Affective Computing and Interaction:

Psychological, Cognitive and Neuroscientific Perspectives

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Published in the United States of America by
Information Science Reference (an imprint of IGI Global)
701 E. Chocolate Avenue
Hershey PA 17033
Tel: 717-533-8845
Fax: 717-533-8661
E-mail: cust@igi-global.com
Web site: http://www.igi-global.com

Library of Congress Cataloging-in-Publication Data

Affective computing and interaction : psychological, cognitive, and neuroscientific perspectives / Didem Gokcay and Gulsen Yildirim, editors.
p. cm.
Includes bibliographical references and index.
ISBN 978-1-61692-892-6 (hardcover) -- ISBN 978-1-61692-894-0 (ebook) 1. Human-computer interaction. 2. Human-machine systems. 3. Affect (Psychology)--Computer simulation. I. Gokcay, Didem, 1966- II. Yildirim, Gulsen, 1978-
QA76.9.H85A485 2011
004.01'9--dc22
2010041639

British Cataloguing in Publication Data
A Cataloguing in Publication record for this book is available from the British Library.

Chapter 11
Problems Associated with Computer-Mediated Communication:
Cognitive Psychology and Neuroscience Perspectives

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ABSTRACT

In this chapter, the authors examine some of behavioral problems frequently observed in computer-mediated communication and point out that a subset of these behavioral problems is similar to those of patients with brain lesions. The authors try to draw an analogy between the lack of affective features in text-based computer-mediated communication (CMC) versus the functional deficits brought along by regional brain damage. In addition, they review the social psychological studies that identify behavioral problems in CMC, and merge the literature in these different domains to propose some requirements for initiating conceptual changes in text-based CMC applications.

INTRODUCTION

Humans solve real life problems through an intricate interplay between emotion and cognition. In general, cognitive processing demands conscious involvement of the individual, but emotional processing employs automatic survival mechanisms as well. In daily situations, communication usually occurs through face-to-face (FtF) interaction. This type of interaction contains adequate environmental context for generation of subjective judgments automatically, using the emotional circuitry in our brains. For example, individuals are capable of evaluating the real intent or meaning behind

DOI: 10.4018/978-1-61692-892-6.ch011

a sentence, not only by judging the content in semantics (which is accomplished by cognitive procedures), but also by judging facial expressions, prosody in speech and sensory inputs received from the surrounding environment. A sentence which is neutral according to semantic content can be conceived as a happy or a fearsome event, if extra information regarding subjective ratings of the present situational cues is provided by the emotional circuitry.

On the other hand, computer- mediated communication (CMC) became an indispensable part of our lives. For more than two decades, CMC applications have been evolving continuously (Antheunis et al., 2010). Starting the journey with primitive and asynchronous text-based communication tools, the latest generation of CMC applications such as social network sites is very different from the initial examples of CMC applications in terms of both media richness and the largeness of the communities using those applications (Antheunis et al., 2010). For instance, social network sites are different from conventional CMC applications as they support both offline-online and asynchronous-synchronous communication, the audiovisual content and "one-to-many communication" (Antheunis et al., 2010; Ross et al., 2009). In addition, users of the social network sites can interact with each other in all passive, active and interactive strategies in order to collect more information about the individuals of the target of the social attraction (Antheunis et al., 2010).

Although CMC eases our lives, it also brings along some problems. The anonymous and socially disconnected medium of CMC applications cause people to exhibit behaviors which are otherwise prohibited to be performed in natural social environments (Short et al., 1976; Siegel et al., 1986). In addition, CMC ranks far behind FtF communication in terms of media richness causing less social presence, reduced social norms and control (Daft & Lengel, 1986). Because of these reasons, people communicating through CMC, whether in a text-based environment or not, exhibit a multitude of negative behaviors such as flaming (Siegel et al., 1986; Moor et al., 2010), fearlessness (Maksimova, 2005), and inability to self-monitor (Sproull & Kiesler, 1991; Short et al., 1976; Zhao et al., 2008). Furthermore, there is a lack of awareness in this type of miscommunication (Kruger et al., 2005) as well as inability to evaluate social cues (Lo, 2008; McKenna et al., 2002; Bargh et al., 2002).

Interestingly, similar behavioral problems also exist in patient populations with damage to the limbic system and its anatomic correlates. In this study, we investigated the behavioral problems in CMC from both socio-psychology (Section 2) and cognitive neurology perspectives (Section 3) by examining the literature. We found striking behavioral similarities between the users of, mainly, text-based communication platforms and patients with deficits of the limbic system (amygdala, OFC and septal nuclei). These similarities and the fundamental concepts about limbic system are provided in Section 3. In light of the problems of CMC and corresponding anomalies in the human brain, we will present a preliminary perspective to help to interpret problems associated with text-based CMC and emphasize the immediate need for the enhancement of the affective dimension in platforms that depend primarily on text.

In our review, we mainly concentrated on text-based CMC for the following reasons. First, although CMC applications evolve continuously, the most rigid, in other words resistant to change, part of these applications are text-based CMC applications. Therefore, understanding behavioral problems in text-based CMC is essential, especially when the exponential increase in the number of individuals using these environments is considered. Second, text based communication is the main component of, roughly, all CMC applications, regardless of the multimedia features supported by the applications. For that reason, text-based communication requires attention constantly as a core component. Third, even though the number of CMC environments operating with

multimedia channels increase day by day, especially with the success of social network sites, the studies conducted on the next-generation CMC environments are limited for now.

THE SOCIO-PSYCHOLOGICAL EVALUATION OF CMC

In this section, we present the studies and theoretical approaches in an attempt to explain the reasons underlying some of the fundamental problems in CMC: the lack of social cues and self-monitoring, flaming, anonymity, and exaggerated truth bias. Although one may find lots of studies that approach the social and psychological problems in CMC in different perspectives like the effect of personality in CMC usage (Swickert et al., 2002; Ross et al., 2009) and changes in group behavior in CMC (Siegel et al., 1986), we tried to encapsulate only the topics which are strongly connected to the proposed neuroscientific approach.

In the first part, social presence theory and cues-filtered-out is examined to clarify the absence of social cues, flaming and lack of self-monitoring. In addition, opposing or complementing views for the cues-filtered-out is presented. In the following part, identity creation and self-disclosure on the Internet are presented in order to underline one of the most important problems of Internet, and so of CMC, anonymity as well as the lack of self-monitoring. In the third part, we mention the difficulty of developing trust on the Internet in order to make clear the concept of underestimated and exaggerated truth bias. In the last part of this section, we present the studies, and thus, the proved facts about transmission of emotional cues and in particular, flaming.

Social Presence, Media Richness and Cues-Filtered-Out

Social presence theory states that parties involved in communication must be aware of each other (Short et al., 1976). When people stop considering other social actors in interaction, their social attitude changes; they stop monitoring themselves as individuals, and thus, altering their behavior based on social norms (Zimbardo, 1970). Consequently, their evaluation of the opposite party according to social norms decreases. Therefore, the absence of social presence leads to inefficient social communication due to the inhibition of the interpersonal situations and social rules in extreme cases.

On the other hand, there is a strong relationship between the codes and channels available in the communication medium, which is in fact media richness, and the attention paid to the existence of other people (Riva, 2002). In the case of fewer codes or channels, users pay less attention to the social presence of others. Accordingly, FtF communication ranks highest with respect to the quality and diversity of information carried during communication and CMC ranks far behind FtF communication in terms of media richness (Bos et al., 2002). Therefore, social presence, and thus, the social norms and control, is much less in CMC environments (Daft & Lengel, 1986).

The social presence theory is the fundamental concept which explains the "cues-filtered-out" in CMC (Culnan & Markus, 1987). Based on the social presence theory, 'the cues-filtered-out' means that, in CMC, individuals are isolated from social cues and rules required to identify both personal and interpersonal situations, resulting in depersonalization, disinhibition, and misinterpretation in CMC (Kiesler et al., 1984; Sproull & Kiesler, 1991). Once social cues are excluded from the communication medium, social identities are curtained in such a way that the social presence of communicating parties disappears and more open and free communication styles arise (Sproull & Kiesler, 1991). This context, then, encourages individuals to break social rules and engage in swearing or flaming.

To emphasize the effect of the absence of social cues in a more detailed manner, Kiesler et

al. assess CMC environments according to the following technical and cultural characteristics (Kiesler et al., 1984, 1125):

a. Lack of social context: In FtF communication, due to the existence of the corporal body, individuals handle the information exchanged during communication with the help of social cues such as "head nods, smiles, eye contact, distance, tone of voice, and other nonverbal behavior." Such regulating feedback that assists in the in-depth exploration of the meaning and evaluation of communication are absent in CMC. This characteristic also reduces the cues for "dramaturgical" assessment, such as head position, tone of speaking, and touching, which helps us in coordination of communication. In addition, as there is no way to interpret the social hierarchy, especially in text-based CMC environments, in which computer communication is blind to "status and position cues" in terms of both "contextual" ways (i.e., "the way clothes communicate") and "dynamic" ways (i.e., communication through facial expression, touch, etc.).
b. Accepted norms driving CMC usage: Most importantly, communication via computers is depersonalizing. The medium through which we interact terminates individuality with the common and anonymous standards it imposes, which results in "more uninhibited text and more assertiveness in return." As for common standardization, the widely used language in CMC (i.e., the abbreviations people use within computer chat mediums, the technical terminology infiltrated into our conversations or the use of emoticons) and CMC medium standards like the pressure of instantaneous communications can be considered. For instance, instantaneous communication, like in the case of chat or email, forces individuals to engage in rapid information transitions that could lead to a decrease in quality of information and, consequently, miscommunication.

Along with the studies supporting the cues-filtered-out concept (e.g., Zhao et al., 2008), the ones opposing or complementing it have also been published. The most widely cited theoretical approaches that try to explain the miscommunication and the effects of the absence of social cues in CMC are social information processing perspective (Walther, 1992; Walther & Burgoon, 1992), social identity model of deindividuation (Lea & Spears, 1995), and miscommunication as a chance theory (Anolli, 2002). These approaches will be introduced in the following along with a summary in Table 1.

According to the social information processing (SIP) perspective (Walther, 1992; Walther & Burgoon, 1992), individuals have the capability to adopt given communication circumstances independent from the constraints provided, such as language and textual display. Although it takes time to learn usage specifications of the communication medium, individuals are capable of finding alternative ways to sustain relational content and impression management in the absence of social cues in CMC.

On the other hand, the social identity model of deindividuation (SIDE) tries to cover the absence of social cues and regulating feedbacks in CMC with the invisible social norms and identity (Lea & Spears, 1995). According to SIDE, the processes driven by the unseen social regulations become more important in the absence of social cues in CMC. Therefore, individuals are forced to regulate their behaviour with respect to hidden social norms within the uncertain environment of CMC.

The miscommunication as a chance theory (MaCHT) (Anolli, 2002) focuses on the advantage of the lack of social cues. According to MaCHT, the miscommunication that arises in CMC provides individuals with the opportunity to communicate freely. This degree of freedom may lead to the discovery of new communicative

Table 1. Summary of theoretical approaches for miscommunication in CMC

Theory	Explanation	Corresponding Publication
Cues-filtered-out	Based on the social presence theory, CMC lacks social cues required to identify the interpersonal situations	Kiesler et al., 1984
Media Richness	Due to the insufficient media richness, CMC lacks social norms and control.	Daft & Lengel, 1986
Social Information Processing (SIP)	Individuals have ability to adopt the absence of social cues and find alternative ways to handle relational and impression management in the interaction with others.	Walther, 1992
Social Identity Model of Deindividuation (SIDE)	Hidden social norms will be more important in the absence of regulating social cues such that individuals tune their behavior according to these hidden social norms to interact with the others effectively.	Lea & Spears, 1995
Miscommunication as a CHance Theory (MaCHT)	The miscommunication and absence of social cues in CMC provides a free way of communication for the individuals. Under the existence of such constraints, individuals may find compensatory ways to communicate and obtain results that FtF communication may not allow.	Anolli, 2002

tools to improve the efficiency of interaction such that the results not observed in FtF communication may be explored. For instance, the creation of a relationship in CMC for a person with low social skills is given as a result that supports MaCHT.

To summarize, we tried to present explanations to clarify the problems of the absence of social cues, flaming and lack of self-monitoring in CMC. The inadequate characteristics of CMC like the paucity of rich media may result in the absence of self presence which results in disinhibition, and consequently flaming. In addition, the CMC medium in which the social cues are filtered out causes depersonalization, disinhibition, and misinterpretation. Although, there are opposing arguments such as the ability of individuals to adopt to weak communication mediums (SIP), the existence of invisible social norms to regulate interpersonal relationships (SIDE), and the benefits of free communication environment which the drawbacks of CMC medium produces (MaCHT), the disadvantages brought by the cues-filtered-out is likely to dominate the evaluation of CMC environments.

Although the cues-filtered-out in CMC has been evaluated for more than two decades ago (Kiesler et al., 1984; Sproull & Kiesler, 1991), most of the claims are still valid today. Since that time, only the variety of CMC applications and the multimedia content they support, consequently the media richness, have changed. Fortunately, today, we have a chance to engage in video conferences or communicate in an enhanced audiovisual environment. Certainly, the inventions of technology such as the realization of large-bandwidth usage have an important effect on enabling rich multimedia applications of CMC. However, we would like to mention in this chapter the paucity of innovative approaches in CMC applications to overcome the constraints and behavioral problems in the communication medium. Ever since the cues-filtered-out was highlighted, only minor functional but not conceptual changes have been observed in the widely used text-based CMC applications like email.

Identity Creation, Self-Disclosure, and Anonymity

Many studies have examined the motivations behind people's use of the Internet to identify the Internet's effect on our social lives and to understand the shift in some traditional human behaviors. Among the many motivations behind Internet usage, the fact that the Internet serves as a domain for identity recreation stands out. Needless to say, identity recreation for the sake of better self-presentation to a larger audience in

contrast to FtF interaction is commonly observed in CMC environments (Yurchisin et al., 2005; Ellison et al., 2006; Zhao et al., 2008; McKenna et al., 2002; Bargh et al., 2002). Moreover, Yurchisin and her colleagues (2005) found that one of the main reasons people use Internet dating sites is because they wish to (re)create themselves, thereby giving expression to the selves what they wish to be, although seeking friendship or romance partners is thought to be the main motivator. Therefore, in this section, we will try to enhance the idea of identity recreation via CMC environments, and introduce some of the characteristics, such as anonymity, which facilitate this behavior. We will first introduce the notion of self-concept and identity creation to give a brief idea of the fundamental concept of this section. Then, we will provide plenty of studies on identity creation in CMC environments to present the reader with the new ways the Internet offers to create and present identities.

Schouten (1991, p. 413) defines self-concept as "the cognitive and affective understanding of who and what we are." In other words, self-concept is all of the explicit and implicit symbols, feelings, and thoughts we use for self-creation and self-understanding. Self-concept is "what comes to mind when we think of ourselves" (Oyserman, 2001, p. 499).

Identity is defined as a social product of self-concept, which is developed through social context and shaped to fit the characteristics of the participated social environment. Hence, identity construction occurs according to relationships with others and the way others view us (Oyserman, 2001; Schau & Gilly, 2003; Yurchisin et al., 2005; Ellison et al., 2006; Zhao et al., 2008; McKenna et al., 2002; Bargh et al., 2002). The individuals evaluate and tend to redefine their identities when they encounter a triggering event. In other terms, identity construction is a continually ongoing dynamic interplay of the social context and cognitive processes (Oyserman, 2001). Markus and Nurius (1986) put forward the concept of possible selves to identify the dominant factors in this interplay, which leads the winning decision of the identity recreation process. They have shown that possible selves have a remarkable impact on identity recreation.

Markus and Nurius (1986) categorize self-concept in two divisions: now (or "here-and-now" - Markus & Nurius, 1986, p. 961) and possible selves. The way we perceive ourselves at the present time refers to 'now selves'. The selves that are not currently realized, but are hoped or feared for, are called possible selves: "hoped-for" and "feared" possible selves (Markus & Nurius, 1986, p. 957). In other words, what we want to be or not be (like) has a significant influence on our identity recreations: "possible selves can be viewed as cognitive bridges between the present and future, specifying how individuals may change from how they are now to what they will become" (Markus & Nurius, 1986, p. 961).

In addition, the identity recreation process is affected by others' feedbacks (Yurchisin et al., 2005). In the recreation process, feedbacks from, and thus, the validation of others, together with the hoped-for selves play an important role in identity recreation.

Online applications, in which individuals introduce themselves to someone or an audience, seek friendships or social interactions, meet their offline social network partners became part of our social worlds. Hence, the process of online identity creation and recreation is an important issue of our social lives. Some of the prominent online environments in which recreation is frequently observed are personal Web sites (Schau & Gilly, 2003), Internet dating forums (Yurchisin et al., 2005; Ellison et al., 2006; Gibbs et al., 2006; Whitty, 2008), and even social network sites (Zhao et al., 2008). The most fundamental reason for identity recreation on the Internet is stated to be anonymity (Yurchisin et al., 2005; McKenna et al., 1999; McKenna et al., 2002).

Possibly, the most remarkable CMC applications in which self-presentation, self-disclosure

and, thus, continuous progress of identity recreation can be observed are Internet dating sites. This is not a surprising fact, as, with the help of the profile matching tools these sites offer, individuals have a chance to communicate with lots of possible partners with whom they probably share similar interests and motivations. It is also reported that social network sites which are today's hot interaction domains with large audiences are also fertile grounds to find romance partners (Lee & Bruckman, 2007) although their main purpose is to serve as an online meeting point for the offline social networks.

There are several studies about self-presentation strategies (Gibbs et al., 2006; Whitty, 2008) and the identity construction characteristics (Yurchisin et al., 2005; Ellison et al., 2006) of individuals on Internet dating sites. These studies tell us a lot about the behavioral characteristics of users in self-presentation more generally on the Internet. To summarize, individuals who overemphasize the importance of physical looks in attraction find the online dating experience more comfortable, probably due to the absence of a corporal body, and the opportunities to be creative in terms of self-presentation and identity construction (Whitty, 2008). Those individuals are extremely strategic in self-presentation on Internet dating sites. Needless to say, the amount and depth of self-disclosure differs from FtF interactions (Whitty, 2008), which also results in the fact that individuals encounter more misrepresentation issues in online romantic relationships than in FtF interactions. Furthermore, the amount of misinterpretation varies according to the degree of involvement (Ellison et al., 2006). The perceived success of online dating sites is evaluated by the dimensions of disclosure, such as amount, intent, valance, and honesty (Gibbs et al., 2006). However, the users of these sites consider that honesty has a negative effect on the success of online dating sites (Gibbs et al., 2006), which explains one of the motivations underlying deception. In a survey of one online dating site's participants conducted by Gibbs et. al. (2006), 86% of participants found that others misrepresented their physical appearance, and 49% reported this misrepresentation by others was about their relationship goals. Finally, Internet dating sites are used not only to create friendships or romantic relationships, but also to recreate identities according to the hoped-for selves (Yurchisin et al., 2005; Ellison et al., 2006).

In contrast to the claims stated above, some of the relationships maintained via the Internet tend to be close and lasting, which provides support for the argument that the Internet provides new ways for identity creation. In order to explain this phenomenon, McKenna et al. (McKenna et al., 1999; McKenna et al., 2002; Bargh et al., 2002) focused on the correlation between intimacy and self-presentation on the Internet. McKenna and her colleagues (2002) assume that the Internet eases the formation of relationships and intimacy due to the following characteristics:

- The anonymity of the Internet reduces the risks of ridicule and disapproval which is facilitated by identity recreation (McKenna et al., 1999). This eases the inclusion of self-disclosure in communications, and therefore promotes intimacy in the relationships.
- The absence of presenting selves physically eases concerns about self-disclosure, particularly in relation to physical appearance, anxiety in social interactions, etc.
- People tend to be attracted by others who are found to be similar, and the Internet forms a playground for people to find "similar others."
- As self-disclosure is facilitated, relationships and intimacy are formed faster than the ones acquired offline.

However, the authors also state that the above assumptions are valid only for those who are lonely or have difficulties in forming relationships offline due to anxiety in social interactions. They sup-

pose that, although socially skillful people attach more importance to relations in offline conditions, such as FtF encounters rather than Internet friendships, those who hesitate to disclose themselves in offline circumstances feel more comfortable in self-disclosure on the Internet, and thus, form more intimate and lasting relationships via the Internet. According to the authors' results, people of the given profile above form close and lasting relationships via the Internet, and those relationships develop faster than relationships in the offline environment. They also make these relationships a part of their real lives so they become a social reality. In fact, relationships established online by the majority of the subjects canvassed in their initial experiment lasted more than two years. It was also found that the Internet, as the medium for the initial impressions, did not affect the quality of the communication and the attractiveness of the relationship that followed. For example, from the first meeting on the Internet, an increasing satisfaction was observed that was different from initial FtF meetings.

The evolving applications of CMC such as social network sites deal with anonymity and self-disclosure situations in a different manner. According to Zhao et al. (2008), some online environments, such as Facebook, are "anchored" to the users' real offline lives. Users register in those environments with true information about their reality, such as their name, e-mail, location, etc. Moreover, individuals from offline social networks who know about the true identity of their network partners exist in those environments. Since presenting a false identity in such an environment may result in blaming, isolation and, in extreme cases, punishment by the offline social relations, the existence of "anchored relationships" in online environments avoids anonymity. Consequently, contrary to the anonymous environments of both the online (chat rooms, MUDs, dating sites, etc.) and offline (bars, clubs, etc.) worlds, in "nonymous" (the opposite of anonymous - Zhao et al., 2008, p. 1818) online environments, people tend to declare "real selves" instead of creating false identities. Nonymous environments are persistent guards that inhibit deviant behaviors on the Internet, as these environments are connected to real offline social lives and, therefore, users are forced to make declarations aligned with their true identities. The results of three experiments conducted by Zhao and his colleagues (2008) show that Facebook users follow more implicit strategies than explicit ones while constructing their identities: "they show rather than tell" while presenting their selves to the large Facebook audience. Users prefer to present themselves implicitly with visual posts (pictures, photographs etc.) or "enumerative" entries (declaring hobbies, interests, etc.), rather than using explicit ways, such as filling up "about me" parts, which require more narrative descriptions.

Moreover, the results prove that Facebook users present their hoped-for selves instead of creating false identities. As Facebook is a nonymous and anchored online environment, the presented selves consist of real selves. However, like other virtual applications, Facebook lacks the corporal body that is useful for transferring regulating features such as gender, appearance, attractiveness, language usage, ethnic origin, etc. in FtF communication. Therefore, in the absence of such regulating features, the users have a chance to manipulate reality by presenting only the socially attractive parts of their existence, which results in the presentation of hoped-for selves.

In conclusion, the Internet, and particularly intensely CMC environments, provides individuals the opportunity to present their identities in a different way because of the anonymous characteristic of these environments. The anonymity of the Internet reduces the risks of disclosing the self and eases the inclusion of self-disclosure in communications. Especially, for an individual with low social skills, the absence of presenting the self physically, in other words anonymously, diminishes concerns about self-disclosure and, thus, these individuals feel more comfortable in

communication via anonymous environments. However, anonymity also causes misrepresentation and deception, and the socio-psychological requirements of human nature provide a ground to exaggerate, and sometimes abuse, this possibility. Therefore, in order to create more realistic applications there is an emerging need for extra features and tools based on the experience of nonymous environments like social network sites, so individuals can be given the chance to identify more with the identities of those with whom they interact.

Truth Bias

Truth bias is simply our assumption of how truthful the opposite party is. Individuals bear higher truth bias towards the others they know closely: "trust needs touch" (Handy, 1995). Therefore, individuals need intimacy which may be provided by socially rich mediums.

Rocco (1998) reports that once trust was formed in a medium with enriched social cues like telephone where affective factors like voice, prosody, accent etc. are simultaneously processed, it can be preserved in a socially poor text-based media such as email. Supportingly, Bos et al. (2002) showed that chat gave the worst satisfaction result in means of trust when compared with video, audio and FtF communications. Interestingly, although communications in audiovisual channels were as satisfactory as the case of FtF communication, trust gained via these channels was improved much slower than the one in FtF condition.

Therefore, developing trust in online environments can be much more difficult than FtF experiences. However, it has also been observed in CMC that truth bias increases with respect to the richness of the utilized media or the enhancements of the graphical visual displays (Wilson et al., 2006). Additionally, it has also been observed that the deception rates of people do not change along the same lines with truth bias. When users have been questioned regarding the trustworthiness of a message received from the opposite party, the rates by which they decided that the received message is trustworthy has been much higher than the estimated truth bias (Maksimova, 2005). Hence, truth bias is also found to be modulated not by the actual media richness provided in the communication environment, but by the perception of it by the users. For instance, once a picture is sent in a message as an attachment, the receiver may stop questioning the content of the picture and choose to believe that a deceptive picture is trustworthy. In these types of scenarios, the truth bias may increase miscommunication and misinterpretation.

Expression of Emotions in CMC

Expression and interpretation of emotions in communication are vital processes in our offline social lives. However, peers communicating through CMC are usually prone to make wrong emotional judgments. Lo (2008) proved that the actual emotion and intent of the sender could not be extracted from the pure text content without emoticons. In addition, the paucity of the CMC environments in terms of transmission of social cues hardens the communication of emotions, and therefore result in more misinterpretation and miscommunication issues frequently observed in CMC. For instance, Harris and Paradice (2007) found that emotion in CMC is conveyed mainly through implicit phrases. Individuals prefer to use indirect phrases to mention emotions (e.g., "That's impossible, you can't do that to me" - Harris and Paradice, 2007, 2083) rather than direct and accurate ones (e.g., "I'm angry", - Harris and Paradice, 2007, 2083) to avoid presenting emotion explicitly. This finding explains the hesitation for direct emotion communication via CMC in order to avoid miscommunication and misinterpretation. On the other hand, the same authors report that the existence of emotional phrases in the emails affects the perceived emotion levels in the receiver, supporting the idea that the tools

which facilitate better emotional communication are needed in CMC.

In order to facilitate emotional expressions, and thus the emotional communication in CMC, individuals use emoticons which can be described as the graphical representations of facial expressions usually in a humored sense. Emoticons are as easily recognized as facial expressions reported by Ekman and Friesen (1969) (Walther & D'Addario, 2001). Emoticons facilitate the communication of moods or mental states of individuals (Constantin et al., 2002). and make the interpretation of textual messages more clear and hence, substitute the non-verbal displays (i.e. facial expressions or eye gaze) in FtF (Walther & D'Addario, 2001, Derks et al., 2008). Individuals tend to use more emoticons in social interactions than task-oriented contexts (Derks et al., 2008).

The existence of emoticons plays a prominent role in the interpretation of the messages. Emoticons empower the meaning of the verbal part of a message (Rezabek & Cochenour, 1998). Emoticons also affect the degree of perceived emotions in emails (Harris & Paradice, 2007) but only in the case of positively valanced emails. Although, emoticons usually help to strengthen the content, they do not convey a meaning alone; they rarely enrich the semantic content. The contribution of emoticons to the context transmitted is limited by the narrative content and the meaning extracted from verbal content overwrites the sense of emoticons (Walther & D'Addario, 2001).

One of the widely discussed topics in CMC is flaming which can be defined as an extreme form of negatively valenced expression. From the perspective of the social presence theory, flaming, which can also be defined as sending messages that contain threats and insults, is a result of loss of personality (Short et al., 1976). In addition, it is known that the anonymity of the interacting parties reinforces flaming (Siegel et al., 1986). Unfortunately, the level of flaming gives an idea about the effect of anonymity in CMC: flaming is found more often in CMC than in FtF (Dyer et al., 1995). More precisely, Gaunt (2002) has reported that flaming is observed to occur four times more frequently in text-based CMC in comparison to FtF communication.

As for another explanation for flaming, changes in the interpretation of positively and negatively valenced content are frequently observed in CMC. For instance, in the case of negative content, whether or not the message contains emoticons, the negative meaning of the message comes forward (Walther & D'Addario, 2001). Additionally, in interactions with low emotional cues transmitted, negative emotions tend to increase (Kato et al., 2007). In fact, this behaviour may explain one of the reasons underlying flaming: flaming is not only a result of anonymity but also a result of the medium with weak capabilities for transmission of emotional cues.

According to Derks, Fischer, and Bos (2008), there is not much evidence to support the idea that CMC is less emotional in terms of talking, expressing and interpreting emotions, than FtF communication. However, the claims and results given above clearly states that: (i) although emotional communications is handled very commonly in CMC, the existing CMC environments do not have necessary tools and features for a plausible emotion transmission; (ii) the use of emoticons somehow fills the gap of insufficient emotional cue transfer but it is still primitive form; (iii) flaming is not only a result of anonymity but also a result of the medium with weak capabilities for transmission of emotional cues. Therefore, all these facts emphasize the emergent need for affective designs.

In the following section, we present the correlation between the behavioral problems which are summarized throughout the previous section, and the lessons learned from brain damages. In fact, we aim to convince the reader about the emerging need of affective and intelligent CMC applications by showing the similarities of these concepts. There is a high correlation between the behavioral problems stated above and some of

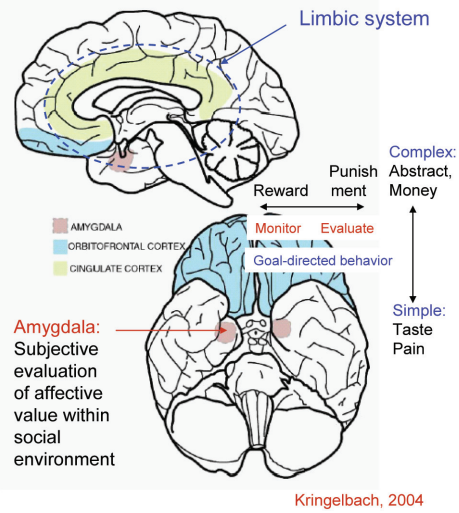
brain anomalies studied in neuroscience. CMC has usually been compared to FtF which is unavoidable as FtF is our native communication medium. However, in this chapter, we tried to express a new way of analysis by comparing the behavioral problems in CMC with the characteristics of a brain functioning properly.

THE COGNITIVE NEUROSCIENCE PERSPECTIVE FOR CMC

The Fundamental Neuroscientific Concepts

Limbic system is located in the central part of the brain, consisting of cingulate cortex, parahippocampal cortex, hippocampus, amygdala, septal nuclei, and hypothalamus. Through its bidirectional connections to the prefrontal, temporal and occipital cortices, the limbic system helps emotional and cognitive processes to work in synchronization. Episodic memory, attention, visual perception, fear conditioning are some cognitive processes modulated directly by the limbic system (Phelps, 2006). On the other hand, prefrontal cortex is the area of the brain within which higher cognitive functions such as executive function, working memory, decision-making, social behavior, and goal-directed behavior are localized. The functions that are directly related to social behavior are localized in the orbitofrontal (OFC), ventromedial and dorsolateral cortices of the prefrontal cortex (Mah et al., 2004). Amygdala and OFC, which are shown in Figure 1, are two key players in this big picture (Kringelbach & Rolls (2004)). Amygdala takes an important role in the evaluation of social cues in the surrounding environment and attaining a subjective rating whereas OFC participates in self-monitoring and attaining an objective reward-based rating, in a multitude of abstract versus concrete modalities spread out by spatial location on the OFC.

Figure 1. Emotions and subjective evaluation at the neurological level. (Adapted from Kringelbach & Rolls (2004))



Several social adaptation and behavioral problems are observed in patients with amygdala and/or OFC lesions. Because amygdala and OFC lesions are rarely found in humans, the lesion literature benefits quite a lot from animal studies. For example, when bilateral amygdalectomy is performed on monkeys in a colony in the Caribbean islands, they no longer seemed to be restricted by social mores, they embarked in socially inappropriate behavior, acted fearless in presence of higher ranking monkeys and soon are killed by other monkeys. There are several studies regarding development of fearlessness in monkeys with damaged amygdalae (Kalin et al., 2004; Skuse et al., 2003) In addition, observation of socially disinhibited behavior in monkeys with amygdala lesions makes researchers believe that amygdala may have a role in inhibiting inappropriate social behavior (Amaral, 2002). It is also known that monkeys with damage to septal nuclei become extremely aggressive even in completely natural and neutral environments.

In humans, when there is damage to amygdala, people fail to identify facial expressions, especially the expression of fear (Adolphs, 1995; Adolphs,

2005). However, it is also a fact that amygdala does not participate in fear perception in an isolated way. Awareness facilitated through participation of hippocampal areas as well as insular cortex and existence of autonomic responsivity are key factors in fear conditioning (Critchley et. al., 2002). On another front, experiments reveal that humans with amygdala lesions fail to evaluate trustworthiness and show a high tendency to trust even strangers due to increased truth bias (Adolphs, 1998). Also, amygdala lesion patients are shown to be deficient in interpreting social cues and fail to capture the emotional content in social situations (Phelps, 2006). On another front, in humans, amygdala and OFC are believed to have balancing roles; because in impulsive aggressive behavior disorders, where this balance is tipped, exaggerated amygdala activation is observed in conjunction with reduced OFC activity (Coccaro et al, 2007).

The best example for social behavioral problems introduced by OFC lesions is inarguably the utilization behavior reported by Lhermitte (1986). Utilization behavior can be explained simply as the impulsive use of tools made available to an individual without hesitation and questioning their appropriateness in the existing social context. For example, in a congress, Lhermitte invited his patient with OFC damage to the stage while a large crowd of people were present in the audience. The patient briefly looked at the presented tools at the desk. He immediately wrote something using the pen and paper, tried to wear the two glasses at the same time and urinated to the provided duck in front of all the onlookers without hesitation. The most important functionality attributed to the OFC is thought to be self-monitoring. In patients with OFC damage, there is a self-monitoring deficit, which, in turn, presents itself as lack of feelings of shame or guilt. It has been reported that behavioral therapies which consist of providing feedback to the patients by having them watch their behavior from video recordings at a later time seem to be of use, at least to reduce the intensity of the inappropriate social behaviors (Beer et al., 2006).

Behavioral Problems in CMC and Brain Damages

We can group the communication problems in, especially, text-based CMC with respect to the properties of the sender and receiver parts in the communication. The behavioral problems in each party and related brain analogies are given in Table 2.

Text-based CMC degrades social presence which in turn makes the sender act fearless just like patients with amygdala damage. Disinhibition, flaming and aggressive behavior are other behavioral disorders connected to fearlessness exhibited on the sender side. In addition, the sender takes advantage of the absence of the social normative pressure in the text-based CMC environment, and attempts impulsive behavior which is

Table 2. The summary of behavioral problems in CMC and the corresponding analogy in brain regions

Behavioral Problem	Localization in brain	Party Affected in CMC
Lack of social cues	Amygdala, OFC	Receiver, Sender
Lack of self-monitoring	OFC	Sender
Aggression	Septal nuclei	Sender
Fearlessness	Amygdala	Sender
Disinhibition, flaming	Amygdala, OFC	Sender
Exaggerated truth bias	Amygdala	Receiver
Utilization	OFC	Sender

prohibited under normal environmental settings. This is mainly because the sender does not recognize himself as an individual, which in turn causes him to skip self-monitoring his behavior in this type of communication. Uninterrupted availability and ease of the accessibility of the communication channel triggers utilization behavior in the sender, due to expectations of immediate satisfaction similar to that of patients with OFC damage.

Because of the absence of social cues in text-based CMC, the receiver cannot evaluate the received message correctly from a subjective viewpoint. In addition, the receiver can be deceived easily because of the ease of manipulation of the truth bias. Usually, the receiver is prone to interpret the received message with a higher truth value than normally expected. These types of mistakes in the judgment of the social environment are deficits observed in patient populations with amygdala damage as explained above.

NEW ASPECTS FOR THE DESIGN OF CMC APPLICATIONS

Although most of the problems stated in the earlier sections of this chapter have been known for more than two decades, up to now, only minor practical but not major conceptual improvements have been implemented in the widely used text-based CMC applications. In this statement, the innovation brought by the social network sites is not accounted for, because we categorize these media as another form of CMC which is very different form text-based CMC, primarily due to the nonymous environment and the anchored relationships (see Identity Creation, Self-Disclosure, and Anonymity part for further information). So in this chapter, the limitations of CMC are predominantly discussed within the context of text based environments.

We believe that although solutions for the problems mentioned in the earlier sections may not be entirely possible, reformative and innovative designs may produce better results in terms of the communication and perception of affect in CMC. Some of the studies we examined also support this view. For instance, Lee & Bruckman (2007) evaluates the current interface in social network sites and states that:

User-interface design choices in social computing software can have a profound effect on non-trivial activities like finding a life partner. For example, is a friends list alphabetical, or is the order determined by the user? This may seem at first glance like a low-level detail, but we have found that people pay attention to such details and use them to convey a surprising amount of meaning. (p. 377)

Another suggestion of intelligent interface design arises from the study of Lour and his colleagues (2010):

We suggest avoiding the use of "flaming" emoticons in IM because these may cause unexpected negative emotions between the communicators even if the original intention was to just kid around… The use of neutral emoticons in unnecessary circumstances should be avoided since it has no significant difference as compared to the use of pure text messages. (p. 894)

The above examples suggest very simple, but remarkable and innovative solutions for the problems targeted. The following examples are given in order to clarify what we mean by a more affective and intelligent design for CMC applications:

- Anonymity: Individuals can be given the chance to identify more with the identities of those with whom they interact. If the identity is not known, data accumulated with the behavioral characteristics of the opposing party could be presented. In addition, feedbacks from the other users in the interaction network could be used to evalu-

ate or rank the anonymous character of the individual.

- Effective Tools for Emotion Transmission: The existing CMC environments do not have necessary tools and features for a plausible emotion transmission. The use of emoticons somehow fills the gap of insufficient emotional cue transfer but they are primitive forms. Emoticons could be reanalyzed and a sufficient set of emotional cues could be transferred into graphical user interfaces defining a new pseudo-language for emotional communication. On the other hand, the emotional engagement techniques in game or movie business can be adapted to text-based CMC environments.
- Self-monitoring: Mood detection could be done using affective text processing techniques. This information could be provided to the sender through simple feedback indicators or warnings as well as the feedbacks from the interaction network of the sender. In order to allow for better self-monitoring, the messages can be buffered and sent to the receivers only after a review and approval phase imposed on the sender.
- Media Richness: Enhancing the media channels in CMC applications or supporting text with audiovisual data (i.e. voicemail) is necessary to overcome other problems like the lack of social cues, or weak transmission of emotions.

Finally, there are some important points to be mentioned considering the analysis given in Table 2, which will be valuable for future design considerations. First, the roles of peers as sender and receiver are changing dynamically in real-time CMC platforms like chat. Therefore, all the problems must be considered for each peer independent of the present role. Second, there are commonalities in terms of the causes and effects of behavioral problems, which mean that a solution for one of the problems may also end another problem.

CONCLUSION

In this chapter, we presented a group of social problems frequently observed in text-based CMC such as misinterpretation of messages and exaggerated truth bias caused by lack of social cues, or reduced self-monitoring, flaming and aggressiveness caused by anonymity. According to the literature review about socio-psychological problems in CMC, decoding of the underlying social and emotional cues can be evaluated as a missing component of CMC at the site of the receiver. On the other hand, at the site of the sender, due to the anonymity and reduced social presence, lack of self-monitoring and impulsivity are major factors that cause negative behaviors such as flaming and aggressiveness. When a neuroscientific perspective is brought along, these behavioral deficits are no different than those of patients with brain damage. When locations of the brain which subserve roughly the functional profile of these behaviors are severed, similar behavioral problems are observed in patients as well.

CMC has usually been compared with FtF communication because FtF is our native communication medium. However, in this chapter, we tried to express a new perspective in which affective features of communication is compared across healthy versus severed brain areas. Implications and appropriateness of this type of comparison will become evident in emerging designs of affective text-based CMCs hopefully in the near-term future.

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KEY TERMS AND DEFINITIONS

Computer-Mediated Communication (CMC): Term describes communication of individuals via two or more computers. Text-based messaging (e.g., chat, email), MUDs (Multi User Dungeons – the general term used to refer multiplayer online fantasy role playing games), internet dating sites, social network sites are some examples of CMC applications.

Depersonalization: This term defines an anomaly in which self-awareness weakens.

Disinhibition: Disinhibition is a term in psychology used to explain the condition in which the individual feels the lack of social moderation and looses self-control. Within the scope of this chapter, disinhibition is mostly used to recall the case of abuse and flaming.

Face-to-Face (FtF): Direct communication of individuals in which corporal body and non-verbal social cues exits. There must be no inclusion of transferring or telecommunication tools such as computers and telephone in communication. In FtF, individuals handle the information exchanged during communication with the help of social cues such as "head nods, smiles, eye contact, distance, tone of voice, and other nonverbal behavior." (Kiesler et al., 1984, 1125).