these differences in anticipated future interaction significantly affected levels of affinity in CMC, more than in FtF interaction, and to a greater extent than was accounted for by the communication technology.

These results confirm that CMC users are sensitive to whether or not to expect ongoing interaction with their partners, which in turn shapes their interpersonal interaction. It is presumed that anticipated future interaction leads CMC users to increase their social information seeking, disclosure, and positive affect as they commence their interaction.¹ It remains ambiguous at this point what contributions derive from anticipation or the actual development of CMC groups over time; it is reasonable that anticipation provides a catalyst for positive development. These studies as well as others (e.g., Hollingshead, McGrath, & O'Connor, 1993) demonstrate that CMC interaction is quite sensitive to temporal influences. Even to think that one's CMC interaction will be limited seems to impel greater task orientation (Walther et al., 1994), whereas to think that it will be continuous seems to impel more socially oriented interaction.

Hyperpersonal CMC. The hyperpersonal model extends these processes in a larger framework, which may account for the extraordinary depth and intimacy sometimes associated with CMC interaction relative to parallel FtF activities (e.g. Walther, 1995). First, CMC receivers may idealize the impressions that they construct of their communication partners. Recognizing SIDE theory (Spears & Lea, 1992), it specifies that CMC partners produce overattributions of each other based on the minimal social cues conveyed by the medium, in the absence of contraindicating information.

Second, CMC partners engage in "selective self-presentation" (Walther, 1996, p. 19). They take advantage of the limitations of the medium to mask physical and behavioral cues that senders find undesirable or less controllable, focusing instead on presenting self-revealing cues and indicators in a preferred and intentional manner. Cognitive resources may be reallocated from simultaneous monitoring and nonverbal expressive systems back to message construction activities, furthering the ability to enhance purposeful message construction.

Third, users may avail themselves of the CMC's affordances for editing and off-line processing. This, too, points to greater facility in CMC for more purposeful and desirable self-presentation than is commonly afforded FtF. Fourth, the reciprocal interactions of selectively self-presented messages and affectively idealized perceptions provide an intensification of these processes through *behavioral confirmation* (Snyder, Tanke, & Berscheid, 1977). That is, as users treat targets based on their perceptions of them, targets' behavior may come to converge with those expectations and actually manifest these behaviors more extremely. Concurrent perceptions may even extend to those personal attributions about which CMC partners have no observational data, such as physical attractiveness, as has been seen in other telecommunications research (Chilcoat & DeWine, 1985). As in SIP theory, the content of communication reciprocally influences perceptions, although it is now said to be selectively presented and perceived. Relationships developing in this manner may be very rewarding, even more so than so-called normal FtF ones.

Despite its potential for understanding positive relational communication processes, the hyperpersonal perspective has been less explicit in predicting negative relational outcomes in CMC. Token consideration was formerly given to the notion that CMC participants may for some reason be motivated to enact negative presentations and hypernegative interpersonal communication (e.g., "flame wars") and social evaluations may result based on the same principles of selective presentation and reciprocation that affect positive outcomes. The specification of such occurrences has been, up to this point, rather teleological.

On the other hand, if we revisit the expected tendency for short-term, time-limited CMC partnerships to be more task oriented, impersonal, and

potentially hostile than long-term, unrestricted partnerships, there is a strong basis for the prediction of negative social behavior. Reintroduce to this notion SIDE theory's point that attributions of any nature become exaggerated in CMC, and the interplay between situationally induced normative behavior and CMC processes begins to become clear.

Interactions

While both SIDE and the Hyperpersonal model may account for interesting patterns in the nature of CMC and its effects, an attempt may be made to draw on aspects of both models in hopes of better accounting for CMC phenomena.

Extending the SIDE perspective, we focus on the intensification versus amelioration of group normative behavior in particular CMC-plus-identity conditions. Specifically, when a group identity is salient in CMC, participants will adhere more closely to group norms (i.e., more closely than will FtF interactants or CMC partners with a salient individual identity). Assuming that whatever existing norms internal to a group should be magnified, the question then arises, What are the norms of a zero-history CMC group at the moment of its inception? Other theories suggest that there are large-scale cultural or stereotypical norms about groups on which they may draw and adapt (see e.g., DeSanctis & Poole, 1994), which is not disputed here. However, it is also reasonable that an ad hoc group may, at inception, take as normative any artifact salient to its existence. This proposal suggests that among such norms that a group may adopt are those induced by the artifact of its temporal existence, namely, a predisposition to engage in interpersonal inquiry, the norm of reciprocal self-disclosure, and affinity induced as a result of the anticipation of future and ongoing interaction. In other words, the fact that a group knows it will be a continuing group becomes an artifact of the group, leading to relational behavior, which becomes normative and reciprocal and is therefore enhanced among members with a strong group identity. From this perspective, a salient group identity and a high level of expected future interaction should prompt rewarding communication and high levels of interpersonal and social attraction.

What of short-term groups? According to the SIP research, short-term CMC partnerships are normatively task oriented and impersonal. This contention is bolstered by Kelly and McGrath's research on entrainment problems that time spans present in nonmediated groups (Kelly, Futoran, & McGrath, 1990; Kelly & McGrath, 1985): Groups that perceive they have less time to work together forego social maintenance behaviors and display a stricter devotion to task-related communication. Thus a short-term CMC relationship combined with a salient group identity should be normatively task oriented, manifesting lower affinity and attraction.

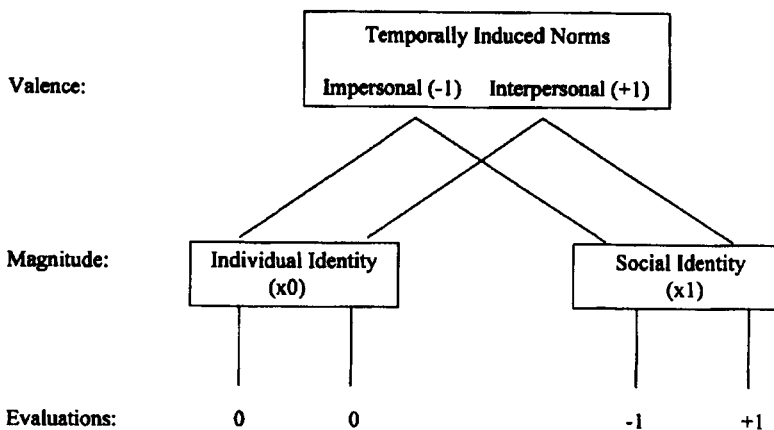


Figure 1: Interaction of Longevity by Identity Factors on Communication and Judgments

At the same time, anticipated future interaction should not affect individual identity CMC participants. In this case, participants are disposed to perceive others not as comembers of a group but as autonomous agents. They are not expected to adhere to group norms, and intermember evaluations should become, on aggregate, neutral. Although anticipation has been found to lead to greater adherence to norms and suppression of deviant behavior in nonmediated groups (Kiesler, Kiesler, & Pallak, 1967), these effects are expected to be undermined by the instantiation of a salient individual identity in CMC. Thus an individual identity in CMC may flatten the effects of a long- or short-term association.

These dynamics can now be specified by the following model. Temporally related processes offer a specification of valence, and the identity factor offers a specification of magnitude. These elements interact such that the magnification of the identity factor would be expected to amplify the social tendencies affected by the temporally induced valence factor. Let the effect of the group identity function as an intensifier, or a multiplying factor of ($\times 1$), wherein an individual identity would be a neutralizer, or a multiplying factor of ($\times 0$). Each of these would multiply with the valence factor for time period on general social orientation, represented for long term as (+1) or for short term as (-1). These relationships are expressed graphically in Figure 1.

These conditions are expected to instigate differences in the ways participants communicate, leading to differing social perceptions. Specifically, these effects are hypothesized to result in an interaction affecting both (a) partners' relational communication with one another and

(b) partners' attraction to one another. Thus, among partners in a CMC-only relationship:

H1: For relational communication, long term/group identity renders the greatest (a) intimacy/affection and (b) social orientation; short term/group identity is (a) least intimate/affectionate and (b) most task oriented. Individual identity renders moderate levels of intimacy/affection and task/social orientation regardless of length of relationship.

H2: For social perceptions, long term/group identity renders the greatest attractiveness, and short term/group identity is least attractive. Individual identity renders moderate levels of social attraction regardless of length of relationship.

Finally, although sociability and flattering relations may be desirable ends in themselves at times, and may be an important step to bridging out-group differences and enhancing international relationships, they are not the only objective of group activity. Previous research has noted the literature on the often ironic, sometimes curvilinear relationship between cohesiveness and productivity in groups in general (see Shaw, 1981) and CMC in particular (Connolly, Jessup, & Valacich, 1990). It is possible that friendly relations could provide social facilitation, increasing individuals' efforts, or social loafing, reducing individuals' efforts. In an educational context, members of a higher performing collaborative group should study more information and contribute more to the group's final project. Thus a research question is posed to explore whether these interpersonally facilitative factors are accompanied by greater academic effort:

RQ1: How do the mutual influences of interaction term and group versus individual identity affect intellectual effort?

METHOD

Subjects

Fifty-four student subjects participated in this research as part of their courses. Six groups of five members, and four groups with six, were compiled in a randomized block arrangement from three classes, two at a midwestern U.S. university and one from a university in middle England. Because of enrollment differences, each group contained a majority of American students. In almost all cases, two of the four American students were in the same class and two were in the other class, with one or two English students in each group. Twenty-nine subjects were female and 25 were male, and their ages ranged from 18 to 41 with a modal age of 21. U.S. students majored in communication or education, and the

English students pursued psychology degrees. Each national group also contained a foreign national within it (from outside the United States and United Kingdom). No differences appeared to exist on sex or age composition for the classes or the universities from which subjects were recruited (analysis of variance [ANOVA] detecting none, although statistical power with which to do so was not strong, .2 to .3 power for a .2 effect size at $\alpha = .05$).

Procedure

Each group was provided a single electronic mail address that was set up as a distribution list, remailing all messages to all respective group members. All members were given two consecutive group assignments that called on them to read, review, and write a common document summarizing, critiquing, and commenting on five articles relating to two topics germane to both courses: electronic communities and the use of CMC for recreation and social interaction. None of the readings discussed the variables and conditions of interest to this research except for the general CMC topic. Each assignment was to last two weeks, but technical problems cut off transatlantic communication for 3 days, so 3 days were added to the deadline for the first task.

As a field experiment, participants were not required to limit their communication with one another to e-mail, and participants were polled to see what alternative media they used. These logs revealed some FtF and telephone contact among respectively colocated national teammates, although the frequency of these contacts dropped off as participants seemed to find that group decisions needed to be typed up and distributed overseas regardless and that off-line conversations saved little effort in the long run. There was a formidable 6-hour time zone difference between the two universities, and fewer hours of computer access at the English location, which seemed to preclude communication other than e-mail. The logs also revealed that no international contact took place outside of CMC channels, although some e-mail messages were sent privately rather than via the groups' distribution lists.

Groups were randomly assigned to the following experimental conditions.

Long term versus short term. The subjects were informed that they would be working collaboratively for two projects sequentially but half the groups would work with the same partners both times and the other half would work with different partners in the second task than they did in the first. This factor was used to create variation in the degree of anticipated future interaction subjects would experience with regard to some of their partners while working on the first task, and the degree of history

they would have developed while working in the second (see Walther, 1994).²

Social versus individual identity instantiation. To make salient whether participants were to think of themselves in light of their groups or as individual agents, the language of the instructions directing them to their work was modified to reflect these differences, similar to the methods used by Spears, Lea, and Lee (1990). The group version stressed the word *group* as many times as was plausible. Additionally, the instructions asked participants individually to note impressions of their groups as they communicated:

As you get to know your group, consider this: One of the advantages of working in groups is that the group forges a distinctive identity for itself that can lead to higher quality outcomes. As you get to know your group, try to assess the group's characteristics. What are the things that identify your group and make it different from other groups?

In the individual identity condition, diversity and individuality were stressed, and the instructions called on participants to gather individual impressions as follows:

As you get to know the other individuals, consider this: One of the advantages of working with others is that the diversity of unique individuals can lead to higher quality outcomes. As you get to know the other individuals, try to assess the characteristics of each person. What are the things that identify them as individuals and make them different from one another?

The identity variable was completely crossed with the longevity variable at the group level.

Measures

Dependent measures were administered via self-administered questionnaires twice, once at the completion of each task.

McCroskey and McCain (1974) suggest that there are three dimensions of interpersonal attractiveness: social attractiveness, or the extent to which one sees another as enjoyable with whom to socialize; task attractiveness, or the capability and reward value someone brings to an instrumental collaboration; and physical attractiveness. Whereas foreign partners did not have direct exposure to each others' physical appearance, previous research has highlighted the possibility that attributions based on other social and interpersonal perceptions may carry over to judgments about the physical and that the very absence of physical appearance cues in CMC is conducive to extreme constructions about unobserved physical characteristics. These constructs were assessed using a subset of McCroskey and McCain's scales. The items were presented as nine-

interval Likert-type scales. Cronbach's alpha reliabilities were assessed via data from each subject at the first administration, as pertained to one other group member, with the following results: social, .93; task, .90, and physical, .95.

Relational communication dimensions of intimacy/affection and task/social orientation were assessed using subscales from Burgoon and Hale's (1987) Relational Communication Questionnaire, modified for groups. Although this measure in its entirety has been used to assess as many as seven dimensions of the manner in which people interact interpersonally, no specific hypotheses were considered for several dimensions. Reliabilities from the present administration were .92 for intimacy/affection and .68 for task/social orientation.

Study effort was assessed by asking respondents to indicate, for each of the five articles assigned for the topic, whether they had (a) not read it at all, (b) skimmed through it, (c) read but not written about it, or (d) read and written about it. These responses were averaged for each subject.

RESULTS

Data collected after the first and second tasks were collapsed for the present analysis. Omnibus analyses of variance tests were conducted for the term and identity variables and their interaction, to detect general effects and to generate appropriate error terms for focused contrast analyses, which comprised the hypothesis tests (using harmonic n for unequal sample sizes between cells) (Rosenthal & Rosnow, 1985). Even though interesting variations between time episodes may exist, hypotheses related to such effects are beyond the scope of the present investigation, and although a more detailed analysis would examine separately the data from Time 1 and from Time 2, the reduced sample bore no results of such an analysis.

CMC-Only (Foreign) Partners

The hypothesis tests included subjects' ratings of only their partners with whom they had strictly a CMC-based relationship—that is, students at the university other than their own—who were foreign to them and whom they would never see.

Relational communication. Relational communication variables were subjected to analysis as a test of H1. The overall term-by-identity interaction was significant on intimacy/affection, and the contrast analysis obtained, $F(1, 50) = 8.37, p < .025, \eta^2 = .14$, in the predicted directions: Long-term group members with a group identity experienced the greatest

TABLE 1
Significant Interaction and Main Effect Means
(and Standard Deviations) for Term Length and Identity Effects
from Ratings of Foreign/CMC-Only Partners

<i>Longevity</i>	<i>Long Term</i>		<i>Short Term</i>	
	<i>Group</i>	<i>Individual</i>	<i>Group</i>	<i>Individual</i>
<i>Identity</i>				
<i>n</i>	15	12	12	15
Intimacy/affection	6.03 (.95)	5.62 (.73)	5.02 (1.01)	5.67 (.94)
Social attractiveness	6.11 (.86)	5.92 (.96)	5.14 (.85)	6.04 (1.03)
Physical attractiveness	5.13 (.89)	4.78 (1.38)	4.31 (1.02)	4.98 (.43)
Study effort	2.28 (.53)	2.12 (.55)	1.97 (.26)	2.23 (.66)

NOTE: Variables were measured by nine-interval scales for the first three measures and four-interval scales for study effort. CMC = computer-mediated communication.

affection from their partners, whereas short-term group members with a group identity experienced the least affection; short term/individuated and long term/individuated subjects were both more moderate in the affection they reported (see Table 1 for means, standard deviations, and *n*).

No interaction effects appeared on task/social orientation. ANOVA revealed a main effect for identity, however, $F(1, 52) = 4.18, p = .046, \eta^2 = .07$. The individuated identity condition was more task oriented, $M = 6.68, SD = .73$, than the group identity condition, $M = 6.25, SD = .80$. The long term/short term variable did not render an effect. Overall, partial support for the hypothesis was obtained.

Attractiveness. Regarding H2, attractiveness variables were examined via contrast analysis for the interaction effects of long term/short term association by group/individual identity. The contrast analysis for the hypothesized interaction was significant for social attractiveness, $F(1, 50) = 7.32, p < .025, \eta^2 = .09$. Long term/group identity partners were rated highest in social attractiveness. Both individual identity conditions—short term and long term—were moderate in social attractiveness, and short term/group identity partners were least socially attractive.

A similar pattern was seen in the physical attractiveness ratings. Contrast analysis reflecting hypothesized patterns was significant, $F(1, 50) = 4.70, p < .05, \eta^2 = .08$. Long term/group identity members who had never seen each other rated their partners most physically attractive, and short term/group identity partners rated each other least physically attractive. Individuated identity partners were once again more moderate in their appraisals. Nowhere is a hyperpersonal effect more clear than in the differential attribution of physical characteristics from blind conversations as affected by social circumstances and media.

Task attractiveness was not affected by an interaction, and ANOVA revealed no main effects at a .05 level of significance. Otherwise, H2 was supported for attractiveness effects.

Study Effort

To assess RQ1, data from all subjects at both time intervals were analyzed for the effects of group versus individual identity and long term/short term association on study effort. The competing predictions of social facilitation versus social loafing due to long term/group identity could be assessed with one contrast analysis, which, if significant, could be interpreted by inspection of the directions of the means. In other words, one a priori contrast of (+1, -1, 0, 0) renders the same F coefficient as its directional opposite (-1, +1, 0, 0) with the actual direction detectable through inspection of the observed means. Indeed, the contrast analysis for this interaction was significant, $F(1, 81) = 3.38, p < .05, \eta^2 = .04$. The direction of means supports the facilitation explanation—the patterns of academic effort mirrored those found for attractiveness and intimacy, although the effect was not strong. Long term/group identity subjects showed somewhat more academic effort, and short term/group identity showed the least. Individual identity subjects showed more moderate levels. Thus the social factors not only had a significant effect on some relational communication and interpersonal perceptions of these participants but also affected the members' productivity in these work groups in parallel ways.

Comparison With FtF (Domestic) Partners

Although the results reported above are worthwhile findings in their own regard, it is instructive to compare these results against the same tests performed on the subjects' assessments of their proximal partners. It was not expected that the variables that led to differences among foreign partners would render the same differences among domestic (potentially unmediated) colleagues (rendering CMC hyperpersonal by comparison). Previous SIP research shows that the social factors that come of variable group longevity in CMC are not as important in FtF interaction; interpersonal knowledge accrues much more quickly FtF, and anticipated future interaction does not show as strong an effect between short-term and long-term FtF groups (Walther, 1994). SIDE research also shows that interaction among colocated partners does not lead to the more extreme attributions of the kind seen in distributed CMC because the force of group identity on minimal-cue inference generation is undermined by the abundance of individuating and real (rather than biased) information in FtF settings. One should expect differences among the CMC-only (for-

eign) partner ratings and not within the domestic, mixed CMC/FtF partner assessments on the basis of both these theories. They would predict these effects to pertain to distant partners only in the present context.

Recall that for the students in England, some (but not most) worked with another local partner in their groups. American students always worked with several local partners as well as an English student. Using the available data from participants' averaged ratings of their respective domestic group partners only, the same interactions of term-by-identity were subject to ANOVA and contrast analyses. In this process, no significant interactions emerged. A main effect for long-term versus short-term affiliation affected communication of intimacy, $F(1, 52) = 6.24, p = .02, \eta^2 = .13$, with long-term ($M = 5.92, SD = .61$) greater than short-term groups ($M = 5.42, SD = .72$). A similar effect was found on social attractiveness, $F(1, 52) = 6.60, p = .01, \eta^2 = .14$, with long-term partners ($M = 6.32, SD = .87$) more attractive than short-term partners ($M = 5.63, SD = .91$). These findings are consistent with previous research findings on the effects of anticipated future interaction on the communication and evaluations of unmediated partners (see Berger & Douglas, 1981).

It is noteworthy that overall mean scores for domestic group partners were within the range of the scores produced in the evaluations of foreign partners, intimacy/affection $M = 5.68, SD = .70$; social attractiveness $M = 5.99, SD = .95$; physical attractiveness $M = 4.90, SD = 1.06$. Whereas, statistically, the overall mean scores for foreign partners would also render averages within the ranges defined by the interaction means, it is not obvious that the domestic ratings should be within—not nearer the high end, low end, or beyond—the foreign-partner assessments. Clearly, FtF scores did not exceed mediated scores, as a notion favoring the primacy of unmediated interpersonal interaction would presume (e.g. Palmer, 1995). Post hoc tests for the three-way interaction (foreign versus domestic, by short term versus long term, by group versus individual identity) were not significant on these dependent variables but were obviously attenuated by low power and the similarity of scores among all domestic assessments, in addition to the already similar individual identity participants' data among the foreign assessments. More powerful main effects tests were conducted for time on domestic assessments only within the group identity condition—the condition in the foreign assessments in which temporal conditions were most pronounced—but this, too, failed to produce significant differences for the long term/short term factor. It may be reasonable to conclude that these contrasts between foreign- and domestic-based data illuminate the dynamic that occurred as a result of using CMC and only CMC in this international collaboration: The CMC-only, foreign partnerships were more sensitive to the identity-by-temporal

factors than were those who could communicate FtF locally, consistent with the theories that drove this research.

Although these findings are preliminary, and further integration of the theories and derived factors deserve further study with larger samples and repeated measures, the initial results are promising. These analyses indicate that in terms of intimacy/affection, social attractiveness, and physical attractiveness, we can identify and systematically influence certain social conditions by which the use of CMC renders alternately more positive or more negative outcomes, that these effects are respectively greater than those achieved using the full range of communication that is available in FtF interaction, and that these outcomes correspond to differences in intellectual effort in the groups in which they occur.

DISCUSSION

The implications of this research speak to a number of levels. They offer some pragmatic suggestions for the use of CMC in collaboration both generally and with regard to geographically dispersed collaboration, such as international work in particular. They also raise new theoretical questions, challenging extant models and inviting further study.

Pragmatically, this research shows that decisions about CMC need not be relegated to a choice about whether to use it or not, or what the inherent social risks and benefits of using CMC must be when it is the most practical means of communication. CMC is more malleable than these questions allow. Rather, CMC is an amplifier or magnifier of social psychological and communication phenomena, and the question becomes how to use CMC or rather how to design the social circumstances of its use. In this regard, the interaction of long term/short term existence and group versus individual identity factors have profound implications, leading to significantly different communication, interpersonal impressions, and outcomes.

These results also suggest that while members' diversity may be a valuable asset to a group, it is a potentially harmful topic of focus as people begin to work with each other over a long period of time. When a group has (or is expected to have) a long-term relationship, a focus on unity rather than individual differences is advantageous. This does not at all suggest that true uniformity is preferred over heterogeneity of skills and opinions. It does indicate, however, that the heightened salience of similarity and group belonging is preferred, even among teams whose members comprise different nationalities and backgrounds.

It is noteworthy that the hypothesis failed regarding the prediction of greater task orientation for group identity/short term groups relative to other conditions. This result may have to do with the relatively low

reliability of the measure (which has failed to differ in other recent research) (e.g., Walther, 1994; cf. Walther & Burgoon, 1992), although it was sensitive to the identity factor in ways consistent with early SIDE research. Similarly, no effects obtained on task attractiveness, the partners' perceptions of their value as work colleagues. At the same time, greater actual work effort was observed not in the condition expected to be most task oriented but in the most socially oriented condition, group identity/long term groups. It has already been suggested that there may be a social facilitation phenomenon at play in this process. As a participant later wrote, "Working with people you perceive as friends is FAR easier—there seems to be a sense of commitment/loyalty." The results are reminiscent of previous research in which the more socially oriented FtF groups were more effective in reaching consensus than the task-oriented CMC groups (e.g., Hiltz, Johnson, & Turoff, 1986, although there may be simpler sociotechnical reasons confounding such findings; see Walther, 1992). These findings also contraindicate expectations raised in earlier CMC literature, that CMC might improve groups' effectiveness precisely by promoting greater task orientation (e.g., Dubrovsky, 1985; Phillips & Santoro, 1989). They also limit Smolensky, Carmody, and Halcomb's (1990) finding of an inverse relationship between productivity and personal commentary in CMC. Smolensky et al.'s subjects used a synchronous CMC system with limited and finite time. However, as appears to have taken place in this study and as described in the hyperpersonal perspective (Walther, 1996; see also Hesse, Werner, & Altman, 1988), time spent in social discussion does not preclude work on a task when participants use asynchronous CMC (or when a synchronous CMC system is used over multiple sessions; Chidambaram, 1996). The two foci can develop independently in time. Further research is needed to explore this ironic, apparently synergistic effect of affinity and productivity facilitated by CMC.

Theoretically, this approach and the results offer valuable extensions to previous models. Notions from SIP theory about the rather uniform effects of time and anticipated future interaction on CMC relational development are clearly challenged by the present findings. The current results show that the effect of temporal factors on positive relational development is undermined when partners' motivation to engage is dampened by a salient individual identity. Without contesting their results directly, this alteration and its application to groups' intellectual efforts also raises concerns over the findings of Hollingshead et al. (1993), whose longitudinal research suggests a steady improvement in group decision-making interaction using synchronous CMC over time. Partitioning or exploring other social factors in situations similar to those researchers' may offer more precise patterns as well. Additionally, the SIP expectation that short-term interaction is marked by impersonal orienta-

tion was shown to be magnified when these expectations were affected by a salient group identity. This relatively hypernegative condition also strengthens an aspect of the hyperpersonal approach that has been recognized but underdeveloped, that being the specification of conditions under which negative relations should develop.

The work also extends SIDE theory through its explicit and strategic introduction of a particular normative factor, beyond latent in-group norms, which altered behavior over time. This stands in contrast with previous studies that assumed rather broad-level norms were available to groups with a salient social identity (e.g., how students behave). It supports more recent contentions that acknowledged the likely adoption of norm-related strategic behaviors but which left the nature of these norms and behaviors largely unspecified (Spears & Lea, 1994) or unpredicted in nature and emergent (Postmes, Spears, & Lea, 1995). The intentional instigation of normative factors related to different time frames, by forces initially extrinsic to a group, represents a significant extension to SIDE. Additionally, this research indicates that a salient group identity alone does not inherently lead to social attraction and positive intermember evaluations. Previous SIDE, and particularly social identity, research contended that adherence to prototypical aspects was inherently socially attractive. In contrast, the present results support a magnification effect for social identity, prompting greater adherence to norms even when such adherence leads to unattractive outcomes, as was the case in the group identity/short term condition.

Other theoretical issues remain less clear. Despite the appeal of a unification of the hyperpersonal and SIDE approaches in the present research, there are several respects in which these models do not fit well together. The SIDE approach, incorporating propositions from social identity/self-categorization theories, contends that group participants identify with each other *vis-à-vis* their common group membership and not as individuals within a group. From this perspective, the content-level value of personal and affective information that communicators exchange *in situ*—central to the hyperpersonal model—is problematic. Whereas the hyperpersonal perspective recognizes that initial communication among group members will be highly influenced by group identity, it suggests also that users actively seek and exchange interpersonal information in line with their relational goals, affected in part by identity (and, among other things, temporality).

These conflicts reflect a larger theoretical question: How do people process information about one another as they come to carve interpersonal affinity out of group relations, on-line or off? Lea and Spears (1995, p. 228) suggest that the exchanges of "social self-categorizations . . . provide a foundation for constructing personal relationships." Seemingly consistent with SIP/hyperpersonal predictions, social identity theorists Hogg

and Abrams (1988) concede that parties' shared "self-categorization may allow the development of conditions under which the traditional determinants of interpersonal attraction operate. For example, it may increase social and verbal interaction . . . and perceptions of belief similarity: all of which are antecedents of interpersonal attraction" (p. 107). Yet these theorists also argue that such attraction is not in actuality based on interindividual but rather on intragroup dynamics and is no more than correlated with interpersonal assessments. Indeed, social identity theorists may go to great lengths to distinguish the two kinds of relationships—group and interpersonal—as conceptually different and different in the type of information processing that takes place within them (e.g., Oakes, Haslam, Morrison, & Grace, 1995). According to Hogg and Abrams (1988, p. 108), "while the object of personal attraction is a unique idiosyncratic individual person, that of social attraction is completely interchangeable. It is attraction to an in-group stereotype and hence to any and all individuals who are perceived to be part or prototypic of the group."

Thus it remains unclear how and when one may form a personal relationship with another member of a salient group without losing the prosocial attributions that began as prototypical projections. One illustrative paradox of these opposing levels of information processing would be the case of the norm of self-disclosure. From a social identity theory perspective, those identifying strongly with the group should adhere to this norm by disclosing and should value others that do also. Actual attention to the potentially personalizing *content* of these disclosures, however, is not consistent with a strict social identity framework. Somewhere in the process of communicating electronically, a shift from social identity processing to interpersonal processing may take place, with language and content moving from dependent to independent variable (Giles & Johnson, 1981), but it is not clear when or how. Such reciprocally causal models as this are most challenging (see Singelis, 1996), and discovering and delineating such shifts must be approached through carefully considered studies with more precise methods than the present design and previous efforts allow.

Although the statistical evidence cannot resolve the issue, an anecdote helps show its theoretical complexity. The content of the electronic dialogue between foreign partners, included in the appendix, may illuminate a shift from the group-level information processing to interpersonal processing, or to concern over social identity at other levels, the discussion of which led to positive assessments. The messages came midway through work on the first task among partners in a long term/social identity condition. They seem to show development in the level of attention to one's partners, from dealing with each other as coparticipants to wanting to know each others' personal characteristics, as triggered by an allusion to physical appearance. Whether these partners became more interper-

sonally aware or simply traded one social category (the group) for others (gender, nationality) is debatable. These passages, sent to the group's e-mail address, do show disclosure and concomitant interpersonal affect with apparently positive reward garnered in the process.

There are other aspects of the present work that should be improved in future research. For example, the imbalance in nationalities' subsamples could lead to minority effects that unfortunately would be nested in each case within a national (in this case, English) subgroup. Likewise, majority subgroups' (in this case, American) cultural norms may exert otherwise undue influence either randomly or due to the heightening of normative behavior. The nature of cultural norms toward communication and technology attitudes no doubt play some part in these kinds of interactions, and other research is now beginning to deal with such cultural differences in media use dimensionally rather than as gross-level differences (e.g., Rice, D'Ambra, & More, 1996). The degree to which English students in psychology and U.S. students with communication and education majors vary in multiculturalism or internationalism is arguable, and the extent to which these dynamics generalize to more divergent cultures is not yet known.

In addition to national and cultural effects, greater specificity might be achieved by an analysis of time-based changes in behaviors and social evaluations. For example, in the case of long term/group identity conditions, the effect of anticipated future interaction may drop off near the end of a group's existence, as might its salient group identity, both of which may be subject to closure. Whether they are replaced by more individuated processing or a persistent cohesiveness accrued over time remains to be seen. As mentioned above, sample size makes tenuous such an analysis in the present effort, but replication efforts should address these issues.

At the same time, it is important to know how collaboration via CMC may be optimized, and the present results speak to this concern. Politicians and media commentators are excited about electronic communities and the possibility of greater international cooperation using new communication technology. Scholars have provided preliminary indications about the risks and benefits that may be anticipated in such ventures but have generally done so by extrapolating from the results of local efforts to a broader domain. Much research has assumed that mediated communication efforts will be partial and inferior to FtF communication and has sought to discover when and if these shortfalls may be, at best, minimized. Using an intercontinental approach and drawing on recent theories, the present research draws promising lessons for enhanced cooperation and communication using CMC, with implications for the future of geographically dispersed collaboration and technological innovation in edu-

ation as well. Whether or not modern communication technology may lead to international understanding and global cooperation—or generate misunderstanding and personal isolation—it is doubtful that it will do so simply and automatically by virtue of its existence. Steps in either direction might be achieved, however, by appropriating the interactions of technological factors and social arrangements conducive to these outcomes. This research finds that certain social conditions and technology lead people from different places, who have never and will never see each other, to communicate more affection, to like each other more, to think they look better, and to work harder than people working together under other conditions in CMC or by working together face-to-face.

APPENDIX

Date: Wednesday, February 15, 1995, 19:14:30 GMT

From: Mayte Oliver Maribel

Subject: Who reads what II

To: group1@hera.psy.man.ac.uk

X-Envelope-to: group1

Priority: normal

X-Mailer: Pegasus Mail v3.21

Hello, It's me again.

The list of "Who reads what":

ADAM: (1) Dibbell (2) Bennahum

ERICA: (1) Van Gelder (2) Matheson

MAYTE: (1) Rheingold (2) Dibbell

LOURDES: (1) Matheson (2)

CRAIG: (1) Bennahum (2)

The gaps are for second readers of Van Gelder and Rheingold. Lourdes and Craig, please, decide what you do.

I hope everything is ok.

I am naked, goodbye!!!

Date: Wednesday, February 15, 1995, 16:11:35, 0600

From: Erica

Subject: RE: Who reads what II

To: group1@hera.psy.man.ac.uk

Hey Mayte, I just wanted to thank you for taking the time to compile the reading list for everyone.

By the way, this may sound crazy, but aren't you a guy? We can't tell from your name; the "Oliver" part looks masculine, but the "bel" nickname could be feminine. Sorry for such an offensive question. I guess that when you mentioned you're naked, I just couldn't stand the suspense any longer. Erica

(continued)

APPENDIX Continued

Date: Thursday, February 16, 1995, 11:45:43 GMT

From: Mayte Oliver Maribel

Subject: To be or not to be male

To: group1@hera.psy.man.ac.uk

X-Envelope-to: group1

Priority: normal

X-Mailer: Pegasus Mail v3.21

Hello Erica,

Let's put things clear, I am sorry if I deceive you, but I've been a girl since I can remember (ie: all my life).

Yes, Bel is my name, and then in Spain we have two surnames, the first one (oliver) comes from the father, and the second one (maribel) is from the mother.

WOW!!! Actually, I may talk about this as a main subject for my thesis....

People around me in the PC Lab may think that I am crazy, because I am in front of this cold screen, SMILING.

AH! Concerning the "naked" thing . . . I meant . . . "exhausted" . . .

OK. This message from Erica is the best thing of the day, so far.

COOL.

Well, I better start writing the review.

Talk to you soon.

Mayte.

NOTE: We may presume that "naked" was a fortuitous misperception by the Spanish student of the slang "knackered," for exhausted or worn out. A fictitious name is used above to preserve the participant's confidentiality, but the naming convention is observed.

NOTES

1. This seems to be the case insofar as asynchronous CMC is concerned, although these parameters may not hold for synchronous CMC; see Walther, 1994.

2. A perfect experimental design to test the separate effects of anticipation and history would require a deceptive manipulation, leading some subjects to expect ongoing interaction and then actually switching them to a new group, and the reverse, as well as control conditions where ongoing or switched partnerships were delivered as promised. This was not undertaken, however, as this degree of deception was not appropriate within the purview of the field setting.

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