

Self-disclosure in computer-mediated communication: The role of self-awareness and visual anonymity

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Abstract

Three studies examined the notion that computer-mediated communication (CMC) can be characterised by high levels of self-disclosure. In Study One, significantly higher levels of spontaneous self-disclosure were found in computer-mediated compared to face-to-face discussions. Study Two examined the role of visual anonymity in encouraging self-disclosure during CMC. Visually anonymous participants disclosed significantly more information about themselves than non-visually anonymous participants. In Study Three, private and public self-awareness were independently manipulated, using video-conferencing cameras and accountability cues, to create a 2 × 2 design (public self-awareness (high and low) × private self-awareness (high and low)). It was found that heightened private self-awareness, when combined with reduced public self-awareness, was associated with significantly higher levels of spontaneous self-disclosure during computer-mediated communication. Copyright © 2001 John Wiley & Sons, Ltd.

INTRODUCTION

Computer-mediated communication (CMC), and more generally the Internet, have become the focus of interest for social psychological research for a number of reasons. One reason is that the main use of the Internet in the home is for interpersonal communication (Kraut, Mukhopadhyay, Szczypula, Kiesler, & Scherlis, 2000), suggesting large amounts of social behaviour worth investigating. A second reason is that CMC contains two features, visual anonymity and limited channel (i.e. text only) communication that have been implicated in a variety of interpersonal behaviours. Both visual anonymity and text-only communication have been used to predict that CMC will lack the richness of normal face-to-face interaction and hence be task oriented and low in socio-emotional content (Rice & Love, 1987). They have also been used to predict that CMC would discourage awareness of others (Kiesler, Siegal, & McGuire, 1984) and encourage anti-normative, aggressive, uninhibited behaviour termed 'flaming' through a corresponding reduction in self-focus (Kiesler *et al.*, 1984). Although there is some evidence that both task-focus and negative, anti-social behaviour does occur during CMC,

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literature reviews and meta-analytic studies have questioned the prevalence and universality of both flaming and task-focus (Lea, O'Shea, Fung, & Spears, 1992; Walther, Anderson, & Park, 1994).

However, as research into CMC has continued, a number of researchers have noted instances of highly positive social interaction using CMC, sometimes even culminating in marriage or co-habitation (Parks & Floyd, 1996). For instance, Walther (1995) concludes that his own model of social information processing, which predicts eventual parity of CMC and face-to-face (FtF) communication 'underestimates the positive effect of computer-mediation on relational communication' (p. 198). Furthermore, Walther (1996) proposes that social interaction using CMC can be 'more stereotypically socially desirable or intimate than normal' (p. 34) – a phenomenon he termed 'hyperpersonal' interaction. The focus of the present research is on one cornerstone of the formation, development and maintenance of intimate social relationships – self-disclosure (Derlega, Metts, Petronio, & Margulis, 1993).

Self-disclosure and CMC

Self-disclosure is the 'act of revealing personal information to others' (Archer, 1980, p. 183). Although usually discussed in light of the development of close relationships (e.g. Laurenceau, Barrett, & Pietromonaco, 1998), self-disclosure has also been investigated as an outcome of alcohol intake (see Steele & Southwick, 1985), gender differences (Dindia & Allen, 1992) and personality characteristics (e.g. self-consciousness and self-monitoring: Shaffer & Tomarelli, 1989).

Both experimental and anecdotal evidence suggests that CMC and general Internet-based behaviour can be characterised as containing high levels of self-disclosure. For instance, Reingold (1993) claims that new, meaningful relationships can be formed in cyberspace because of, not despite, its limitations. He further argues that 'the medium will, by its nature . . . be a place where people often end up revealing themselves far more intimately than they would be inclined to do without the intermediation of screens and pseudonyms'. Wallace (1999) argues that 'The tendency to disclose more to a computer . . . is an important ingredient of what seems to be happening on the Internet' (p. 151).

Indeed, medical patients tend to report more symptoms and undesirable behaviours when interviewed by computer rather than face-to-face (Greist, Klein, & VanCura, 1973). Clients at a STD clinic report more sexual partners, more previous visits and more symptoms to a computer than to a doctor (Robinson & West, 1992). Ferriter (1993) found that pre-clinical psychiatric interviews conducted using CMC compared to FtF yielded more honest, candid answers. In the UK, the Samaritans report that although only 20% of telephone callers report suicidal feelings, this number increases to around 50% of e-mail contacts (*The Scotsman*, 24 February 1999).¹

Parks and Floyd (1996) found that over 60% of Usenet participants report forming personal relationships with fellow newsgroup users. Significantly, Parks and Floyd also found high levels of self-disclosure in on-line relationships (e.g. high scores on the item 'I usually tell this person exactly how I feel' and low scores on 'I would never tell this person anything intimate or personal about myself'). Similarly, Wilkins (1991) reports a member of an on-line community of church workers saying, 'I know some of these people better than some of my oldest and best friends' (p. 56). Rosson (1999) analysed 133 stories posted by Internet-users on a resource called 'Web Storybase'. Overall, 81 of the stories contained personal information of some sort. Rosson concludes that: 'users seem to be quite comfortable revealing personal – even quite intimate – details about their lives in this very public forum (p. 8). Similarly, McKenna and Bargh (1998) argue that participation in on-line newsgroups

¹Although of course, Internet users could simply be more suicidal rather than more candid.

gives people the benefit of ‘disclosing a long secret part of one’s self’ (p. 682). McKenna and Bargh also found that self-disclosure on-line had powerful repercussions for ‘real life’:

As a direct result of Internet newsgroup membership and participation, over 37% of participants in Study 2, and 63% of those in Study 3 revealed to others what had been an embarrassing secret about themselves (p. 691).

The tendency to disclose more about the self during on-line interaction also extends to the completion of psychological measures. Kiesler and Sproull (1986) report that, compared to pencil and paper surveys, answers to electronic surveys are less socially desirable and lead to the disclosure of more information about the self (see also Joinson, 1999; Locke & Gilbert, 1995).

Visual Anonymity and CMC

Anonymity is central to most explanations of both pro- and anti-social CMC behaviour, including self-disclosure (Kiesler *et al.*, 1984; Spears & Lea, 1994; Walther, 1996). For instance, the application of de-individuation to CMC relies primarily on anonymity (Kiesler *et al.*, 1984). Thus, according to Kiesler *et al.* (1984):

computer-mediated communication seems to comprise some of the same conditions that are important for deindividuation–anonymity, reduced self-regulation, and reduced self-awareness (p. 1126).

More recently, McKenna and Bargh (2000) claim that: ‘It is not surprising then that de-individuation and the negative results that often accompany it... readily occur on the Internet’ (p. 60). McKenna and Bargh further argue that de-individuation on the Internet will also lead to greater self-disclosure: ‘under the protective cloak of anonymity users can express the way they truly feel and think’ (p. 62).

Anonymity is also crucial to understanding ‘hyperpersonal’ CMC (Walther, 1996). According to Walther, visual anonymity allows CMC users to construct a predominately positive impression, which leads to idealised impressions of one’s communication partner. In line with work on self-fulfilling prophecies and behavioural confirmation, as a CMC interaction progresses, so the inflated positive impressions will be magnified as the communicators seek to confirm their initial impressions, and in turn respond to the positive impressions conveyed by their partners. Indeed, Walther (presentation at the annual meeting of the International Communication Association, San Francisco, May 1999) warns against the trend of plugging video cameras into PCs, arguing that visual cues *detract* from social impressions during CMC. For instance, Walther, Slovacek, and Tidwell (presentation at the annual meeting of the International Communication Association, San Francisco, May 1999) report that long-term CMC groups show lower attraction and affinity if they have seen a still picture of their fellow participants. Moreover, according to Walther (1996), because many on-line communicants share a social categorisation (e.g. as ‘Internet users’), they will also tend to perceive greater similarity between themselves because they share a social category.

The application of the Social Identity explanation of De-individuation Effects (SIDE) model to CMC also places anonymity centrally (Reicher, Spears, & Postmes, 1995; Spears & Lea, 1992). Spears and Lea (1992) argue that the anonymity inherent in most CMC, when a social identity is salient, serves to strengthen the impact of social norms, and hence normative influence. When a personal identity is salient, the same anonymity will reduce the impact of social norms, and increase the person’s adherence to their own personal standards. The SIDE model also predicts that anonymity

and lack of identifiability lead to different processes. Anonymity of others to the self (i.e. visual anonymity) leads to heightened self-awareness, and thus to greater adherence to group norms when a social identity is salient. On the other hand, anonymity of the self to others (i.e. lack of identifiability) allows 'one to express one's true mind, or authentic self, unfettered by concerns of self-presentation' (Spears & Lea, 1994, p. 430), and might lead to a reduction in conformity to group norms.

Self-awareness and CMC

Thus, explanations of CMC that include anonymity in their models tend to invoke changes in self-awareness (either explicitly or implicitly) to predict specific behaviours (e.g. [Kiesler *et al.*, 1984](#); [Spears & Lea, 1994](#); [Walther, 1996](#)). However, relatively few studies have attempted to measure self-awareness during CMC, and manipulations of self-awareness tend to be via anonymity and identifiability rather than directly.

In one exception, Matheson and Zanna (1988) compared participants' levels of self-awareness (using a four-item questionnaire) after they had discussed using computers or face-to-face. They found that 'users of computer-mediated communication reported greater private self-awareness and marginally lower public self-awareness than subjects communicating face-to-face' (p. 228). In line with this, Matheson (1992) reports that users find CMC a highly reflective experience. Weisband and Atwater (1999) found that CMC users over-estimate their contribution to discussions compared to FtF, suggesting that they might experience heightened private self-focus.

Moreover, one well-established outcome of heightened private self-awareness is increased self-disclosure. For instance, [Franzoi and Davis \(1985\)](#) found that adolescents high in private self-consciousness were more willing to disclose information about themselves than those with low private self-consciousness. Similarly, heightened private self-awareness is associated with an increased salience of one's physical and affective states ([Scheier, 1976](#)). Being self-focused also leads to increased accuracy of self-reports of hospitalisation history among psychiatric patients, and their descriptions of their problems ([Gibbons, Smith, Ingram, Pearce, Brehm, & Schroeder, 1985](#)). Similarly, disclosed information about sociability and college examination marks is more accurate when individuals are self-aware ([Pryor, Gibbons, Wicklund, Fazio, & Hood, 1977](#)). The self-reports of those high in private self-consciousness also have higher test-retest reliability ([Hjelle & Bernard, 1994](#)).

However, while being high in either private or public self-consciousness leads to increased reciprocal self-disclosure, being high or low on both leads to reduced self-disclosure ([Shaffer & Tomarelli, 1989](#)). Shaffer and Tomarelli argue that focus on both aspects of the self divides one's attention, leading to a reduced influence on self-disclosure.

If individuals are indeed experiencing heightened private self-awareness during CMC, it would be expected that one would see high levels of self-disclosure in on-line life (cf. [Scheier, 1976](#)). Moreover, if users also experienced reduced public self-awareness (presumably through lack of identifiability and/or accountability concerns), one would expect this focus on the self to be more likely to be disclosed to others because of lowered self-presentation concerns ([Crowne & Marlowe, 1960](#); [Schlenker, 1980](#)).

Overview of the Studies

The present research is designed to examine the prevalence and potential causes of self-disclosure during CMC. In Study One, the amount of self-disclosure during CMC and face-to-face discussions is compared. It is predicted that dyads discussing a dilemma using a CMC system will disclose significantly more about themselves than dyads discussing face-to-face.

In Study Two, visual anonymity is manipulated during CMC-based discussions. Two conditions were constructed: a visually anonymous (text-only) condition and a non-anonymous condition (participants could see the other communicant on screen 'real time' using a video conferencing system). It is predicted that dyads discussing a dilemma using a CMC system when visually anonymous will disclose significantly more about themselves than dyads discussing with a live video feed of the other participant on screen.

In Study Three, private and public self-focus are experimentally manipulated during CMC, and the impact on self-disclosure measured. It is predicted that a manipulation designed to heighten private self-awareness and reduce public self-awareness will yield high levels of self-disclosure, while manipulations designed to create alternative high/low combinations (e.g. low private self-awareness and low public self-awareness) will lead to significantly lower levels of self-disclosure. Participants in the high public and low private self-awareness condition may also disclose increased levels of information about the self (cf. [Shaffer & Tomarelli, 1989](#)).

STUDY ONE

Method

Participants and Design

Participants were 40 undergraduate students (29 female, 11 male) who were awarded course credit for participation. Where possible, participants were paired with a student of the same gender (in all but one CMC trial). Dyads were allocated to one of two conditions (face-to-face versus computer-mediated) in a one-way, between-subjects design. The dependent variable was the amount of self-disclosure within each dyad. The mean age for participants was 24.13 years ($SD = 6.42$).

Materials

A dilemma was used to encourage communication between participants. It was:

There is room for five people in the world's only 100% safe nuclear shelter. Excluding yourself and your family and friends, which five people in the world do you think should be given a place in the shelter in the event of nuclear war?

Procedure

Participants were recruited in class by the experimenter. The participants in the CMC condition were asked to sign up to an hour slot and given a receipt stating the location, date and time of the experiment. They were informed that they were to take part in a study using the Internet. One half of the dyad was asked to arrive five minutes earlier than the other participant. This was so that the participants did not meet. Each half of a dyad was recruited from a separate class (either psychology or communication studies), so participants did not have any prior knowledge of each other. Participants were identified as 'lab 1' and 'lab 2' within the 'chat' program. Once participants arrived they were taken to one of two cubicles on the same corridor, but separated by a further cubicle. Once inside they

were quickly trained how to use the chat program, and told that the dilemma they were to discuss would appear on screen. They were given written instructions that explained 'shortly you will be given a dilemma to discuss with another person connected to this computer. There is no time limit, but you must come to a joint decision'.

Once participants were set up in each cubicle, the experimenter (using the log-on name 'operator') posted the dilemma to the chat program and finished with the line 'OK. I'll leave you to it . . . '.

In the face-to-face condition, participants were recruited to arrive at the same time, and were led to a cubicle and handed written instructions with the dilemma on the front. The discussion was tape recorded.

All the participants were stopped (unless they had made a decision by then) after 45 minutes. They were then debriefed, thanked for their participation and asked not to discuss the study for two weeks. Participants in the CMC condition left the laboratory area separately, and met at no time.

Results and Discussion

Content Analysis

Two trained raters who were blind to the experimental condition of the transcripts rated the level of self-disclosure in each condition. The raters were instructed to note the location in the transcripts of self-disclosures by participants. They were further instructed to ignore positional, value or task-based statements (e.g. 'Don't put Tom Jones in, I don't like him'), and to only rate occurrences of non-task based self-disclosure (e.g. 'I am a psychology student', or 'I also take anti-depressants'). They were further instructed to rate only spontaneous self-disclosure, and not answers to questions (e.g. 'how old are you?', '22'). Self-disclosure was rated in two categories, positive or neutral self-disclosure and negative self-disclosure. The stringent nature of the scoring criteria meant that the raters disagreed just once over an occurrence of spontaneous self-disclosure. There were 38 instances of spontaneous self-disclosure in total. Because occasions of negative self-disclosure were rare (5 in total), self-disclosure was collapsed across valence.

The mean number of words spoken by each individual in the FtF condition ($M = 464.70$, $SD = 241.47$) was higher than in the CMC condition ($M = 350.65$, $SD = 117.09$; $F(1, 38) = 3.62$, $p = 0.06$).

A one-way ANOVA (CMC versus FtF) was calculated to test for any significant differences in self-disclosure across media. Because the individual's making up a dyad are not independent of each other (Kenny, 2000; Kenny & Judd, 1986), each dyad was treated as a single unit of analysis. Dyads in the CMC condition disclosed significantly more personal information than dyads in the FtF condition ($F(1, 18) = 8.23$, $p < 0.02$, $M_s = 3.10$ ($SD = 2.41$) and 0.70 ($SD = 0.82$) for CMC and FtF respectively).

In light of the marginally significant differences in word count across conditions, the measure of self-disclosure (the raw number of occurrences) was analysed as a percentage of the amount of communication (i.e. the word count for each dyad). These percentages were then standardised into z -scores.

Dyads in the CMC condition disclosed significantly more information about themselves than participants in the FtF condition ($F(1, 18) = 17.73$, $p < 0.001$, $M_s = 0.69$ ($SD = 0.99$) and -0.69 ($SD = 0.27$) for CMC and FtF respectively).

Therefore, as predicted, dyads in the CMC condition disclosed significantly more about themselves than dyads in the FtF condition. This provides experimental confirmation that people disclose more information about themselves during CMC compared to FtF communication. To be sure, the amount of spontaneous self-disclosure is relatively low in both conditions, although this may in part be due to the stringency of the rating criteria rather than a generally low level of self-disclosure. It should also be

remembered that the participants were engaged in a task-based discussion requiring a specific outcome (a joint decision), which may have led to low levels of social communication overall (Walther, Anderson, & Park, 1994).

STUDY TWO

Method

Participants and Design

Participants were 42 undergraduate students (28 female, 14 male) who were awarded course credit for participation. Participants discussed in same sex pairs. Dyads were allocated to one of two conditions (visually anonymous versus visually non-anonymous) in a one-way, between-subjects design. Content analysis of the discussions for occurrences of spontaneous self-disclosure formed the dependent variable. Participants discussed the same dilemma as in Study One, using the same experimental procedure. The mean age for participants was 23.01 years ($SD = 5.42$).

Results and Discussion

The mean time each discussion lasted was 40.90 minutes ($SD = 5.35$). Approximately half of the discussions (12 pairs) chatted until stopped by the operator. The mean discussion time of the dyads who came to a decision before being stopped was 36.11 minutes ($SD = 4.51$).

Participants posted an average of 25.67 messages ($SD = 10.14$) during the discussions, with a mean word count for each participant of 371.05 words ($SD = 149.77$). The mean number of spontaneous self-disclosures recorded was 0.91 per participant ($SD = 1.246$). There was no significant difference across the two conditions for either word count ($F(1, 40) = 0.70, ns$) or number of postings ($F(1, 40) = 0.07, ns$). Again, the unit of analysis was the dyad.

The amount of self-disclosure did differ across conditions ($F(1, 19) = 9.23, p < 0.01; Ms = 3.05$ ($SD = 2.49$) and 0.63 ($SD = 0.92$) for no video and video conditions respectively). The amount of self-disclosure as a percentage of each dyad's word count (converted to z -scores) was also significantly different across the two conditions ($F(1, 19) = 17.02, p < 0.001; Ms = 0.70$ ($SD = 0.100$) and -0.64 ($SD = 0.39$) for no video and video conditions respectively).

As predicted then, the presence of a video picture of one's discussion partner led to significantly lower levels of self-disclosure within a dyad during computer-mediated communication. The results of the present experiment support Walther's warning that the rush to plug video cameras into PCs will inhibit 'hyperpersonal' communication (Walther, presentation at the annual meeting of the International Communication Association, San Francisco, May 1999). A number of potential reasons why visual anonymity might encourage self-disclosure during CMC were outlined above. The most obvious is that people have more to disclose when anonymous. However, of the 31 occurrences of spontaneous self-disclosure recorded in the no-video condition, none were, for instance, the participants' gender (it tended to be requested). In one case, gender was disclosed through the participants' self-disclosure of their gender-specific name. This would suggest that having more to disclose when visually anonymous was not a major factor in the results of the experiment. However, if further research was to more closely examine this question, it might be the case that visual anonymity encourages the self-disclosure of basic categorical information which, because self-disclosure tends to be reciprocated, leads to high levels of intimacy and self-disclosure on-line (Archer, 1980).

An alternative explanation is that in the video condition participants' self-presentation concerns were heightened through an increase in public self-awareness and accountability concerns, which should lead to relative social inhibition (Joinson, 1998). Linked to this is the possibility that in the no-video condition, private self-awareness was heightened (Joinson, 1998; Matheson & Zanna, 1988; Walther, 1996), which, particularly when combined with a reduction in self-presentation concerns, will lead to increased self-disclosure (Shaffer & Tomarelli, 1989). The use of video cameras during CMC may well reverse this, leading to reduced private and heightened public self-awareness. This is not a state of self-focus likely to encourage intimacy and self-disclosure during CMC.

STUDY THREE

Method

Participants and Design

This experiment used a two-way between-subjects design (private self-awareness (high versus low) \times public self-awareness (high versus low) to create four conditions. Participants discussed the same dilemma as in Studies One and Two, and followed the same basic procedure (but see manipulations below). Content analysis of the discussions for occurrences of spontaneous self-disclosure formed the dependent variable.

Participants were 84 undergraduate Communication Studies or Psychology students (59 female, 25 male) who were awarded course credit for participation. Where possible, participants were paired with a student of the same gender. The mean age for participants was 23.02 years ($SD = 5.69$).

Self-awareness Manipulations

Private Self-awareness Traditionally, private self-awareness has been manipulated by placing a mirror near a participant (Carver & Scheier, 1981). In the present research, this technique was replicated by relaying a video-conferencing picture of the participant on to his or her own computer screen. It was made clear to participants that the video picture was not transmitted anywhere. According to Duval and Wicklund (1972), any activity, including motor activity, which encourages attention away from the self will reduce private self-awareness. For instance, Webb, Marsh, Schneiderman, & Davis (1989) reduced subjective self-awareness by having participants rotate a record turntable. Because of the need to type during the CMC experience, a variation of the method used by Prentice-Dunn and Rogers (1982) to reduce private self-awareness (loud rock music and video games on monitors) was used. Private self-awareness was reduced by showing participants episodes of a cartoon ('The Simpsons') during the discussion. This should discourage internal self-focus and encourage external focus of attention.

Public Self-awareness Public self-awareness is usually increased by making participants identifiable (Carver & Scheier, 1981) or accountable for their own behaviour (Prentice-Dunn & Rogers, 1982), and reduced by emphasising anonymity. In the reduced public self-awareness conditions participants arrived for the experiment in a darkened corridor. They were then led to a cubicle with the windows

blackened, and their anonymity was stressed. Throughout they were referred to as 'lab 1' (or 'lab 2'). In the increased public self-awareness conditions, the corridor was well lit, the cubicle windows onto the corridor left clear, two video cameras were pointed at the participant and it was made clear that not only was the discussion automatically transcribed, but that the discussants would meet after the experiment. This manipulation fulfils the Prentice-Dunn and Rogers (1982) criteria of both accountability cues (to both experimenter and other participant) argued to increase public self-awareness.

Manipulations Check Participants completed the private and public self-focus measure developed for post-CMC testing by Matheson and Zanna (1988). This measure comprises four items (two for private self-awareness and two for public self-awareness) designed to measure participants' focal state during the CMC encounter. The items measuring private self-awareness were 'In this experiment I've generally been very aware of myself, my own perspective and attitudes' and 'Rather than thinking about myself in this experiment, my mind has been distracted by my task and what is going on around me' (reverse scored). The items measuring public self-awareness were 'In this experiment I have wondered about the way I've responded and presented myself in comparison to others who are the same type of orientation as me' and 'In this experiment, I have been thoughtful of how well I may get along with my discussion partner if we meet in the future'. Each item was answered using a 5-point Likert scale anchored at 'not at all' (1) and 'very much' (5).

Procedure

The procedure was identical to that of the CMC condition in Study One, with the exception that, according to private self-awareness condition, the participants were sat down with the chat program and video camera picture of themselves or 'The Simpsons' already running. If public self-awareness was being heightened, the experimenter began the capture program that recorded the discussion in front of the participant and checked the direction of the two cameras. The written instructions also told the participant that they would meet their discussion partner after the experiment.

Results and Discussion

The mean time each discussion lasted was 37.05 minutes ($SD = 9.19$). Almost half (17) of the dyads discussed until stopped by the operator.

Manipulation Check

The efficacy of the self-focus manipulations was tested using the four-item measure of focal state outlined above. Participants in the low public self-awareness conditions scored significantly lower on the measure of public self-awareness than those in the heightened public self-awareness condition ($F(1, 82) = 4.11, p < 0.05, Ms = 6.37$ and 5.60 for high and low public self-awareness respectively). Participants in the low private self-awareness conditions scored significantly lower on the measure of private self-awareness than those in the heightened private self-awareness condition ($F(1, 82) = 6.11, p = 0.015, Ms = 6.90$ and 6.07 for high and low private self-awareness respectively).

Content Analysis

The same two trained raters scored the amount of spontaneous self-disclosure in each condition. The raters' score cards disagreed just twice, both occasions being due to oversight on the part of a rater rather than disagreement about the coding categories.

There were 2238 exchanges in total. The mean number of exchanges in each discussion was 53.29 ($SD = 36.65$). The mean word count for the discussions was 644.48 ($SD = 291.12$). There were 141 instances of spontaneous self-disclosure in total. The mean number of self-disclosures per participant was 1.68 ($SD = 2.25$). Because occasions of negative self-disclosure were rare (23 in total), self-disclosure was again collapsed across valence.

A series of two-way ANOVAs (private versus public self-awareness) were calculated to test for any difference in the amount of communication across conditions. There was no main effect for the level of private self-awareness on either the word count ($F(1, 80) = 0.28, p > 0.60, Ms = 313.25$ and 331.05 for high and low private self-awareness respectively) or the number of exchanges ($F(1, 80) = 0.36, p > 0.60, Ms = 24.77$ and 27.39 for high and low private self-awareness respectively) in each discussion.

There was a significant main effect for the level of public self-awareness on the word count ($F(1, 80) = 4.48, p < 0.05, Ms = 355.23$ and 292.89 for high and low public self-awareness respectively) but not the number of exchanges ($F(1, 80) = 2.72, p > 0.10, Ms = 29.12$ and 23.42 for high and low public self-awareness respectively) in each discussion.

There was a significant interaction between the level of public self-awareness and private self-awareness on both the word count ($F(1, 80) = 8.28, p < 0.01$) and the number of exchanges ($F(1, 80) = 10.88, p < 0.025$).

Self-awareness and Self-disclosure

A two-way ANOVA was calculated to test for any significant differences in self-disclosure across the experimental conditions. Again, the unit of analysis for these tests was each dyad. The main effect of private self-awareness was non-significant ($F(1, 38) = 0.05, ns; Ms = 3.45$ ($SD = 4.07$) and 3.27 ($SD = 3.87$) for high and low private self-awareness respectively).

The main effect for public self-awareness was also non-significant ($F(1, 38) = 3.41, p = 0.07, Ms = 0.246$ ($SD = 3.43$) and 4.35 ($SD = 4.25$) for high and low public self-awareness respectively). The interaction between private and public self-awareness on self-disclosure was significant ($F(1, 38) = 8.81, p < 0.01$). This interaction is illustrated in Figure 1.

In light of the differences in the amount of communication across conditions, a second two-way ANOVA was calculated with the measure of self-disclosure (the raw number of occurrences) transformed into a percentage of the amount of communication (i.e. the word count), and converted into *z*-scores.

The main effect of private self-awareness was non-significant ($F(1, 38) = 0.05, ns; Ms = 0.02$ ($SD = 1.01$) and -0.02 ($SD = 1.01$) for high and low private self-awareness respectively).

The main effect for public self-awareness was also non-significant ($F(1, 38) = 1.16, ns; Ms = -0.13$ ($SD = 1.05$) and 0.15 ($SD = 0.95$) for high and low public self-awareness respectively). The interaction between private and public self-awareness on self-disclosure was significant ($F(1, 38) = 7.91, p < 0.01$). This interaction is illustrated in Figure 2.

An analysis of simple effects using the Scheffé test found that the high private/low public self-awareness condition had significantly higher levels of spontaneous self-disclosure ($M = 0.59, SD = 1.04$) than the low private/low public ($p < 0.05, M = -0.29, SD = 0.62$) and high private/high

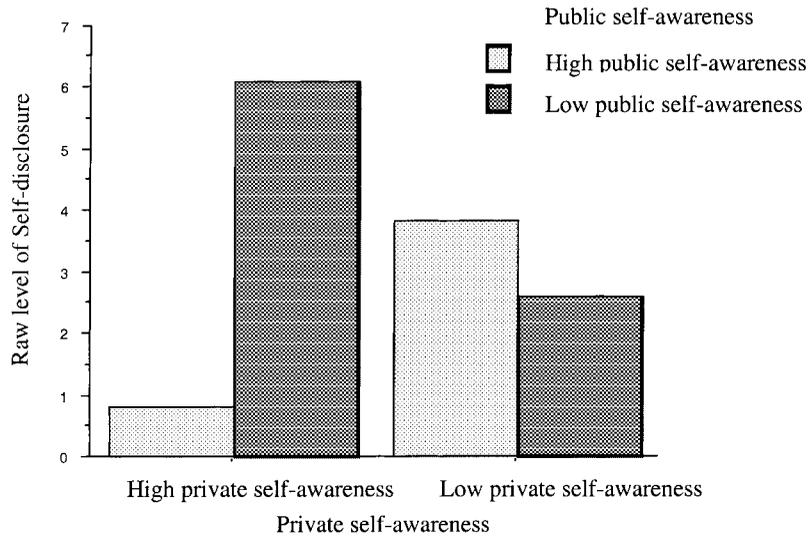


Figure 1. The interaction of private and public self-awareness on self-disclosure

public ($p < 0.01$, $M = -0.54$, $SD = 0.62$) conditions. The difference between the high private/low public condition and the low private/high public condition was non-significant ($p = 0.44$, $M = 0.21$, $SD = 1.23$).

As predicted, heightened private self-awareness and reduced public self-awareness led to significantly higher levels of spontaneous self-disclosure in dyad-based computer-mediated communication. The level of self-disclosure in the high private/low public self-awareness condition was significantly greater than conditions of reduced public and private self-awareness and heightened

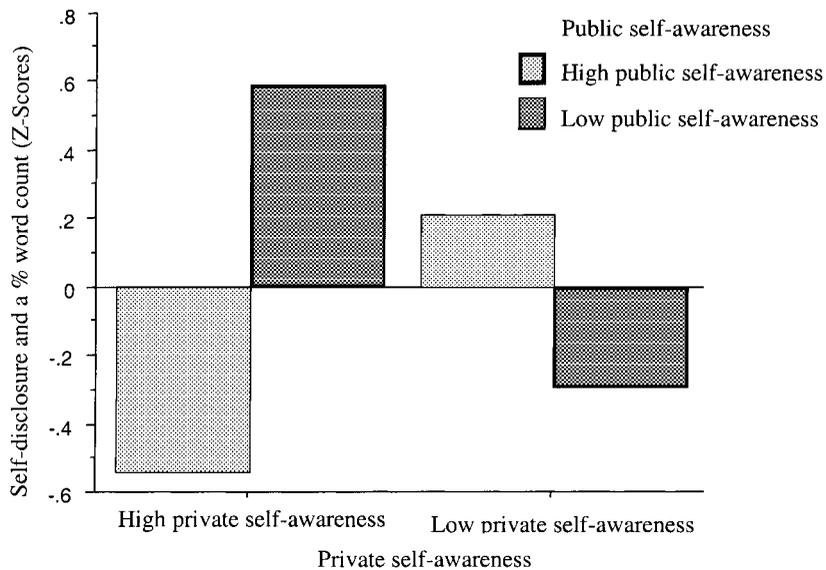


Figure 2. The interaction of private and public self-awareness on adjusted levels of self-disclosure (z-scores)

private and public self-awareness. In line with Shaffer and Tomarelli's (1989) findings, self-disclosure in the high public/low private condition was not significantly different from the high private/low public condition. That heightened private self-awareness increases self-disclosure is to be expected—increased self-consciousness is often characterised by greater levels of self-disclosure (Franzoi & Davis, 1985). However, this condition only exerted an effect on self-disclosure when interacting with public self-awareness. Similarly, the role of reduced public self-awareness in heightening self-disclosure exerted an effect only when interacting with private self-awareness. This suggests that explanations of CMC-based disinhibition will need to take into account not only anonymity (Study Two) but also private self-awareness (Study Three).

Moreover, the results from the manipulation check strongly suggest that self-awareness levels were manipulated by the experimental procedures. However, the possibility of confounding variables within these manipulations needs to be considered. For instance, watching 'The Simpsons' cartoon may have made the task more cognitively demanding for those in the reduced public self-awareness conditions. However, taking into account the amount of discussion, rather than just the raw level of self-disclosure, would cover the possibility that participants' performance was reduced by the difficulty of the task.

GENERAL DISCUSSION

The results of the present research confirm that people disclose more information about themselves during CMC compared to FtF. Study Two has confirmed that visually anonymous people communicating using computers disclose more about themselves than people communicating non-anonymously.

Study Three has shown that this is not due to any de-individuation experienced by CMC users, but rather is due to the interaction between anonymity (i.e. reduced public self-awareness) and heightened private self-awareness. Indeed, in Study Three, when a classical de-individuation condition was effectively replicated (reduced public self-awareness and reduced private self-awareness), self-disclosure was recorded at significantly lower levels than when private self-awareness was heightened. As reduced self-focus is one of the key pre-requisites of de-individuation (Zimbardo, 1969), it would seem that the 'one size fits all' approach to applying de-individuation to both pro and anti-social behaviour on the Internet (e.g. McKenna & Bargh, 2000) is doomed to failure (see Reicher *et al.*, 1995 and Postmes & Spears, 1998 for a more thorough critique of de-individuation theory).

Self-disclosure and CMC

The work presented in the present paper suggests that self-disclosure, because of its role in relationship development, may be important to understanding the development of social relationships on-line. Moreover, Study One goes some way to validating Internet users' self-reports of high levels of self-disclosure during CMC-based relationships (Parks & Floyd, 1996), and supports Walther's notion of CMC as being more 'social' than face-to-face interaction. Indeed, considering that time-limited, task-based CMC seems to curtail emergent social behaviours (Walther *et al.*, 1994), the findings presented here are likely to seriously underestimate the true level of self-disclosure and intimacy in long term CMC. Study Two confirmed the role of visual anonymity on self-disclosure during CMC, but also raised questions about the validity of arguing that 'hyperpersonal' social interaction during CMC is constrained to long-term groups (Walther, 1996). That visual anonymity had an impact on self-disclosure during a short (at most, 45 minutes) task-based discussion suggests that an alternative,

non-time dependent explanation is required. Study Three suggested one explanation – heightened private and reduced public self-awareness during CMC – which is non-time dependent, and is supported by the available evidence.

It is to be expected that the perception of anonymity, and resulting lowered feelings of accountability, should lead to reduced public self-awareness (cf. Prentice-Dunn & Rogers, 1982). However, the present research does not explain why CMC seems to encourage private self-awareness (Matheson & Zanna, 1988). One possibility is that any decrease in public self-focus might tend to lead to an increase in private self-focus, although their manipulation in the present experiment suggests that they operate independently. A second possibility is that the environment in which people engage in computer-mediated communication might encourage private self-focus. Most CMC is undertaken in a quiet room alone, which may encourage the development of an introspective and/or reflective state of mind. A further alternative is that the computer acts as a mirror in that it reflects back to the communicants themselves, leading to private self-focus. Furthermore, the need to express emotions normally done FtF (e.g. to smile) with a text-based alternative (e.g. :-)) may lead to heightened private self-awareness through the act of having to focus on one's inner feelings and emotions to put them down in writing.²

Strengths and Limitations of these Studies

Although the three studies reported here have a number of strengths in their design, some potential methodological problems need to be taken into account. While the use of effectively the same methodology for each study is one strength of the research, more research utilising alternative methodologies (and discussion topics) would be valuable. There is also some evidence that uninhibited communication is considerably higher in mixed sex dyads than same sex dyads (Kiesler, Zubrow, Moses, & Geller, 1985). In this case, the present research may well have underestimated the amount of self-disclosure occurring in CMC discussions by using same-sex dyads. Greater ecological validity would have been achieved through the use of mixed-gender dyads.

Although attempts were made to increase the similarity between FtF and CMC transcripts (e.g. by removing typing errors in the CMC conditions), it is likely that the blind raters could identify whether a discussion was FtF or CMC. This is not a problem for Studies Two and Three where all conditions were computer-mediated, and in Study One neither of the raters was made aware of the direction of the predicted effect.

A further limitation of this research is that self-disclosure was not categorised or weighted according to content, beyond being either positive/neutral or negative (which were then analysed together). Thus, an admission of a suicide attempt would garner the same score as an admission to being a 'bit messy'. This was because the quantity rather than the quality of self-disclosure was the variable of interest in the present research, although future research should address both the breadth and depth of self-disclosure.

A final matter is that in the present series of studies self-disclosure was measured at dyad level. This was done because using individual participants as the unit of analysis would violate assumptions of independence of observations (Kenny, 2000). However, there is likely to be an interaction between individual differences and medium on social behaviour. For instance, it is known that high and low self-monitors respond differently to self-awareness manipulations (Webb *et al.*, 1989), suggesting that they may react in different ways to CMC. For such an investigation, the individual would have to be the unit of analysis.

²I am grateful to an anonymous reviewer for highlighting this possible cause of heightened private self-awareness during CMC.

It should also be noted that the findings reported could be interpreted in a number of alternative ways. That FtF and CMC differ in the amount of self-disclosure could be interpreted as evidence for de-individuation, a shared social identity or hyperpersonal communication. The second study, confirming the role of visual anonymity, could similarly be interpreted in light of the role of anonymity in de-individuation, the importance of anonymity for activating social identities and so on. In light of the inter-relationship between visual anonymity, identifiability, accountability concerns and self-awareness in Study Two, it is perhaps not surprising that the study did not differentiate between theories of CMC. More importantly, the methodology used in Study Two does not differentiate between visual anonymity and lack of identifiability, so the results could be due to either an increase in private self-awareness due to visual anonymity (in line with SIDE) or a decrease in public self-awareness due to lack of identifiability.

Study Three, by independently manipulating private and public self-awareness while maintaining visual anonymity across all conditions goes some distance to differentiating between CMC theories, and addresses the confounding of anonymity and lack of identifiability in Study Two. Public self-awareness was reduced by stressing anonymity and lack of accountability, and heightened by increasing identifiability and accountability. Thus, in Study Three, lack of identifiability on public self-awareness was interacted with a direct, non-anonymity-based manipulation of private self-awareness. This was necessary in the present research because it would not have been possible to construct a condition where participants were both non-identifiable *and* non-visually anonymous. Research using participants separated geographically would make this combination possible.

Indeed, the potentially separate roles of visual anonymity and lack of identifiability in leading to different types of behaviour during CMC suggests that future research may want to test independently the impact of anonymity (others to self) and lack of identifiability (self to others) on both self-awareness and self-disclosure. However, that both forms of anonymity have been argued to influence behaviour through changes in self-awareness (e.g. Spears & Lea, 1994) rather than directly would suggest that more work that attempts to manipulate self-awareness directly, alongside studies that manipulate anonymity and measure self-awareness, would be valuable. It would also be worth investigating alternative explanations for the heightened private self-awareness during CMC effect. For instance, some synchronous CMC environments now provide a set of images linked to emotions for users to send during 'chats'. It is possible that such a provision might encourage private self-awareness by encouraging individuals to seek an appropriate image to match their internal states during communication. On the other hand, removing the ability to use such symbols for internal states might decrease self-focus.

Conclusion

The present series of studies have found that self-disclosure is higher in CMC than FtF, and that both visual anonymity and heightened private/reduced public self-awareness can be implicated in this effect. It is argued that as the Internet becomes a ubiquitous part of people's lives, so psychologists will increasingly need to include the medium as well as the person in any analysis of social behaviour.

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