Online communication, interpersonal attraction, and friendship formation

Antheunis, M.L.

Citation for published version (APA):
Chapter 3

Intervening Processes between Computer-Mediated Communication and Interpersonal Attraction: An Experimental Comparison

Abstract

The first aim of this study was to investigate the validity of four potential mediators that may account for the effects of CMC on interpersonal attraction (i.e., amount of self-disclosure, depth of self-disclosure, question asking, and reciprocity of self-disclosure). The second aim was to clarify the role of nonverbal cues and visual anonymity in the CMC-interpersonal attraction relationship. Eighty-one unacquainted cross-gender dyads were randomly assigned to three experimental conditions: a face-to-face, a visual CMC (i.e., CMC with a webcam), or a text-only CMC condition. Content analysis of the verbal interactions revealed that text-only CMC interactants liked each other more than face-to-face interactants. However, there was no difference in liking between text-only CMC and visual CMC. Depth of self-disclosure and question asking mediated the CMC-liking relationship. Again, there was no difference between the text-only and visual CMC conditions, suggesting that it is not the visual anonymity of CMC that accounts for the higher levels of interpersonal attraction in CMC.

¹ This chapter was submitted for publication as: Antheunis, M.L., Schouten., A.P., Valkenburg, P.M., & Peter, P. (2009). Intervening processes between computer-mediated communication and interpersonal attraction: An experimental comparison.

A version of this manuscript is nominated for a Top Paper Award at the Conference of the International Communication Association in Chicago 2009.
Introduction

The opportunities to form and maintain relationships on the Internet have multiplied in the past years. The vast majority of internet users now use e-mail or Instant Messaging to form and maintain their relationships (Lenhart, Madden, Rankin Macgill, & Smith, 2007; Schouten, Valkenburg, & Peter, 2007). In addition, about half of these internet users are a member of a social networking site, such as Facebook or MySpace (Lenhart et al., 2007). Finally, nearly half of single Internet users have used a dating site to find a date or romantic partner (Valkenburg & Peter, 2007). In fact, the Web has become the fourth most popular strategy in finding a date or partner, next to work, family or friends, and places for social gathering, such as pubs and bars (Madden & Lenhart, 2006).

An important reason for the immense popularity of the Internet for relationship development may lie in the specific nature of online communication. A growing number of studies have found that computer-mediated communication (CMC) stimulates interpersonal attraction and, thereby, relationship development (Antheunis, Valkenburg, & Peter, 2007; Bargh, McKenna, & Fitzsimons, 2002; McKenna, Green, & Gleason, 2002; Ramirez & Zhang, 2007; Walther, 1995). Most of these studies have focused on the socio-emotional part of interpersonal attraction commonly called “liking” (McCroskey & McCain, 1974). The positive effect of CMC on liking is often explained by CMC’s reduced visual (e.g., appearance) and auditory (e.g., voice) cues. It is assumed that these reduced nonverbal cues and their resulting visual anonymity enhances interpersonal attraction. For example, it has been hypothesized that, due to CMC’s reduced cues, CMC interactants may become less concerned about how others perceive them and thus have fewer inhibitions in disclosing themselves (e.g., Joinson, 2001; Walther, 1996). This enhanced self-disclosure, in turn, may stimulate interpersonal attraction (Cooper & Sportolari, 1997; Walther, 1996; Walther, Slovacek, & Tidwell, 2001).

The CMC-liking relationship has often been confirmed in experimental research (e.g., Bargh et al., 2002; McKenna et al., 2002). However, these studies are characterized by at least two shortcomings. First, many previous experimental studies have usually only investigated the direct
relationships between CMC and liking, without attempting to explicitly investigate the processes that may underlie this relationship. Although most studies were based on CMC theories that implicitly explain why reduced nonverbal cues can enhance interpersonal attraction, the proposed underlying mechanisms in these theories have rarely been explicitly tested.

The first aim of our experiment is to fill this void and to investigate why reduced nonverbal cues in CMC can lead to enhanced liking. Based on earlier literature on interpersonal communication (e.g., Uncertainty Reduction Theory) and on CMC, we have identified four possible underlying variables that may account for the positive relationships between CMC and liking found in earlier studies. These variables are: (a) amount of self-disclosure, (b) depth of self-disclosure, (c) direct questioning, and (d) reciprocity of self-disclosure. All these variables have been shown to be positively related to CMC (e.g., Dietz-Uhler, Bishop-Clark, & Howard, 2005; Tidwell & Walther, 2002) and to liking (e.g., Antheunis et al., 2007; Bargh et al., 2002; Laurenceau, Feldman Barret, & Pietromonaco, 1998; Sermat & Smyth, 1973). Therefore, they all qualify as potential mediators in the CMC-liking relationship.

A second shortcoming of earlier experimental CMC research on liking is that most studies have compared only two experimental conditions: text-based CMC versus face-to-face communication (e.g., Bargh et al., 2002; Walther, 1995). However, this binary distinction may not reflect the reality of contemporary CMC. It has been demonstrated that contemporary CMC applications are often accompanied by visual and auditory cues (Lenhart, Madden, & Hitlin, 2005; Peter, Valkenburg, & Schouten, 2007). Moreover, the binary distinction between face-to-face and text-only CMC is not sufficient to investigate the effects of reduced nonverbal cues and the resulting visual anonymity. After all, a face-to-face and a text-based CMC setting differ in many other respects than the quantity and/or quality of nonverbal cues (e.g., face-to-face settings require oral language whereas CMC usually necessitates written language). To address this gap in previous literature, we introduced an additional CMC condition in our experiment, a visual CMC condition, in which a webcam was used. This additional experimental condition allows us to investigate more adequately whether
earlier differences in liking between face-to-face and CMC in favor of CMC can indeed be attributed to visual anonymity.

**Four Potential Mediators**

As mentioned above, four variables may mediate the positive relationship between CMC and liking: amount of self-disclosure, depth of self-disclosure, direct questioning, and reciprocity of self-disclosure. To qualify as a mediator, a variable must be influenced by the independent variable (i.e., CMC → mediator) and has to affect the dependent variable (i.e., mediator → interpersonal attraction).

**Amount of Self-Disclosure**

Several studies have demonstrated that CMC results in a higher amount of self-disclosure (Bargh et al., 2002; Coleman, Paternite, & Sherman, 1999; Joinson, 2001; Tidwell & Walther, 2002). A possible explanation for this enhanced self-disclosure may come from Berger and Calabrese’s (1975) Uncertainty Reduction Theory (URT). According to URT, uncertainty reduction is the gathering of information that allows the information seeker to predict someone’s attitudes and behavior. During the uncertainty reduction processes, the information seeker creates mental models that help him to make sense of other people and their intentions, emotions, and behaviors (Berger & Calabrese, 1975; Srull & Wyer, 1989). One important assumption of URT is that lower levels of uncertainty are positively related to interpersonal attraction in initial interactions. In other words, the better information seekers can predict and explain others’ behavior, the more they are attracted to them (Kellermann & Reynolds, 1990).

In face-to-face settings, people generally use three types of uncertainty reduction strategies (URS) to get to know a target person: passive, active, and interactive strategies (Berger & Calabrese, 1975; Berger, Gardner, Parks, Schulman, & Miller, 1976). Passive strategies are those in which an informant unobtrusively observes the target person, for example in situations in which the target person reacts to or interacts with others. Active strategies involve proactive efforts to get to know the target person,
without confronting the person. Interactive strategies require a direct interaction between the communication partners. Self-disclosure is an important interactive uncertainty reduction strategy. Self-disclosure often elicits reciprocal self-disclosure from the target partner (e.g., Jourard, 1971; Tidwell & Walther, 2002). Therefore, self-disclosure is seen as an effective uncertainty reduction strategy (Berger et al., 1976).

In face-to-face interactions, conversation partners have many cues that they can use to develop an impression of the other, such as physical appearance and other non-verbal behaviors. CMC allows for the use of all – passive, active and interactive – uncertainty reduction strategies. However, in initial online encounters that are text-based, passive and active uncertainty reduction strategies are more difficult to employ than in similar face-to-face settings because they require a lot of effort (Carey, 1980; Curtis, 1996). In CMC settings, therefore, self-disclosure is often one of the few available strategies to get to know each other (Parks & Floyd, 1996; Ramirez, Walther, Burgoon, & Sunnafrank, 2002; Tidwell & Walther, 2002). The ‘enforced’ use of self-disclosure in CMC settings may explain why it has repeatedly been found that CMC settings elicit higher amounts of self-disclosure than face-to-face settings (Bargh et al., 2002; Coleman et al., 1999; Joinson, 2001; Tidwell & Walther, 2002).

There is ample evidence that the amount of self-disclosure stimulates interpersonal attraction (e.g., Bargh et al., 2002; Collins & Miller, 1994). This results holds for both face-to-face and CMC settings. The amount of self-disclosure exchanged between interaction partners may be viewed as an indicator of developing closeness (Taylor, 1979). According to Altman and Taylor’s social penetration theory (1973), self-disclosure is viewed as “rewarding because it communicates the discloser’s liking and the desire to initiate a more intimate relationship” (Collins & Miller, 1994, p. 458). Partners are typically more attracted to others who provide them with more rewarding outcomes (Worthy, Gary, & Kahn, 1969). Additionally, disclosing more aspects of one’s inner self creates bonds of empathy, which enhances liking between interaction partners (Bargh et al., 2002). Self-disclosure also encourages liking in reduced-cues CMC settings (Antheunis et al., 2007; Bargh et al., 2002; Collins & Miller, 1994; McKenna et al., 2002). Therefore, our second hypothesis states:
H1: CMC leads to a greater amount of self-disclosure, which in turn results in higher levels of liking.

**Depth of Self-Disclosure**

CMC does not only stimulate the amount of self-disclosure, it also stimulates its depth (Tidwell & Walther, 2002). This result can be explained by Walther’s hyperpersonal communication framework (1996). This framework postulates that the reduced non-verbal cues that characterize CMC may make conversation partners feel less inhibited. The reduced inhibition in CMC makes conversation partners disclose their inner feelings at an earlier stage than in face-to-face communication. CMC provides some sheltering effects not offered in face-to-face communication, through which CMC interactants feel more comfortable disclosing more intimate information compared to face-to-face interactants (Tidwell & Walther, 2002).

Intimate self-disclosure has been shown to result in intimacy and interpersonal attraction (Collins & Miller, 1994; Cooper & Sportolari, 1997; Reis & Patrick, 1996; Reis & Shaver, 1988). Self-disclosure that involves emotions is believed to generate more intimacy than self-disclosure that is mainly factual because emotional self-disclosure enables the listener to support and confirm core aspects of the discloser's view of him/herself (Reis & Shaver, 1988). Accordingly, Collins and Miller (1994) stated: “it is likely that the mechanisms thought to enhance liking are more strongly communicated by the quality of one’s disclosure than by the quantity of information revealed” (p.465). Empirical research has consistently demonstrated that intimate self-disclosure stimulates liking (Berg & Archer, 1983; Laurenceau et al., 1998; Meleshko & Alden, 1993). We therefore hypothesize that:

H2: CMC leads to more depth of self-disclosure, which in turn results in higher levels of liking
Direct Questioning

Direct questioning is, just like self-disclosure, an interactive uncertainty reduction strategy (Berger, 1979; Berger et al., 1976). As discussed, in text-based CMC settings, it is difficult to employ the passive and active uncertainty reduction strategies. Therefore, in such settings, interactive uncertainty reduction strategies are more common (Parks & Floyd, 1996; Ramirez et al., 2002; Tidwell & Walther, 2002). Direct questioning may also be less common in face-to-face settings because it is more easily perceived as impolite. However, direct questioning may be forgiven in a CMC setting due to the lack of alternative strategies. Until now, only two empirical studies have investigated the effect of CMC on direct questioning, and both of these studies have found a positive relationship (Antheunis et al., 2007; Tidwell & Walther, 2002).

A possible result of the enhanced use of direct questioning in CMC could be that communication partners feel privileged by the straight interest in different aspects of their self, which may stimulate their liking of this partner. After all, positive verbal attention in early stages of relationship formation can have powerful effect on interpersonal attraction (Albada, Knapp, & Theune, 2002). To our knowledge, there is to date only one study that has examined the relationship between question asking and liking (Antheunis et al., 2007). This study has found that both text-only CMC and visual CMC interactants asked more direct questions compared to face-to-face interactants. This enhanced direct questioning also led to higher levels of interpersonal attraction in the text-only CMC condition. Therefore, our third hypothesis states:

H3: CMC leads to more question asking, which in turn results in higher levels of interpersonal attraction.

Reciprocity of Self-Disclosure

Self-disclosure does not only provide personal information about the person, but the process of disclosing also often leads to reciprocal self-disclosure that is similar in levels of intimacy. In other words, the recipient often feels the need to reciprocate the disclosures of the initial self-discloser.
(Jourard, 1971; Tidwell & Walther, 2002). According to URT, people with higher levels of uncertainty, produce higher rates of reciprocity (Berger & Calabrese, 1975). Based on this axiom, it is likely that there will be more reciprocity in CMC than in face-to-face communication because CMC interactants experience higher levels of uncertainty than face-to-face interactants. Moreover, if the amount and depth of self-disclosure is higher in CMC than face-to-face settings, there will be a higher chance of reciprocity (Barak & Gluck-Ofri, 2007; Dietz-Uhler et al., 2005; Rollman, Krug, & Parente, 2000; Rollman & Parente, 2001).

Reciprocity of self-disclosure has been regarded as essential to the development of interpersonal attraction and close interpersonal relationships (see Altman & Taylor, 1973; Jourard, 1959; Worthy et al., 1969). Reciprocity of self-disclosure is experienced as a reward by the self-discloser. It often triggers further reciprocal self-disclosures, and these in turn increase interpersonal attraction (Worthy et al., 1969). Based on the aforementioned assumptions and research, our fourth hypothesis is:

H4: There will be more reciprocity of self-disclosure in CMC, which in turn will lead to more interpersonal attraction.

Comparing Visual CMC with Text–Only CMC

A second aim of our study was to compare the effects of visual and text-only CMC on interpersonal liking. In earlier research, the positive effects of CMC on liking are usually attributed to reduced cues (e.g., McKenna & Bargh, 2000; McKenna et al., 2002; Tidwell & Walther, 2002). For example, Walther’s (1996) hyperpersonal communication theory predicts that there will be more liking in the text-only CMC condition than in the visual CMC condition because the text-only CMC condition leaves more room for idealized impressions. In the absence of nonverbal cues and prior personal knowledge about one's partner, whatever cues do appear in CMC will be particularly valuable. Hence, according to hyperpersonal communication theory, text-only CMC partners will engage in an 'overattribution' process, which results in more idealization and liking than visual CMC conditions (Walther, 1996).
However, URT predicts the opposite effect of text-only CMC on interpersonal attraction. URT assumes that lower levels of uncertainty are positively related to interpersonal attraction in initial interactions. This positive relationship has often been empirically established (e.g., Afifi & Metts, 1998; Clatterbuck, 1979; Douglas, 1990, 1994). According to URT, then, the text-only CMC condition with its reduced amount of information should result in less interpersonal attraction than the visual CMC condition.

The scarce earlier research that has compared text-based CMC with visual CMC does not favor any of the two opposing predictions. Walther, Slovacek and Tidwell (2001) found that the presence of visual cues had positive effects on social attraction among unacquainted CMC partners. However, Joinson (2001) found that self-disclosure, an important predictor of liking, was higher in text-based CMC than in visual CMC. Because of the scarcity and inconsistency in earlier research, we cannot formulate a hypothesis on the differential effects of the two types of CMC on interpersonal attraction. We therefore investigate the following research question:

RQ1: What is the effect of text-only CMC, visual CMC and face-to-face communication on liking in initial interactions?

Method

Sample

A total of 162 university students (81 males and 81 females), between 17 and 31 years of age ($M = 21.07$, $SD = 2.61$), participated in cross-sex dyads in the experiment. 70% of the respondents were recruited from a first-year introductory course in communication science in which a total of 350 students took part divided over 15 separate classes. 30% of respondents were recruited from a database with first and second year students of a large university who had agreed to participate in research projects. To form cross-sex dyads, participants were asked to sign up for a one-hour time slot. Only one male and one female could sign up in one slot. Students were specifically asked not to sign up with someone they already knew. Wherever possible, we paired students from different classes and
communication science students with students from other departments. This reduced the likelihood that communication partners would already know each other. After the experiment, none of the participants stated that they had known their conversation partner beforehand.

We formed 81 cross-sex dyads because self-disclosure varies depending on gender composition of the group (Dindia & Allen, 1992; Hacker, 1981). Due to possible power problems, we did not include gender composition (i.e., male-male, female-female, and male-female groups) in our experiment. Individual scores of the dyads’ participants were collapsed because the scores of individual participants in a dyad are not independent from each other (e.g., Kenny, 1995, 1996). Therefore, we used the dyad rather than the individual participant as the unit of analysis. Hence, the analyses in this paper are based on 81 cross-sex dyads.

**Procedure**

The dyads were randomly assigned to one of the three experimental conditions: a face-to-face condition (n = 27), a visual CMC condition (n = 27), and a text-only CMC condition (n = 27). For each dyad, both participants were instructed to report to different rooms in order to ascertain that they did not see each other before the experiment started. The subjects received the instructions for the experimental task separately, after which they were led to the lab. For the experimental task, we used a get-acquainted exercise (Frank & Gilovich, 1989): Participants were instructed to get to know each other during the conversation and they were free to talk about anything they wanted.

The face-to-face condition took place in an observation room that resembled a living room and was equipped with two comfortable couches. After 12 minutes, the experimenter re-entered the room and the interaction stopped. In the text-only and visual CMC condition, participants interacted via Instant Messaging software especially designed for the experiment. The visual CMC condition was similar to the text-only CMC condition, except that participants saw each other’s face in a window at the right-hand corner of their computer screen. The webcam screen was a high quality 320 x 240
pixel full-color screen running at 30 frames per second. In both CMC conditions, the interaction automatically stopped after 24 minutes.

Different time periods were allocated to the face-to-face condition and the CMC conditions because CMC is relatively slow in comparison with face-to-face communications (Tidwell & Walther, 2002; Walther, 1996; Walther et al., 2001). Therefore, in both CMC conditions, participants interacted for 24 minutes. In the face-to-face condition, participants interacted for 12 minutes. The CMC interactions were logged and the face-to-face interactions were recorded (audio only). We asked the participants for their permission to use their conversations for content analysis. None of the participants refused. Finally, the participants were paid a small fee. The participants were debriefed orally right after the experiment and in more detail via e-mail one week after the experimental period.

Content Analysis

For each dyad, amount and depth of self-disclosure and question asking, reciprocity of self-disclosure, and liking were coded from the transcribed face-to-face conversations and the logged CMC interactions. Based on Tidwell and Walther (2002), two coders first split each conversation into a series of utterances. An utterance marks an idea unit, which is an expression of one whole idea or proposition (Weisband, 1992). This can occur either by coordinated exchange or by interruption (e.g., person 1: “I love reading books”, person 2: “Me too”, person 1: “Especially thrillers”; these are three utterances), or could meaningfully occur, as in the case of speaking turns that contain multiple utterances (e.g., “My name is John and I love playing soccer”; this sentence contains two utterances). To assess intercoder reliability, nine conversations (11%) were coded by both judges. The intercoder reliability was .93, as measured by the number of agreements divided by the total number of utterances coded.

A subsequent analysis of the conversations revealed that the face-to-face interactions ranged from 133 to 364 utterances (M = 219.63, SD = 51.81); visual CMC from 78 to 224 utterances (M = 170.89, SD = 40.31); and text-only CMC from 72 to 316 utterances (M = 169.04, SD = 55.23). Despite attempts to equalize talk time, more utterances were contained in
the face-to-face conversations than in both CMC conversations, \( F(2, 78) = 9.06, p < .001 \). Although dyads in the CMC conditions interacted twice as long as dyads in the face-to-face condition, the face-to-face interactions were still 50 utterances longer on average. Therefore, our hypotheses were tested using proportions rather than frequencies. Proportions were calculated by dividing the number of occurrences of a certain conversation by the number of utterances in the conversation.

**Self-disclosure and question asking.** Coders assigned each utterance to one of the following categories: self-disclosure, question, or other. Self-disclosures were operationalized as an utterance that reveals personal information about the sender; describes the person in some way; tells something about the person; or refers to the subject’s experiences, including thoughts and feelings (Chelune, 1975; Derlega, Metts, Petronio, & Margulis, 1993; Dindia, 1983). Questions were operationalized as an expression of inquiry that invites or calls for a reply; an interrogative sentence, phrase, or gesture (Tidwell & Walther, 2002). Utterances that were neither a self-disclosure nor a question, such as as statements of fact that were nonpersonal in nature, statements about third parties, exclamations, greetings, and other filler items that were not clearly questions or self-disclosures, were coded as other.

**Depth of self-disclosure.** Each self-disclosure was judged on the degrees of intimacy: low, medium, or high. We used a classification scheme by Altman and Taylor (1973), which consists of three layers. The peripheral layer (low intimacy) is concerned with biographic data, such as height, weight, gender, and other public information which takes little questioning to discover, for example “I live in New York”. The intermediate layer (medium intimacy) deals with attitudes, values, prejudices and opinions, such as “I hate watching TV”. The core layer (high intimacy) is concerned with personal beliefs, emotions, feelings, needs, fears, and things people are ashamed of, such as “I am really worried about my poor grades”.

**Reciprocity of self-disclosure.** To measure reciprocity of self-disclosure, the judges coded each self-disclosure as a *reciprocal self-disclosure* or *no reciprocal self-disclosure*. Reciprocal self-disclosure was coded when a disclosure from one of the interactants was followed by a disclosure of the same topic by the other interactant, without questioning. For example: “X: I have a
boyfriend; Y: I am single” or “X: I hate watching TV; Y: Oh, I love watching TV.”

**Liking.** Statements of liking and appreciation of the other person consisted of any statement that contained support, respect or acceptance for the conversation partner. Positive statements about the other, expressions of gratitude, and encouragement are examples of statements of liking (Grotevant & Cooper, 1986; Weimer, Kerns, & Oldenburg, 2004). For example: “You are so cool”, “Yes, that is really good music”, “Fabulous”, “You look good today.”

**Intercoder reliability.** The 81 conversations were divided evenly among two coders. Two conversations (a CMC conversation and a face-to-face conversation) were coded by both coders to assess intercoder reliability, which was calculated using Cohen’s Kappa (1960). All Kappa’s indicated high intercoder agreement. Kappa’s were .93 for coding self-disclosure, question asking, or other; .64 for depth of self-disclosure, .87 for reciprocity of self-disclosure, and .81 for liking.

**Results**

**Direct Effect CMC on Liking**

To investigate the direct effect of experimental condition on liking (RQ1), we conducted an ANOVA with the three experimental conditions (face-to-face communication, visual CMC, and text-only CMC) as the independent variable and liking as the dependent variable. There was a significant main effect of experimental condition on liking, $F (1, 78) = 13.64, p < .001$. Bonferroni post-hoc test revealed that dyads in the text-only and visual CMC condition (M<sub>text-only CMC</sub> = .06, SD = .03; M<sub>visual CMC</sub> = .05, SD = .02) liked each other significantly more than dyads in the face-to-face condition (M<sub>FTF</sub> = .03, SD = .02). There was no significant difference in the level of liking between the text-only and visual CMC condition.

**Testing the Mediators**

In recent years, several approaches to examine mediation effects have been discussed (MacKinnon, Lockwood, Hoffman, West, & Sheets,
Online Communication, Attraction, and Friendships

The most widely used method is the causal steps approach to mediation developed by Judd and Kenny (1981) and Baron and Kenny (1986). However, this approach has been criticized, because it does not provide a statistical test of the indirect effects, and because the requirement of a significant association between the independent and dependent variable is viewed as too restrictive (MacKinnon, Krull, & Lockwood, 2000; MacKinnon et al., 2002; Shrout & Bolger, 2002).

Therefore, we used the approach of MacKinnon, Lockwood, Hoffman, West, and Sheets (2002) to investigate our mediation hypotheses. The first step in this approach is to run a regression analysis with the independent variable predicting the mediator. The second step is to estimate the effect of the mediator on the dependent variable after controlling for the independent variable. We tested the significance of the indirect effects by means of the formula developed by Sobel (1982): \( z = \frac{A \times B}{\sqrt{B^2 \times S_A^2 + A^2 \times S_B^2}} \). In this formula, \( A \) is the unstandardized regression coefficient for the relationship between the independent variable and the mediator, \( S_A \) is the standard error of \( A \), \( B \) is the unstandardized regression coefficient for the relationship between the mediator and the dependent variable when controlled for the independent variable, and \( S_B \) is the standard error of \( B \) (Preacher & Leonardelli, 2005).

The Sobel test is by far most commonly reported (Kenny, 1996, 2006). However, in recent years several methodologists have recognized that the Sobel test suffers from low power (Kenny, 2006; MacKinnon et al., 2002). Because the distribution of the product of regression coefficients \( A \) and \( B \) is not normally distributed (MacKinnon et al., 2002), the critical z-value of 1.96 for the standard normal test at a level of \( p = .05 \) is too conservative. According to MacKinnon et al. (2002), “The empirical critical value is .97 for the .05 significance level rather than 1.96 for the standard normal test of \( A \times B = 0 \)” (p. 90).

Because we are interested in the effects of visual anonymity of text-only CMC, the text-only CMC condition acts as the baseline condition to compare the visual CMC and face-to-face conditions to. Therefore, we created two dummy variables: One with the text-only CMC condition and visual CMC condition coded as 0 and the face-to-face condition coded as 1, and one with the text-only CMC condition and the face-to-condition coded
as 0 and the visual CMC condition coded as 1. The four potential mediators were analyzed separately. Table 1 presents the regression analyses with the two dummy’s representing the experimental conditions as the independent variables and the potential mediators as the dependent variables. Table 2 presents the results of for the regression analyses with the potential mediators as the independent variables and liking as the dependent variable, controlled for the two dummy variables.

Table 1. Effects of Experimental Conditions on Five Potential Mediators

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SE</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MV: Amount of Self-Disclosure</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV: text-only CMC vs. FtF</td>
<td>.01</td>
<td>.02</td>
<td>.08</td>
</tr>
<tr>
<td>IV: text-only CMC vs. visual CMC</td>
<td>.02</td>
<td>.02</td>
<td>.09</td>
</tr>
<tr>
<td><strong>MV: Depth of Self-Disclosure</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV: text-only CMC vs. FtF</td>
<td>-.14</td>
<td>.05</td>
<td>-.35**</td>
</tr>
<tr>
<td>IV: text-only CMC vs. visual CMC</td>
<td>-.03</td>
<td>.05</td>
<td>-.08</td>
</tr>
<tr>
<td><strong>MV: Question Asking</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV: text-only CMC vs. FtF</td>
<td>-.06</td>
<td>.02</td>
<td>-.49***</td>
</tr>
<tr>
<td>IV: text-only CMC vs. visual CMC</td>
<td>-.01</td>
<td>.02</td>
<td>-.04</td>
</tr>
<tr>
<td><strong>MV: Reciprocity of SD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV: text-only CMC vs. FtF</td>
<td>.01</td>
<td>.02</td>
<td>.10</td>
</tr>
<tr>
<td>IV: text-only CMC vs. visual CMC</td>
<td>.02</td>
<td>.02</td>
<td>.14</td>
</tr>
</tbody>
</table>

*Note. MV = Mediating Variable; IV = Independent Variables based on dummy variables to compare three experimental conditions; FtF = face-to-face communication; CMC = computer-mediated communication. *p < .10, **p < .01, ***p < .001.*

Our first hypothesis stated that CMC leads to a greater amount of self-disclosure, which in turn results in higher levels of liking. As the first row of Table 1 shows, there was no significant effect of experimental condition on the amount of self-disclosure, neither when we compared text-only CMC with face-to-face communication (β = .08, ns), nor when we
compared text-only CMC with visual CMC ($\beta = .09, n.s.$). Although there was a significant effect of the amount of self-disclosure on liking ($\beta = .24, p < .05$), the first hypothesis was not supported because the first requirement for mediation (i.e., a significant effect of the independent variable on the mediating variable) was not met.

Table 2. Effects of Five Potential Mediators on Liking (Controlled for the Two Dummy Variables)

<table>
<thead>
<tr>
<th></th>
<th>Liking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
</tr>
<tr>
<td>Self-Disclosure</td>
<td>.08</td>
</tr>
<tr>
<td>Depth of Self-Disclosure</td>
<td>.03</td>
</tr>
<tr>
<td>Question Asking</td>
<td>.15</td>
</tr>
<tr>
<td>Reciprocity of Self-Disclosure</td>
<td>.02</td>
</tr>
</tbody>
</table>

Note. *$p < .05$, **$p < .01$, ***$p < .001$.

Hypothesis 2 predicted that CMC interactants would engage in more intimate self-disclosure, which in turn would result in higher levels of liking. There was a significant difference between the text-only CMC condition and face-to-face condition on depth of self-disclosure ($\beta = -.35, p < .01$). When we compared text-only CMC with visual CMC, we did not find a significant effect of visual CMC on the depth of self-disclosure ($\beta = -.08, n.s.$). Thus, the text-only CMC and visual CMC interactants exhibited more intimate self-disclosures than face-to-face interactants did. As Table 2 shows, there was also a significant effect of depth of self-disclosure on liking when we controlled for the experimental conditions ($\beta = .20, p < .05$). The Sobel test yielded a $z$-value of -2.43, providing support for the second hypothesis when the text-only CMC condition is compared to the face-to-face condition.

In our third hypothesis, we hypothesized that CMC would lead to a greater proportion of question asking, which in turn would result in higher levels of liking. There was a significant effect of text-only CMC on question
asking, when we compared text-only CMC with face-to-face communication ($\beta = -.49, p < .001$). However, there was no effect of visual CMC on question asking, when we compared text-only CMC with visual CMC ($\beta = -.04, ns$). This indicates that compared to the face-to-face condition, interactants asked more questions in both the text-only CMC and visual CMC conditions. In support of the second requirement of mediation, there was also a significant effect of the proportion of question asking on liking when controlled for the experimental conditions ($\beta = .32, p < .01$). The Sobel test produced a z-value of -1.64, indicating support for H3 when the text-only CMC condition was compared with the face-to-face condition.

Hypothesis 4 stated that there would be more reciprocity of self-disclosure in CMC, which in turn would lead to more liking. This hypothesis was not supported. We did not find a significant effect when we compared text-only CMC with face-to-face communication on reciprocity of self-disclosure ($\beta = .10, ns$), and when we compared text-only CMC with visual CMC ($\beta = .14, ns$). The second requirement of mediation was also not met: there was no effect of reciprocity of self-disclosure on liking ($\beta = .03, ns$).

**Discussion**

One of the aims of this study was to investigate the effect of visual cues on the relationship between CMC and liking. Earlier studies on this topic typically compared text-based CMC and face-to-face communication. However, this distinction does not sufficiently cover contemporary CMC applications. Many popular CMC applications, such as Instant Messaging, often allow users to include visual and auditory cues in their interactions, for example by using a webcam (Peter et al., 2007). To extend earlier literature we added an extra experimental study, a visual CMC condition. By comparing a visual CMC condition to a text-only CMC condition and a face-to-face condition, we were able to make some important refinements to earlier studies.

In agreement with earlier studies we found a direct effect between CMC and liking (e.g., Bargh et al., 2002; Ramirez & Zhang, 2007). However, there was no difference between the text-only CMC condition and the
visual CMC condition. The addition of visual cues did not affect the level of liking. Thus, it seems that the number of visual cues available in a CMC application is not important for the attractiveness of the conversation partner. Our results, therefore, contradict the assumption that reduced visual cues of CMC and the resulting visual anonymity stimulate interpersonal attraction (Cooper & Sportolari, 1997; Walther, 1996; Walther et al., 2001).

Another aim of the study was to investigate the validity of four potential mediators (i.e., amount of self-disclosure, depth of self-disclosure, question asking, and reciprocity of self-disclosure) that could explain the relation between the three experimental conditions (i.e., text-only CMC, visual CMC, and face-to-face communication) and liking. Of the four potential mediators, only depth of self-disclosure and question asking mediated the relationship between CMC and liking.

**Amount and Depth of Self-Disclosure**

Several studies have shown that self-disclosure is more common in reduced cues CMC environments than in face-to-face communication (Parks & Floyd, 1996; Ramirez et al., 2002; Tidwell & Walther, 2002). Based on these earlier results, we hypothesized that there would be a higher amount of self-disclosure (H1) and direct questioning (H3) in CMC. In contrast to earlier research (Bargh et al., 2002; Coleman et al., 1999; Joinson, 2001; Tidwell & Walther, 2002), we did not find a CMC effect on the amount of self-disclosure. However, we did find a significant CMC effect on depth of self-disclosure, which is in line with hyperpersonal communication theory (Walther, 1996). Participants in both text-only and visual CMC conditions disclosed more intimate information than participants in the face-to-face conditions. Furthermore, in line with earlier research (e.g., Collins & Miller, 1994; Laurenceau et al., 1998) more intimate self-disclosure also enhanced liking. Thus, in agreement with Collins and Miller (1994), depth of self-disclosure seems more important that mere amount of self-disclosure. Earlier studies have sometimes been unclear about whether they focused on amount or depth of self-disclosure. By investigating both amount and depth of self-disclosure within one study, we
were able to conclude that it is depth and not amount of self-disclosure that accounts for the increased liking in CMC interactions.

**Question Asking**

In agreement with earlier research (Antheunis et al., 2007; Tidwell & Walther, 2002) we found that people in both CMC conditions asked more questions than people in the face-to-face condition. We did not find a difference in direct questioning between text-only CMC and visual CMC condition. Furthermore, the increase in question asking stimulated liking in both CMC conditions. We found that the addition of visual cues to CMC did not decrease the number of questions asked. This suggests that it is not the reduced cues but other factors in the CMC environment that stimulate direct questioning. A viable explanation could be that direct questioning may be more forgiven in a CMC setting because CMC interactants are aware that alternative uncertainty strategies, such as observation, are more difficult to employ than in face-to-face communication (Tidwell & Walther, 2002).

**Reciprocity of Self-Disclosure**

According to URT, people with higher levels of uncertainty, produce higher rates of reciprocal self-disclosure (Berger & Calabrese, 1975). Moreover, people in CMC will disclose more than in face-to-face communication. As a result, there will be more reciprocal self-disclosure (Dietz-Uhler et al., 2005). Based on these assumptions, we expected that the CMC conditions would lead to more reciprocal self-disclosure than the face-to-face condition. Contrary to our expectations, our results showed no effects of CMC on reciprocity of self-disclosure. Furthermore, contrary to our expectations and earlier research (Barak & Gluck-Ofri, 2007; Dietz-Uhler et al., 2005; Rollman et al., 2000; Rollman & Parente, 2001), reciprocity of self-disclosure did not predict the level of liking. Therefore, it seems that reciprocity of self-disclosure does qualify as an explanation for the positive CMC-liking relationship found in earlier studies.
In sum, our results show that two mediating variables may account for the positive CMC-liking relationship found in earlier studies: depth of self-disclosure and direct questioning. Our results also clearly showed that reduced visual cues is CMC does not provide a sufficient explanation for the higher levels of liking, question asking and intimate self-disclosure exhibited in the CMC. After all, if reduced visual cues had been a valid explanation for higher levels of intimate self-disclosure, question asking, and enhanced liking, the text-only and visual CMC condition should have led to lower levels of intimate self-disclosure, direct questioning, and liking.

An explanation for the similar outcomes between the two CMC conditions is that the amount of direct questioning and depth of self-disclosure, which are less appropriate in face-to-face settings, are more accepted in CMC settings, irrespective of whether visual information is added to the CMC setting. Especially among the young who have grown up with CMC technologies, question asking and intimate self-disclosure may be acceptable and normative uncertainty reduction strategies in CMC (Walther et al., 2001). The addition of a webcam to text-only CMC apparently does not change this norm.

Our study has several implications for future theory and research. First, URT predicts that, in comparison to text-only CMC, the visual CMC condition and face-to-face condition result in more liking. After all, the interactants in the visual CMC and face-to-face condition have more information available to form impressions of each other than participants in the text-only CMC condition. URT also predicts that the text-only CMC condition leads to more self-disclosure and question asking than the other two conditions because these uncertainty reduction strategies are most easily employable in this type of CMC (e.g., Parks & Floyd, 1996; Tidwell & Walther, 2002).

Our results were diametrically opposed to both of these assumptions of URT. There was significantly more liking in text-only CMC compared with face-to-face communication, and there was no difference in
liking between the text-only and visual CMC condition. In addition, the amount of self-disclosure did not differ between the three conditions. This result suggests that the premises of URT do not hold in CMC settings. In CMC, it is apparently not (only) the quantity of information that accounts for enhanced liking. Future research should extend on our finding by comparing different CMC conditions that vary in the amount and types of information.

Second, our findings have implications for Walther’s (1996) hyperpersonal communication theory, which predicts that visual anonymity in CMC stimulates depth of self-disclosure, and interpersonal attraction. In agreement with this theory, CMC interactants indeed disclosed more intimate information in comparison with face-to-face interactants. However, there was no difference in the level of intimacy of self-disclosure between text-only and visual CMC. In addition, there was no difference in the level of liking between the text-only and visual CMC conditions, which contradicts Walther’s hyperpersonal theory. Our results suggest that visual anonymity is not the key factor in the CMC-liking relationship. Future research should further explore this finding, by paying closer attention to the effects of cue-richer versus cue-poorer CMC applications on liking.

References


Online Communication, Attraction, and Friendships