

Using side to investigate group interaction in a realistic computer-mediated context

Systematic research investigating the effects of using CMC on group interaction has rarely been conducted within *realistic* computer-supported contexts. Research has tended to study inexperienced participants in artificial situations (e.g., Sproull & Kiesler, 1991). The limited research which has observed established groups indicates that group history and the expectation of future interaction are important factors in moderating the effects of technology on group process and performance (Harmon, Schner, & Hoffman, 1995). A body of research which emphasizes the importance of the social context in which CMC is used (e.g., Lea, 1992; Lyytinen, Maaranen, & Knuutila, 1994) has been an important influence in directing the design of the study reported in this paper. It is the precise context in which computer-mediated group interaction occurs that is of interest to us. A second criticism of much of the CMC research is that it frequently does not address the *process* of group work and the social interactions that occur within groups (e.g., level of self-disclosure), but rather concentrates on the outcome of group work (e.g., Sosik, Avolio, Kahai, & Jung, 1998).

In particular, there has been very little research on the way that the use of CMC affects the way individuals perceive each other and the way they perceive the group; group cohesion in computer-supported contexts is rarely studied.

Effects of Computer-Mediated Communication

Group Communication and CMC

Research has shown that using e-mail for communication between group members can have a number of effects on the content and style of group discussion (e.g., Taylor & MacDonald, 1994). In particular two effects have frequently been observed: the expression of more extreme opinions (flaming) and a more open style of discussion (self-disclosure).

Steele (1983) defines flaming as 'to speak incessantly and/or rabidly on some relatively uninteresting subject or with a patently ridiculous attitude' (p. 65), while more recent definitions of flaming focus on the negative emotion involved, for example, Straus (1997) records the incidence of 'blunt or destructive criticism'. Early CMC research consistently found more flaming in computer-mediated group

discussions compared to face-to-face discussions. Much of this research was stimulated by the work of Sproull & Kiesler (1991) who proposed that the limited non-verbal and social context cues in CMC lead to a reduced regard for other users. However, there are many methodological weaknesses with the research investigating flaming in CMC. For example: frequently participants were unaccustomed to using e-mail (Siegel, Dubrovsky, Kiesler, & McGuire, 1986); tasks were very narrow (e.g., the instructions in a study by Hiltz, Johnson, & Turoff, 1986, stipulated that participants should not try to find out more about other participants and should concentrate on completing the task), and most studies were conducted in artificial laboratory environments (Dubrovsky, Kiesler, & Sethna, 1991). More recently, researchers have questioned the extent and nature of flaming. For example, Straus (1997) found that despite many references to flaming, only a few of these were supported with empirical research, while Walther (1997) suggests that flaming only occurs in specific CMC contexts.

CMC has frequently been associated with more open communication and there have been suggestions for CMC to be used to conduct sensitive surveys and counseling (Turkle, 1995). However, although many CMC studies note the occurrence of self-disclosure (e.g., McCormick & McCormick, 1992), this has not been systematically investigated. In contrast, self-disclosure has received much attention in the small group processes literature conducted in face-to-face contexts. For example, Cathcart & Samovar (1992) suggest that 'our impact and influence on a group is partially determined by *what* and *how* we disclose personal information to other members of the group' (p. 249). There needs to be investigation of the factors or contexts under which self-disclosure is shown during computer-mediated discussion (e.g., whether self-disclosure is related to the degree of anonymity).

Group Decision-Making and CMC

CMC has been shown to affect both the *process* of decision-making and the final *outcome*. During computer-mediated discussion there tends to be more balanced participation, compared to face-to-face discussion which is more likely to be dominated by individuals with high status or dominant interpersonal styles. Dubrovsky, Kiesler & Sethna (1991) called this effect the 'equalization phenomenon'; the effects of this phenomenon on group processes are many. Sproull & Kiesler (1991) found that, as a result of the increased democracy, CMC users gave more proposals for action compared to members of face-to-face groups. Also, Miranda (1994) found that there was less likelihood of groupthink in computer-mediated discussions as more alternatives in a decision-making task were put forward by group members. On the negative side, Kraemer & Pinsonneault (1990) found that compared to face-to-face decision-making groups, CMC groups found it more difficult to arrive at a consensus, taking a longer time and reporting lower satisfaction with the consensus.

Using CMC can also affect the final outcome of decision-making tasks, in particular increasing the likelihood of group polarization. Group polarization is defined as the tendency for groups to make decisions which are more extreme than individual decisions, in the direction initially favored by the group (Myers & Lamm, 1976).

Sproull & Kiesler (1991) showed that the opinions of members in CMC groups shifted even more towards extreme positions following group discussion than did opinions of members in face-to-face groups. Based on social identity theory, Spears, Lea, & Lee (1990) proposed that under certain conditions computer-mediated group communication could be de-individuating. They hypothesized that when participants are de-individuated, adherence to group norms will be high and therefore group polarization will be more likely to occur. In their study, participants were assigned to one of four conditions in which the CMC context was manipulated: with Identifiability (Low or High) and Group Salience (Individual or Group) the two key variables. Spears *et al.* (1990) predicted that the attitudes of participants in de-individuated groups (i.e., those receiving Low Identifiability and Group Salience) would become the most polarized. Participants were asked to discuss a number of controversial topics and attitudes towards the topics were collected before and after discussion. The results confirmed the predictions. However, there are a number of methodological problems with this research. For example, the research was conducted in the laboratory and there were only three participants in each group and discussion was limited to 10 minutes. Therefore, it is not clear how much these results would generalize to group decision-making in real CMC contexts.

Interpersonal Perception and CMC

The absence of social cues in CMC has been hypothesized to affect interpersonal perception and result in the treatment of others in a depersonalized manner. For example, Sproull & Kiesler (1991) propose that the anonymity in CMC creates the equivalent of 'a tribe of masked and robed individuals'. However, they collected no data to substantiate this hypothesis. The individuals' perceptions of the group has received surprisingly little attention in computer-supported group research. In contrast, within organizational psychology and the small group processes literature, group cohesion has been a major focus of research. Many of the studies conducted with face-to-face groups have shown group cohesion — the feeling of unity among group members, of being closely knit — to be important for a group to be effective and for members to enjoy their experience together (Elias, Johnson, & Fortman, 1989). Without group cohesion, individual members are unlikely to commit themselves to the group, to the task or to each other (Mudrack, 1989).

Hogg & Abrams (1988) present a model of group cohesion that is grounded in the theories of social identity and self-categorization. They propose that group cohesion will only occur under conditions which inhibit personal attraction and allow social attraction to develop¹ and that, 'these conditions arise under all circumstances where

¹ Two different forms of interpersonal attraction can be identified from the group cohesion literature. Personal attraction is an interpersonal attitude that is personalized in terms of unique properties of individuals and close interpersonal relationships. While, social attraction is an interpersonal attitude that is depersonalized in terms of group prototypes and generated along with other intra- and inter-group behaviors. Hogg (1992) states that 'only social attraction relates to group solidarity and cohesiveness — it is a group phenomenon. Personal attraction has nothing to do with groups — it is an interpersonal phenomenon' (p. 108).

the relationship between two or more individuals contains limited individuating inter-personal information' (Hogg & Abrams, 1988, p. 108). Indeed, Hogg & Abrams (1988) propose that where there is more individuating information, group cohesion will be less likely to occur. However, a recent study by Straus (1997) which compared CMC and face-to-face groups does not support these propositions. Straus (1997) found that computer-supported groups expressed *lower* group cohesiveness than did face-to-face groups (which presumably possess more individuating information). In the discussion of her results, Straus (1997) suggested that group cohesion may be less variable in computer-supported groups because 'group members will have less exposure to characteristics of others that they might find attractive or unattractive' (p. 237).

Whereas in face-to-face groups, members have greater access to information about other members' characteristics, therefore differences and similarities will be revealed on which levels of attraction can be based. However, a major problem with this study is that it was conducted in a laboratory environment on very small groups of students and therefore the results are of limited generalisability to real world contexts.

Using the Social Identity model of De-individuation Effects (SIDE) to Investigate CMC

Over the last 8 years, a programme of research involving Postmes, Spears, & Lea (1999) has used SIDE to guide the design of studies to investigate the effects of CMC. Based on SIDE, it is proposed that an interaction of group immersion and reduced identifiability (i.e., conditions which restrict interpersonal cues) enhance the group context (rather than shift attention away from the context as proposed by Sproull & Kiesler, 1991) and lead to more inhibition in CMC. However, although the empirical work has found support for SIDE in terms of group polarization, measures of other factors involved in computer-mediated group interaction (e.g., group cohesion and self-disclosure) have not been collected at the same time.

Experimental Rationale and Hypotheses

The study reported here aims to address some of the criticisms of previous research raised. A general problem is that researchers tend to focus their studies on either perception, communication or the outcome of CMC but rarely set out to observe all three. In particular, previous research has neglected to collect measures of the way users perceive each other as individuals and the way they perceive the group. This study will record and examine the relationship between measures of interpersonal perception, group interaction and group decision-making. Second, it is not clear that the results from the laboratory studies can be generalized to real CMC networks where larger numbers of people would be involved and discussion would take place over longer periods of time. The effects of context, daily routine and workload that occur in normal everyday use of e-mail need to be taken into account. The study reported here has been designed to test whether SIDE can be used to explain group interaction in a realistic computer-mediated context.

This study will manipulate the e-mail conditions under which communication will take place and which it is predicted will lead to different degrees of de-individuation, which in turn will lead to differential effects on group processes and interpersonal perception. The de-individuated group is predicted to be that which receives Low Identifiability (i.e., very little identifying information about other group members) and Group Salience (i.e., instructions emphasizing the importance of the group) manipulations. Four hypotheses will test predictions based on SIDE:

Hypothesis 1 — there will be less uninhibited communication (in terms of flaming and self-disclosure) in de-individuated groups;

Hypothesis 2 — attitudes of participants in de-individuated groups will become more polarized after group discussion, compared to groups receiving Low Identifiability and Individual Salience, while there will be no significant movement in the attitudes of those participants receiving High Identifiability;

Hypothesis 3 — those participants in the Low Identifiability conditions will perceive more group cohesion than those in the High Identifiability conditions, and

Hypothesis 4 — those participants in the Group Salience conditions will perceive more group cohesion than those in the Individual Salience conditions.

Method

Participants

Forty eight participants (37 males and 11 females) were recruited from a population of e-mail users who responded to a request to participate in a study of communication mediated by e-mail. This request was posted on a number of different e-mail networks within the UK. Participants were randomly assigned to groups of six. Participants were geographically dispersed and care was taken to ensure that volunteers from the same electronic network were not placed in the same groups and that no one had previously met or spoken to another member of their group. At the beginning of the study, participants were requested to complete a brief biographical questionnaire, which asked for information regarding education, employment, e-mail use, spare time activities and a personal description.

Experimental Design

A 2 x 2 between subjects factorial design was employed, with Identifiability (Low or High) and Salience (Individual or Group) as the independent variables. Two discussion groups were assigned to each condition. Personal identifiability was manipulated by providing those in the High Identifiability condition with an electronic biographic database containing details of each group member. Participants in the Low Identifiability condition were given only the e-mail user names of other group members. Immersion in the group was manipulated by varying the emphasis (Salience) of instructions given to participants. In the Group Salience condition participants were

told that they were participating as members of the group and not as individuals, and instructions referred to the participant as a 'group member' and the other participants as 'the rest of the group'. In the Individual Salience condition the briefing focused the aims of the study upon individual factors and the instructions referred to the other group members as 'the other participants'.

Apparatus and Materials

Each participant used their normal e-mail terminal. Although these varied across the sample in terms of power, speed and functionality it was felt to be more important that participants should use familiar technology rather than try to standardize the systems being used. Participants sent messages to a group address and these were then automatically distributed to other group members and the experimenter. Each group discussed the same topic which was 'Issues Concerning the Definition of Rape.' This produced an active discussion and many differences of opinion among the participants. Participants were asked to try to produce a set of guidelines to help define the act of rape by the end of the discussion period. Changes in attitude towards the discussion topic and measures of interpersonal perception were obtained from two self-report questionnaires. Prior to, during and at the end of the discussion period participants were asked to complete a questionnaire which collected attitudes to seven different aspects of the discussion topic. At the end of the discussion period participants completed a questionnaire which contained measures of interpersonal perception (one on group cohesion and one on interpersonal attraction), and measures regarding their experience of taking part in the study (one regarding the perceived success at completing the task and one on the perceived openness of e-mail for group discussion). Attitudes and perceptions were measured on seven-point Likert-type rating scales (-3 to +3 indicating disagreement to agreement).

Procedure

After participants had been allocated to one of the groups, they were given background information to the study and instructions specific to the condition. At this point (T1) they completed the Attitudes to Rape Questionnaire. The discussion period lasted for two weeks, during which participants were free to send as many or as few messages as they wished, on as many days as they wished. During the discussion, approximately every three days (at T2, T3 and T4) and at the end of the discussion period (T5) attitudes were collected using the same seven-item questionnaire. At T5 participants also completed the Post Discussion Questionnaire. The transcripts were coded blind by one of the authors (headers and all information that could be used to identify conditions or individual participants were first removed) for instances of flaming and self-disclosure. Two types of flaming were differentiated: Type A consisted of abusive or impolite comments directed towards other participants, while Type B consisted of general comments containing uninhibited language. Self-disclosure was defined as any comments that revealed something private about the person. A number of quantitative measures were extracted from the transcripts including the number and length of messages sent by each individual.

Results

The analysis of the data will be considered for each type of measure: group communication, group decision-making and interpersonal perception.

Group Communication

There were relatively few instances of self-disclosure and flaming per condition, therefore Table 1 shows the *total* number of self-disclosure and flaming comments per condition. It can be seen that participants receiving a low level of Identifiability produced very few flames — with only 5 out of a total of 26 Type A flames and 6 out of a total of 30 Type B flames. The observed frequencies were compared against expected values of equal distribution. The observed values were not equally distributed for either Type A flames ($\text{Chi}^2(1)=12.45$; $p<0001$) or Type B flames ($\text{Chi}^2(1)=15.32$, $p<.001$). Therefore flaming did not occur evenly across conditions and it can be seen that Identifiability was the significant factor in both Types of flaming. Contrary to previous research it was participants in the individuated, High Identifiability conditions who produced the most flames. The Salience manipulation had little effect, with those in the Group and Individual conditions producing similar numbers of both Types of flame. Table 1 also shows that the more that is known about other members of the group, the more a person will disclose about themselves. Again testing against an expected equal distribution, frequency of self-disclosure across conditions was significantly and strongly affected by the experimental manipulations ($\text{Chi}^2(1)=42.62$, $p<.001$).

Table 1 *Frequency of Flaming and Self-disclosure per Condition*

Communication Measure	Low Ident. Ind. Sal.	Low Ident. Grp. Sal.	High Ident. Ind. Sal.	High Ident. Grp. Sal.	Total	Significant effects
Frequency of flames — type A	1	4	13	8	26	$\text{Chi}^2=12.45$, $p<.01$
Frequency of flames — type B	4	2	13	11	30	$\text{Chi}^2=15.32$, $p<.01$
Frequency of self-disclosures	4	1	17	31	53	$\text{Chi}^2=42.62$, $p<.01$

Two-way Analysis of Variance (ANOVA) tests were conducted for both measures of communication activity and the results are shown in Table 2. Identifiability was shown to have a strong and statistically significant effect on message-sending activity: participants receiving High Identifiability sent significantly more messages ($F(1,44)=10.5$, $p<.01$) and significantly longer messages ($F(1,44)=21.93$, $p<.01$) than those receiving Low Identifiability. The Salience manipulation had no significant effect on either the number or length of messages sent. When the standard deviations are examined, for both communication measures there is more variability in the High Identifiability groups. While standard deviations are lower for the Low Identifiability groups indicating a more balanced distribution of messages, of a similar length sent by each group member.

Table 2 *Mean Number and Length of Messages Sent per Person*

Communication Measure	Low Ident. Ind. Sal.	Low Ident. Grp. Sal.	High Ident. Ind. Sal.	High Ident. Grp. Sal.	Means Total	Significant effects
Mean message frequency	3.2	6.9	9.7	8.4	7.0	Ident. $p < .01$
standard deviation	1.2	4.9	5.3	4.0		
Mean message length (number of lines)	51	71	160	206	122	Ident. $p < .01$
standard deviation	29.2	46.2	103.3	131.2		

In summary, Identifiability is a significant factor affecting uninhibited communication: the more that is known about other members of the group, the more that people are prepared to flame and self-disclose. The results provide support for Hypothesis 1, in particular the least number of Type B flames were produced in de-individuated groups. Also, limiting the amount of identifying information available produces a more balanced discussion, although there was less communication occurring in these groups.

Group Decision-Making

Hypothesis 2 predicted that the attitudes of individuals in the de-individuated groups would become more polarized, following group discussion, compared to those in groups receiving Low Identifiability and Individual Salience. In order to determine whether group polarization occurred *during* discussion as well as at the end of the discussion period (T5), measurements of attitude were collected on three occasions (T2, T3 and T4) during the discussion period for each of seven attitude items. In total then, 28 measurements were compared with pre-discussion attitude levels (at T1). The results revealed only six instances (Item 1 at T3, Item 2 at T4, Item 4 at T2, T3 and T4, and Item 7 at T2) where changes in attitude reflected the interaction predicted by Hypothesis 2 and none of these was statistically significant. Also, it was hypothesized that there would be no significant movement in attitude for the two High Identifiability conditions, but contrary to this some large, but not significant, differences were shown.

Table 3 *Mean Responses to Post-Discussion Questionnaire Items*

Questionnaire Item	Low Ident. Ind. Sal.	Low Ident. Grp. Sal.	High Ident. Ind. Sal.	High Ident. Grp. Sal.	Significant effects
Task success	-1.33	-0.30	-0.58	0.91	Salience $p < .05$
Openness	-0.85	-0.36	0.42	0.45	Ident. $p < .01$
Group cohesion	-1.31	-0.73	0.42	0.36	Ident. $p < .01$
Attraction	0.19	0.36	0.42	1.20	NS

Two-way Analysis of Variance (ANOVA) tests were conducted for the responses to post-discussion questionnaire items; the significant findings and the mean responses are presented in Table 3. When participants were asked how successful they were in completing the task, it can be seen that those receiving High Identifiability and Group Salience perceived the level of success to be high, while the other three conditions indicated negative mean responses. Although this interaction was not statistically significant, the Salience manipulation was significant ($F(1,44)=6.68, p<.05$). Participants were asked if they felt more open to discussion of the topic using e-mail (compared to face-to-face discussion). It can be seen that participants receiving High Identifiability reported feeling significantly more open than those receiving Low Identifiability ($F(1,44)=7.25, p<.01$), supporting the data presented in Table 1 regarding self-disclosure.

In summary, members of Low Identifiability groups indicated more negative perceptions of the group process, compared to the High Identifiability groups. There were no consistent changes in attitude during or following discussion, and the strong interaction effects shown in previous research were not found, therefore Hypothesis 2 cannot be supported.

Interpersonal Perception

The Identifiability manipulation strongly and significantly affected perceptions of group cohesion ($F(1,44)=10.09, p<0.01$), with more perceived group cohesion occurring in the High Identifiability groups, contrary to the predictions made in Hypothesis 3. Table 3 shows that perceptions of other group members were generally favorable: participants receiving High Identifiability and Group Salience expressed the most attraction towards other group members, although this interaction was not statistically significant. Surprisingly, the Salience manipulation had no significant effects on perceptions of cohesion, therefore there is also no support for Hypothesis 4.

In summary, the results showed that Identifiability rather than Group Salience was the important factor impacting on perception of group cohesion and that High rather than Low Identifiability was associated with the higher levels of cohesion. This is contrary to the predictions (Hypotheses 3 and 4) based on the social identity model of cohesion.

Discussion

This study had two main purposes. The first was to examine group interaction in *realistic* e-mail discussion groups where the contexts had been manipulated to provide more or less emphasis on a personal individual identity or an impersonal social identity. Previous CMC research has either compared electronic communication with face-to-face communication (e.g., Sproull & Kiesler, 1991) and confounded structural differences between the two (synchronicity, speed of communicating etc.) or compared electronic groups under different conditions but generally in laboratory based experiments (e.g., Lea & Spears, 1991), which are unlikely to generalize to

everyday e-mail use. The second aim was to begin to consider the way that members' perceptions of the group relate to group interaction and in particular to investigate whether social identity theory could be used to predict the impact of the manipulations of identifiability and group identity on group cohesion. Much of the previous CMC research has ignored group cohesion, despite its importance in face-to-face small group interaction.

The first conclusion to be drawn from the data presented here is that it is the conditions in which participants could be personally identified and in which they had provided information about themselves that produced higher levels of flaming and self-disclosure. Hence the rather 'technologically deterministic' arguments of Sproull & Kiesler (1991) regarding the effects of reduced social context cues are unfounded. More complex processes and factors are involved in influencing communication in electronic groups particularly as regards the extent to which people obey the social norms that govern communication and interaction in face-to-face contexts. Whatever leads to uninhibited communication in CMC systems, anonymity does not appear to be the critical factor. If one takes the view that flaming and self-disclosure are more socio-emotional rather than task-based discussion then the provision of personal information has encouraged and facilitated the groups to interact at that level. Whether this can be seen as a positive release of socio-emotional interaction or a negative release is difficult to consider here.

Within this realistic context, the finding of Dubrovsky, Kiesler, & Sethna (1991), regarding more balanced participation in groups receiving limited identifying information, was confirmed, although there was also less communication occurring in these groups. The implications of this are that in circumstances where a high level of interactive discussion is desirable this can be achieved by providing a means for the participants to obtain information about other group members. However, if equality of participation is the critical goal then the anonymity of group members should be preserved. It is difficult to give guidelines on how to realize high level of discussion and equal participation. Further work needs to be conducted in this area.

The results regarding group polarization are more difficult to explain. In this more realistic context, the normally highly consistent phenomenon of group polarization is not shown. This may be due to the longer time frame over which this study was conducted; most group polarization studies take place over minutes or hours, rather than days (Wetherell, 1987). It may be that group polarization only occurs in the early stages of group discussion. The results provide some support for this argument; when the predicted interaction was shown it occurred in the early or middle stages of discussion (i.e., at T2, T3 and T4), and was never shown in the final post-discussion measurement (at T5). Further research needs to focus on those changes in attitudes which occur at the beginning of discussions, rather than just collecting measurements of attitude before and after discussion as is usually the case in group polarization research. McGrath & Hollingshead (1993) arrive at a similar conclusion in their work which emphasizes the importance of investigating intra-group dynamics and temporal issues in computer-supported groups. In a discussion of the differences between laboratory-based and field research, Kraemer & Pinsonneault (1990) discuss the predominance of CMC studies which focus on the very early stages of group development. It is

during the early stages that group members try to establish and understand the norms of the group, and try to obtain a basis of influence over the decision process. CMC may have significant effects on groups at the early stages of development because it permits members to focus more rapidly and intensely upon the task itself. Further discussion of the influence of temporal issues in CMC is considered elsewhere (Taylor & MacDonald, in preparation). In summary, the results here suggest that group polarization in CMC may not be as wide-spread as previously suggested.

A further aspect which needs to be considered is the nature of the tasks that groups are asked to carry out. The task used here was intended to be realistic. There was no correct or incorrect answer, whereas previous group polarization research has used more structured tasks where a decision has been required within a short period of time or where a solution to the task is more definitive (e.g., when Hiltz, Johnson, & Turoff, 1986 used a hypothetical survival task, there was an optimal solution). It may well be the case that the findings of this study are partly a result of the rather open-ended task set to the group (i.e., to discuss the wider issues) and over a longer time-period and may not apply more universally. How people approach the use of a communication medium will undoubtedly be affected by their conception of the nature of the activity required of them and their perception of how the medium will allow them to accomplish that requirement. Future research needs to examine the effects when different tasks are used. A number of researchers have started to address these issues, however so far they have done so within laboratory contexts (e.g., Sosik, Avolio, Kahai, & Jung, 1998).

The second aspect of this study is the consideration of interpersonal perception. The study produced an unexpected set of significant group cohesion findings, contrary to the predictions based on the social identity model of group cohesion. Rather than the manipulation of group immersion affecting group perception, it was the manipulation of personal identifiability which significantly affected perceptions of group cohesion. Tajfel (1981) suggested that the only pre-condition for group cohesion to occur is the explicit categorization of individuals as group members; clearly, this was not the case in this study. Also contrary to social identity theory, but in line with the findings from Straus (1997), the results showed that higher levels of group cohesion were perceived in groups receiving individuating information. It was predicted that there would be more cohesion in groups receiving *limited* individuating information (as these allow social attraction to develop), compared to those groups where more individuating information was available (which encourage personal attraction to develop). However, other factors cited by Hogg (1992) as affecting the development of social attraction (e.g., the nature of the social relationship between group members) may have been significant in this study. In particular, it is not clear whether the high levels of self-disclosure and quantity of communication in High Identifiability groups may have allowed personal attraction to develop and that this was perceived as cohesion by group members. That is, the wording of the group cohesion question in this study may have inadvertently measured level of personal attraction and not social attraction. Further research, in which more extensive measures of interpersonal perception are used, is required to test predictions based on social identity theory. A criticism of the study is that one self-report question is

clearly an insufficient measure of the complex phenomenon of group cohesion. Self-report measures need to include items relating to both social and personal attraction. A further way to examine cohesion in computer-supported groups would be to conduct a content analysis of the discussion transcripts: this would provide a more objective measure of the strength of cohesion and would allow the development of cohesion to be related to measures of self-disclosure and communication activity.

Conclusion

The research has contributed to understanding how the level of social identity of group members affects group processes and interpersonal perception in a non-laboratory environment. Further research needs to focus on other aspects of the context in which CMC is used, for example, task-type and stage of group development. It is suggested here that these factors may moderate the effects of CMC on group processes. For example, group polarization and group cohesion may not operate in the same predictable ways in realistic computer-supported groups as they do in laboratory-based CMC groups or face-to-face groups.

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