Organizational Behavior and Human Decision Processes 116 (2011) 2–16

Contents lists available at ScienceDirect

Organizational Behavior and Human Decision Processes

journal homepage: www.elsevier.com/locate/obhdp

Anger and happiness in virtual teams: Emotional influences of text and behavior on others' affect in the absence of non-verbal cues

Arik Cheshin [a,*], Anat Rafaeli [a], Nathan Bos [b]

[a] Faculty of Industrial Engineering and Management, Technion – Israel Institute of Technology, Haifa 32000, Israel
[b] Johns Hopkins University, Applied Physics Laboratory, 11100 Johns Hopkins Rd., Laurel, MD 20723, USA

ARTICLE INFO

Article history:
Received 13 December 2009
Accepted 2 June 2011
Available online 2 July 2011
Accepted by Maurice Schweitzer

Keywords:
Emotion contagion
Team affect
Virtual teams
Computer mediated communication
Emotional display
Emotionally charged behavior
Emotion
Affect
Moods
Social influence

ABSTRACT

Emotions carry social influence, as evident by emotion contagion – an unconscious process attributed to mimicking of non-verbal cues. We investigate whether emotion contagion can occur in virtual teams; specifically, the emotional influence of text-based and behavior-based cues on participants' emotion in 4-person virtual teams. In a 2 × 2 design a confederate textually communicated anger or happiness, while behaving in a resolute or flexible pattern. The team task required negotiation offering a performance based reward. We demonstrate that emotion contagion occurs in teams even when communication is only text-based. We show that behaviors are perceived as emotionally charged, resolute behavior interpreted as a display of anger, and flexibility as a display of happiness. Moreover, we demonstrate that incongruence between text-based communication of emotion and emotionally charged behaviors elicits negative emotion in fellow teammates. Our findings extend the boundaries of emotion contagion and carry implications for understanding emotion dynamics in virtual teams.

Introduction

Emotions are known to have social influence in domains such as leadership, negotiation, and conflict (e.g., Parkinson, 1996; Van Kleef, 2009). One way in which this influence occurs is through the phenomenon of emotion contagion – a powerful and fundamentally unconscious process (Hatfield, Cacioppo, & Rapson, 1992; Neumann & Strack, 2000) commonly attributed to automatic mimicking of non-verbal cues (e.g., Hatfield et al., 1992; Totterdell, 2000). Emotion contagion has been documented in individual and group interactions (e.g., Barsade, 2002; Neumann & Strack, 2000; Pugh, 2001), but the boundaries within which it is likely to occur are unclear.

Our broad research question deals with the dynamics of emotional influence in the absence of non-verbal cues. Specifically, we address three related questions: (1) Can emotion contagion occur when communication is only text-based? (2) Do individuals interacting in mediums with limited non-verbal cues interpret behaviors of others as conveying emotional cues? (3) Can emotional effects of behaviors change the effects of direct, text-based communication of emotion? All of our analyses deal with dynamics in teams, where people work together on a team goal and depend on others for both individual and team performance.

Below, we first briefly discuss the meaning of emotion as operationalized within this paper, and the ways in which it both differs from and overlaps with the related concepts of affect and mood. We follow this with an overview of what the literature can tell us about emotion contagion in text-based (rather than face-to-face) communication. Next, we suggest that emotion can be communicated through both language and behaviors that are emotionally charged, and we consider what happens when there is incongruence between emotions communicated through text and through behavior. We then present a test of our predictions using an experimental simulation of virtual teams. We show that anger and happiness can be transferred to others through emotion contagion even in text-based communication. We further show that resoluteness and flexibility are read as expressions of anger and happiness, and that incongruence between language and these emotionally charged behaviors evokes negative emotions in team members.

What is an emotion (in text-based communication)?

The classic question posed by William James (1884), "*What is an emotion?*", is especially complicated when emotions are considered

* Corresponding author.
E-mail address: acheshin@tx.technion.ac.il (A. Cheshin).

0749-5978/$ - see front matter © 2011 Elsevier Inc. All rights reserved.
doi:10.1016/j.obhdp.2011.06.002

as social entities (Hareli & Rafaeli, 2008; Parkinson, 2005), and even more so in the context of text-based communication (Parkinson, 2008). We take as a point of departure for our analysis Schwarz and Clore's (1996) definition of emotion – namely, a feeling that arises "in response to ongoing, implicit appraisals of situations with respect to positive or negative implications for one's goals and concerns... [Emotions] have an identifiable referent (what the emotion is 'about'), a sharp rise time, limited duration, and often high intensity" (p. 385). As thus conceived, emotions are distinct from moods, which are more diffuse feelings that may not be linked to a specific cause (Elfenbein, 2007; Schwarz & Clore, 1996). Moods are typically of relatively low intensity and tend to last longer than emotions. Moods may sometimes arise as after-effects of emotion – faded emotions whose initial cause is no longer salient (e.g., Cropanzano, Weiss, Hale, & Reb, 2003; Schwarz, 1990).

While the distinction between emotion and mood is useful at the individual level, in the context of teamwork this difference may be blurred. That is, the processes at work in team dynamics, including emotion contagion, mean that one person's discrete emotion may shape another person's mood; this mood is likely to be broad and unfocused, with no awareness of causality. Put differently, contagion suggests a process that starts with one person's specific emotion, and continues with an unconscious spread of emotion that lacks a clear cause, so what emerges is a more vague and undefined mood. For this reason, some scholars (e.g., Neumann & Strack, 2000) prefer the term "mood contagion" to "emotion contagion". In the current paper we will use "emotion" as a general rule, but will sometimes refer to "mood" when more diffuse, group-level feelings are under discussion.

In studying emotion dynamics in teams, our analysis integrates research on emotion with research on groups and teams. In addition to the transfer of feeling from one agent to another (Hareli & Rafaeli, 2008) – or, expressed differently, from one agent's emotion to another agent's mood – we must also consider the relationship between individual emotion and team-level emotion. However, since our focus is on emotion dynamics in *virtual* teams, we first consider the unique dynamics of text-based and computer-mediated communication of emotion.

Emotion contagion in text-based communication

Members of teams – virtual or not – must recognize and deal with feelings in the course of their work. These feelings may then expand beyond the boundaries of the individual through the unconscious process of emotion contagion (Barsade, 2002), making emotion a property of the team (Kelly & Barsade, 2001). As described above, non-verbal cues are thought to be key to the communication of emotion (Mehrabian, 1972; Sullins, 1991), and emotion contagion (or mood contagion) is believed to arise through the mimicking of such non-verbal cues (Barsade, 2002; Hatfield, Cacioppo, & Rapson, 1993; Neumann & Strack, 2000). But when team communication relies on electronic media, and is therefore primarily text-based, non-verbal cues are limited, which raises the question of whether mimicking and contagion can occur.

This question is important because modern teamwork, more often than not, relies on text-based communication (Malone, 2004; Staples & Webster, 2008). As noted by Short, Williams, and Christie (1976) and DeSanctis and Poole (1994), social interactions are drastically different when they rely on electronic rather than face-to-face communication. Research has begun to shed light on how technology affects interactions and performance in the workplace, including team-based encounters, yet rarely have emotions been studies at this context (Fineman, Maitlis, & Panteli, 2007). Studies have shown, for example, that the interplay between technology and social interaction can be adaptive (DeSanctis & Poole, 1994), so that groups whose communication is electronically mediated are marked by greater participation and more extreme, original and risky decisions (Kiesler & Sproull, 1992). However, whether and how emotion dynamics plays out in teams that can rely only on text-based communication is yet to be fully understood.

Daft and Lengel's (1986) analysis of "media richness" identifies text-based communication as a "poor" form of communication, meaning that nuances conveyed through text-based communication can easily be misinterpreted or misunderstood. This suggests that emotion conveyed in this way is unlikely to result in social influence or emotion contagion.

The relative poverty of text-based communication as suggested by Daft and Lengel (1986) is apparent in Byron and Baldridge's (2005) findings. They showed that emotions could be detected in email, but that different readers interpreted the same texts as expressing different emotions. For instance, the length of an email message suggested different things to different people: some participants interpreted a long message as suggesting positive emotion, and others negative emotion. Even emoticons (☺, ☹ and their offshoots), which appear to offer a substitute for facial expressions, can be confusing and can lead to inaccurate interpretations (Walther & Addario, 2001). Moreover, senders have control over the cues they use to convey emotions in textual communication, such as capital letters, emoticons, or message length (Byron, 2008). In contrast, in face-to-face communication expressions of emotion tend to be automatic, spontaneous, and hard to control, and are therefore presumed to be authentic (Ekman, 2009; Ekman, Friesen, & Scherer, 1976). The fact that recipients may doubt the authenticity of emotions conveyed in text-based media raises further questions about the social influence of such emotions, given that more authentic expressions can be expected to be more influential.

Byron (2008) noted two systematic biases in people's reading of the emotion conveyed in email messages: a *neutrality bias*, whereby people fail to recognize positive emotions and evaluate them as neutral; and a *negativity bias,* whereby people attribute greater intensity to negative emotions. Byron (2008) also found that people appear to be unaware of these biases. Other studies support the presence of a negativity bias, including Walther and Addario's (2001) finding that negative cues overrode other cues in computer-mediated communication, and Kramer's (1995) finding that people tend to attribute sinister intentions to partners in negotiations using electronic media. At the same time, Kruger and colleagues (Kruger, Epley, Parker, & Ng, 2005) showed in a series of studies that senders typically overestimate their ability to convey anger and other emotions in email messages.

Notwithstanding the problems inherent in text-based communication, there is some evidence that people can accurately detect emotion from computer-mediated communication, and that such emotion can be contagious. Hancock and colleagues (Hancock, Gee, Cicaccio, & Lin, 2008) found that partners in a dyadic interaction who were induced to feel negative emotion wrote shorter messages, used more negative terms and exchanged messages at a slower rate than those induced to feel neutral emotion. These text-based communications of emotion were detected and "caught" by partners interacting via text-based instant messaging.

The recognition of emotion in text-based communication is also evident in the phenomenon of flaming. *Flaming* is an online attack typically involving profanity, obscenity, and insults intended to offend people or organizations (Reinig, Briggs, & Nunamaker, 1997). Flaming often occurs in the context of Internet forums, chat rooms, or social networking sites, where hostile communications can be seen by many people, and may spread quickly. The idea of a rapid spread of negative emotion through a social network clearly resonates of emotion contagion. Johnson, Cooper, and Chin (2009) attributed flaming to a sense of anger arising from perceived unfairness or maltreatment in text-based communication, where

non-verbal cues and, especially, facial expressions are not there to offer a counterweight to text-based content. They suggested that flaming attacks spread rapidly in computer-mediated communication because posters feel anonymous and insulated from punishment.

In the absence of non-verbal cues, emotion contagion in text-based communication may be activated by a physiological mechanism identified by Foroni and Semin (2009), wherein exposure to words with emotional content leads people to activate facial muscles related to the display of the emotion (Ekman, 2009). For example, people exposed to the word "frown" activated the facial muscles that Ekman et al. (1976) showed to be used in producing a frown. Further, researchers have shown that an emotion can be ignited by the activation of facial muscles (Strack, Martin, & Stepper, 1988). Building on this so-called "facial feedback hypothesis", a process similar to the mimicking in face-to-face contagion may be proposed, whereby exposure to texts with emotion-laden content may create emotion contagion. Hence, in spite of the relative poverty of text-based communication, we offer the following:

Hypothesis 1. Emotion contagion will occur in teams relying only on text-based communication.

Social Influence of emotion in virtual teams

Additional theoretical support for H1 is afforded by the idea that *social comparison* (Festinger, 1954) and *social information processing* (Salanick & Pfeffer, 1978) influence human behavior. Festinger's (1954) theory of social comparison holds that people's behavior is based on their reading of others' actions. Social information processing theory similarly positions the scanning of the social environment as influencing behaviors and feelings, such that "the social environment provides cues which individuals use to construct and interpret events, also providing information about what a person's attitudes and opinions should be" (Salanick & Pfeffer, 1978, p. 226). The idea that people engage in social comparison of emotion is therefore not inconceivable. Indeed, in Schachter's (1959) classic study, people who had to wait for a stressful experience (an electric shock) preferred to wait with others who were about to have a similar experience. Participants explained that they wanted to see how others reacted, so as to gauge whether their own emotions were appropriate.

Van Kleef (2009) proposed the *Emotion as Social Information* model, an extension of the *Affect-as-Information* idea presented by Schwarz (1990). Schwarz proposed that people use their own affect as a source of information on how to act in given situations, and Van Kleef (2009) extended this, suggesting that individuals also assess the emotions of others for this purpose. Continuing this line of thought, we suggest that people use the emotions of others as input when assessing how they themselves should *feel*. This gauging process does not depend on the availability of non-verbal cues: one can hear or read about other people being angry or happy and come to develop similar emotions in the complete absence of non-verbal cues (Hareli & Rafaeli, 2008).

Some initial empirical evidence has documented social comparison effects of emotion. Epstude and Mussweiler (2009, p. 1) argued explicitly that "what you feel is how you compare;" they showed that emotions were more contagious when participants were primed to focus on their similarity to others. In their study, subjects exposed to pictures or audio stimuli that conveyed specific emotions (e.g., smiling or frowning faces; the sound of laughter or crying) reported feeling these same emotions if they were primed for similarity, or if the source of the emotion was construed as a member of their "in-group." In a similar vein, Hunstinger, Lun, Sinclair, and Clore (2009, p. 909) demonstrated what they label as "anticipatory contagion", wherein participants matched their moods to that of a stranger with whom they were about to interact, but had not yet had any contact with.

Social comparison and inter-personal mimicry are complementary patterns of emotional dynamics in groups (Kelly & Barsade, 2001). Gump and Kulik (1997) empirically documented both mimicry and social comparison in teams. Parkinson and Simons (2009) found participants' emotions in a decision-making game to be influenced by the emotions of people around them; they attributed this finding to a combination of social appraisal and mimicking. But all previous analyses of emotion in teams involved face-to-face communication. The current study is unique in that we examine a team environment with impoverished non-verbal cues – where text-based communication is the only medium.

Verbal and behavioral communication of emotion: emotional influence of others' emotionally charged behaviors

Emotion can obviously be communicated directly through narrative or textual means (e.g., "I am really angry!"; "I am so happy!"). But people may also infer the emotions of others from the behaviors these others display.[1] Conceptually, we suggest that certain behaviors, or behavioral styles, are evaluated by others as conveying specific emotions, so that a person displaying these behaviors is presumed to be feeling those emotions. We propose two sets of behaviors that are related to negotiation settings: behaviors related to flexibility and resoluteness.

The idea that behavior and emotion are intertwined dates back to the classic assertion that behavior precedes emotion – for instance, that fear comes from the realization that one is running away (James, 1884; Schachter & Singer, 1962). Frijda's (1988) "laws of emotion" defined emotion in terms of behaviors or *action tendencies*, and Frijda, Kuipers, and ter Schure (1989) further argued that emotion can be analyzed as both an experience (the appraisal of a situation) and a state (action readiness). Gross (1998) suggested that emotions evoke response tendencies, thus connecting emotions and specific behaviors. But all of this work was within-person – connecting an individual's behavior to his or her own emotions. Little attention has been given to the inter-person parallel: Do we identify the emotions of others based on their behavior?

The idea that people identify others' emotions based on their behavior is consistent with attribution theory (Weiner, 1985), which explores how people attribute causes to different events and behavior. Attribution theory is based on the idea that people are hard-wired to look for the reasons behind others' actions; therefore, we are naturally primed to use behavior as an indirect source of information about emotion. Equally, people have an interest in identifying the emotions of others as a means whereby to predict their future behavior (e.g., Schachter, 1959; Schwarz, 1990). When non-verbal cues to someone's emotional state are lacking, people will naturally seek other sources of information, looking for alternative, indirect cues. In a negotiation situation, behaviors that express flexibility or resoluteness are discernable acts that may offer clues to the negotiator's emotional state – and by extension, the likely path that person is likely to follow as the negotiation continues. Importantly for our purposes, the resoluteness or flexibility of behavior is a useful sign that can be readily identified even in text-based communication, and even in the absence of direct verbal communication of emotion (of the "I am really angry" type).

We specifically propose that people construe resoluteness to imply anger, and flexibility to suggest happiness. In other words, we

[1] While it can be argued that verbal communication is a form of behavior, when we refer to behavior here we are focusing on actions that can be observed by others, or that can be inferred through their consequences.

propose that when Person A observes or experiences resoluteness in the behavior of Person B, Person A is likely to *presume* that Person B is angry. We further propose that this will occur regardless of whether anger is apparent in Person B's verbal communication. Likewise, we suggest that when Person A observes Person B behaving flexibly, Person A is likely to *presume* that Person B is happy regardless of whether happiness is apparent in the communication of Person B.

This connection between emotion and behavior in others represents an extension of the cognitive appraisal theories of emotion (e.g., Ellsworth & Scherer, 2003; Scherer, 1984; Smith & Ellsworth, 1985). These theories suggest that people construe their own emotions by reading the context in which they are experiencing the emotion. A between-person-perspective extension suggests that appraisals of the emotions of *another* person rely on observations of that person's behavior. Behaviors suggesting resoluteness and flexibility are particularly appropriate for an initial test of this idea, because such behavior patterns are common in negotiation settings and are likely to be noticed by negotiation partners. Also, being opposites, resoluteness and flexibility can be expected to complement the opposing emotions of anger and happiness (Russell, 1980).

The literature suggests that resoluteness – standing one's ground, not giving in, "acting tough" – will produce attributions of anger. Kopelman, Rosette, and Thompson (2006) trained participants to develop a resolute bargaining style by telling them to act in a tough, persistent manner; their manipulation checks confirmed that this was viewed as displaying anger. Sinaceur and Tiedens (2006) similarly used resoluteness as an operationalization of anger. However, both of these studies dealt with dyadic interactions and included face-to-face communication. Toward our interest in emotion dynamics in teams limited to text-based communication, we rely on these findings to offer the following prediction:

Hypothesis 2. A member of a virtual team acting in a resolute manner will be perceived as being angry by the other members of the team.

Similarly, we propose that flexibility – defined as responsiveness, adaptability, willingness to cooperate with others – will lead to attributions of happiness. Importantly, flexibility does not mean that one is not willing to protect one's personal interests; rather, it suggests that one is willing to work with the other party for the benefit of both, and to settle for smaller gains. The association between flexibility and positive emotion is supported by Fredrickson's (2003) connection of positive emotions to expanded thought-action repertoires and mental resources. Fredrickson showed that people in a positive mood are more creative and flexible in their thinking. By extension, we suggest that people, probably unconsciously, will read flexible (or creative) behavior as an indication of positive mood – that is, happiness. They thus can be expected to attribute happiness to people displaying flexibility in their behavior.

Indeed, such a link has been documented in within-person studies (e.g., Brown, Palameta, & Moore, 2003; Mehu, Grammer, & Dunbar, 2007; Stouten & De Cremer, 2010). Stouten and De Cremer (2010) showed that smiling people are assessed as more cooperative than people whose facial expressions are neutral or angry. Mehu et al. (2007) similarly found a correlation between cooperation (in that case, sharing of a financial reward) and smiling. These findings support our prediction that people will interpret others' flexible behavior as a cue that these others are happy:

Hypothesis 3. A member of a virtual team acting in a flexible manner will be perceived as being happy by other members of the team.

Incongruence of verbal and behavioral communications of emotion

If emotion can be communicated via both words and behavior, the question arises: What happens when the emotions conveyed through these two channels are incongruent? Nobody is surprised when words and actions are congruent – e.g., when hostile words accompany firm and resolute actions. But things become interesting when a person's words are pleasant but his or her behavior is rigid and uncompromising. This study examines instances of such "mismatches". We thus aim to separate the effects of emotionally charged behaviors (resoluteness and flexibility) from the effects of text-based communication (of anger and happiness).

Stouten and De Cremer (2010) provided insight into the effects of incongruence by manipulating the facial expressions and the verbal message of a confederate in a trust game. They found that facial expressions of happiness coupled with verbal communication of cooperation (as opposed to verbal communication of self-interest) led participants to attribute honesty to the confederate, and to express greater desire to cooperate and even to interact socially with the confederate. When confederates' behavior was not congruent with the verbal message (i.e., self-interest expressed with a smile), participants' cooperation and desire for social interaction was significantly lower.

Newcombe and Ashkanasy (2002) also studied incongruence between verbal and non-verbal expressions of emotion. In their research, participants observed a scenario in which supervisors gave an employee either positive or negative feedback, coupled with either matching or non-matching facial expressions. They found a strong effect of negative facial expressions, which were significantly more influential than verbal messages; in addition, incongruence between the verbal message and facial expression produced negative reactions in participants. Reactions were most negative where a positive verbal message was delivered with a negative facial expression.

That incongruence between verbal and non-verbal signals is likely to influence assessments of others is evident from Gross's (1998) discussion of emotion regulation. Gross (1998) notes that a first step in any interaction or encounter is each person's assessment of the emotional cues conveyed by the other. When the person's behavior appears routine and familiar – which we would suggest is the case when verbal and behavioral cues are congruent – people file away their assessment and focus on the task or the situation at hand (see also Forgas, 1995). Situations of incongruence, however, are likely to be less familiar and to stand out (Weick, 1995). Being potentially confusing, they are likely to ignite negative reactions (e.g., Newcombe & Ashkanasy, 2002).

Because people prefer familiar situations whose components are easily categorized (Turner, 1985), the confusion produced by incongruence can also be expected to produce a sense of discomfort and frustration (Ellseberg, 1961; Kahneman, Knetsch, & Thaler, 1991). This confusion and the resulting sense of discomfort is likely what gives rise to the negative reactions reported by Newcombe and Ashkanasy (2002), described above, and is the foundation of our next prediction:

Hypothesis 4. Incongruence between text-based-communication of anger and happiness and the emotion signaled by sets of behaviors representing resoluteness vs. flexibility on the part of a team member will lead to reports of negative emotion by fellow team members.

Summary

Our analysis predicts that emotions can be recognized when communication is only text-based, and that behaviors also trigger emotional attributions and reactions. We predict that emotion contagion will occur following text-based communication of anger and happiness (H1); that resolute behaviors will lead other people to assume the resolute person is feeling anger (H2); that flexible behaviors will lead other people to assume that the flexible person is feeling happiness (H3); and that incongruence between text and behavior will produce negative emotions in fellow team members (H4). We test our predictions using a simulation of virtual teams in which we experimentally manipulate both the content and behavior of one member's textual communications.

Methods

Overview and participants

Data were collected using the organizational simulation *Shape Factory*, which was designed to systematically study virtual teams (Bos, Olson, Nan, & Cheshin, 2009). The simulation creates the experience of a virtual team that must collaborate to accomplish both individual and group goals. Participants interact using only text-based asynchronous electronic communication on a task where both individual and team success can be rewarded. Teams work together for approximately 60 min, which enhances external validity since the relatively long interactions enable group dynamics to manifest and allow emotions to play out. This task offers a good blend of the reliability and control of a lab study and the external validity of real teamwork. Full details on the simulation process are available in Bos et al. (2009).

University students (n = 394, mean age = 26.12, 57.65% males) were randomly assigned to experimental teams of four members (123 teams). Teams in the experimental conditions (see below) included three participants and a confederate, and teams in the control conditions included four participants. The confederate created the experimental manipulation by following preset rules regarding textual and behavioral communication of anger or happiness and resoluteness or flexibility respectively, creating a 2×2 experimental design of text-based emotion and emotionally charged behaviors (see Table 1). Participants were promised monetary rewards for their participation and performance, with a reward structure designed to stimulate commitment to both individual and team performance.

Table 1
Study design.

		Confederate Text-based communication of emotion		No confederate Spontaneous language and behavior
		Angry	Happy	
Confederate behaviors	Resolute	A[a]	B[b]	
	Flexible	C[c]	D[d]	
No confederate	Spontaneous Behavior			E[e]

Total n = 123 teams, 1182 dyads, 394 participants.
[a] n = 24 teams, 216 dyads, 72 participants.
[b] n = 24 teams, 216 dyads, 72 participants.
[c] n = 25 teams, 225 dyads, 75 participants.
[d] n = 25 teams, 225 dyads, 75 participants.
[e] n = 25 teams, 300 dyads, 100 participants.

Procedures

Students participated in the study for partial course credit as well as a small monetary reward. After arriving at a computer lab, they were introduced to the other members of their team; each team member was then escorted to an individual station separated from the others by tall dividers. Once seated, the team members completed a short survey, then drew from a hat one of four shapes (a square, triangle, X or circle) that they were told would represent them for the duration of the experiment. They then viewed a presentation explaining the experimental task, completed a short test verifying that they understood the task, and were instructed to communicate only through the asynchronous messaging system, which is similar to email. The text-only communication was enforced by the experimenter and a practice round was run to clarify any further questions.

Participants completed three rounds of the simulation, during which they bought and sold shapes from other participants, to complete orders comprising a random selection of the four shapes. Each participant could produce their own "specialty" shape at a cost which was substantially lower than the cost of producing a shape that was not their specialty. To acquire other shapes, participants could either produce the shape themselves (at a relatively high price) or purchase it from the person for whom this shape was a "specialty" at a price to be negotiated. The production prices for the various shapes differed for each participant and were known only to that person. For example, *Square* could produce squares for $16, while producing other shapes would cost *Square* anywhere from $25 to $30. Alternatively, *Square* could try to purchase a circle from *Circle* at a negotiated price, where *Circle*'s production cost was known only to *Circle*. The number of shapes each participant could sell was limited, creating scarcity. This made the negotiation process demanding but realistic, and also created opportunities for better or worse dyadic negotiation relationships with different fellow team members.

Success in a round (and subsequent compensation to participants) was based on the number of orders completed by the team, and each person's profit from buying and selling shapes. The task, therefore, involved negotiating with fellow team members about purchase prices using text-based communication, with an incentive for maximizing both individual and team success, thus motivating interaction with fellow team members and consideration of both team and personal interests. After three rounds of the task, participants responded to a survey providing the dependent variables. They were then paid based on performance ($1–$10), debriefed, and dismissed.[2]

Variables and measures

Verbal Communication of Anger and Happiness was manipulated through the text-based communication of the confederate. These communications were scripted and prepared in advance following the procedures used by Barsade (2002), Van Kleef, De Dreu, and Manstead (2004a, 2004b) and Kopelman et al. (2006). Confederates pasted sentences from a "bank" of allowable statements into the text-based communication system. For example, in response to an offered price for shapes, a confederate in the Angry condition

[2] The task is complex in nature, combining scarcity of resources, internal competition between members, and a group goal, while being repetitive, ongoing, and time-constrained. There is no systematic advantage to a strategy of acting in either a consistently resolute or a consistently flexible manner. To succeed in this task over the long run, a positive relationship needs to be maintained with all team members: neither solely resolute nor solely flexible behavior can guarantee higher performance. For instance, consistently resolute behavior might lead to higher gains in one or two interactions, but make teammates less likely to negotiate in the future. Consistent flexibility might do the reverse, enabling the participant to buy and sell more shapes, but with smaller gains each time.

might reply "*Your offer really makes me mad!*", and in the Happy condition, "*It is a pleasure doing business with you!*" (For a sample set of these sentences see Appendix A) Since the task was dynamic, there was occasional need to improvise, but the instructions were to stay "within character".[3]

Resolute and Flexible Behavior was manipulated through the confederate's actions and reactions during the negotiations. These also followed preset guidelines. In the Resolute condition, the confederate countered all price offers, seeking higher gains, while in the Flexible condition the confederate accepted initial offers as long as there was no loss involved. Importantly, agreements about sales and prices could be (and were) reached with resolute confederates, but the process of negotiation about price or quantities was more difficult. Confederates were highly trained and became experts in the Shape Factory task before the simulation was conducted (the full set of confederates' behavioral instructions is available in Appendix B).

Negotiations in the Resolute conditions tended to be longer than in the Flexible conditions, which meant that the Resolute conditions created more of a sense that the clock was ticking. However, the time allocated to each round was sufficient for completing the task in all conditions, and all participants were able to sell all of their shapes up to their production limit in all teams.

Thus, confederate verbal communication and behaviors created four experimental conditions, two with congruence of text and behavior (Angry–Resolute, Happy–Flexible), and two with incongruence (Angry–Flexible, Happy–Resolute). A fifth condition served as a control group; these comprised teams of four, all of them naive participants (students), with no confederate and no manipulation (see Table 1).

Manipulation check

After completing the experimental task all participants responded to two questions about their fellow team members: "To what extent did (*Square*, *Circle*, *X*, *Triangle*) (1) display anger during the task?" and (2) "display happiness during the task?" (7-point Likert scale; see Barsade, 2002; Kopelman et al., 2006). All participants provided this evaluation, including the confederate, and confederates' responses were discarded. Ratings of the confederate's shape (which was randomly determined at each session) were combined into an index of *emotion attributed to confederate*, which served as a manipulation check (elaborated below). No effects were found for the confederate's randomly assigned shape. For a second manipulation check the emotional tone of the confederate's messages was rated by independent coders (elaborated below).

Dependent variables

To examine the effects of the experimental manipulations, we assessed participants' ratings of their own and others' emotions following the task. It should be noted that by necessity, these variables somewhat blur the distinction described above between emotion and mood (Schwarz & Clore, 1996). As these affective states are diffuse and with no identifiable cause, it is perhaps more accurate to refer to them as moods rather than emotions. However, for the sake of internal consistency within this paper, we use the term *emotion* as well as *mood* in discussing these measures. It should also be noted in this context that we used a well-regarded measure of positive and negative affect, the PANAS scale (Watson, Clark, & Tellegen, 1988), to assess the emotional states of individual participants, rather than a measure of emotion *per se*.

[3] Independent raters verified that the confederate's text was within character, as elaborated below.

Mood of fellow team participants

Participants completed a shortened version of the PANAS scale (Watson et al., 1988) before (Time 1) and after the experimental task (Time 2). The shortened scale covered four PA items (determined, strong, proud, and interested) and four NA items (scared, nervous, guilty, and irritable) (7-point Likert scale, 1 = slightly or not at all, 7 = extremely). Confirmatory factor analysis validated the two dimensions of PA and NA (Cronbach's Alpha NA Time 1 = .74, PA Time 1 = .77; NA Time 2 = .85, PA Time 2 = .73).

Team emotion

We used two methods to assess team mood. For the first, we adopted participants' ratings collected for the manipulation check ("To what extent did *Square*/*Circle*/*X*/*Triangle* display anger/happiness during the task?". We aggregated these ratings (excluding those of the confederate) to the group level to produce indices of *Team Anger* and *Team Happiness*.

For a second index of team mood we assessed the tone of the messages sent by participants. Three independent raters, who were blind to the experimental condition and not aware of the presence of a confederate, coded the text messages as negative, positive or neutral in affect. Raters were instructed to code a message as negative if it showed signs of rudeness, frustration, threat, urgency, or complaint (e.g., "You are really annoying me"). Messages were coded as positive if they included pleasantries, politeness, humor, advice or tips, or offers of assistance (e.g., "I have more shapes left and I would be happy to sell them to you"), and were coded as neutral if they lacked an identifiable affect (e.g., "Send me the shapes"). Inter-rater agreement of ratings was satisfactory (Cohen's Kappa = 0.79). We discarded the ratings of confederate messages and counted the number of positive and negative messages at the team level to produce the index.

Dyadic interaction behaviors

We analyzed relationships between pairs of participants, in each case looking at the behavior of one member of the pair (so that each set of two participants effectively formed two dyads). Participants' actions throughout the task were recorded and then analyzed at the dyadic level for all possible pairs within each team (four team members created 12 possible dyads per team). Dyads with the confederate as the subject of analysis were then excluded, leaving nine dyads per team in the experimental conditions, and a total of 1182 dyadic interactions for 123 teams in the study. This analysis thus captures the behavior of each team member toward each of his or her partners in the team, and provides insight into the effects of spontaneous verbal and behavioral expressions on attributions of anger and happiness. For each dyad we collected the following verbal or behavioral indices (in each case Participant A is evaluated by Participant B):

Textual communication:

(1) Number of negatively toned messages: The number of messages sent by Participant A to Participant B that were identified by raters as having a negative tone.
(2) Number of positively toned messages: The number of messages sent by Participant A to Participant B that were identified by raters as having a positive tone.
(3) Total number of messages sent: The total number of messages sent by Participant A to Participant B regardless of content. Messages containing no text could not be evaluated for affective tone, but were included in this measure.

Negotiation Behavior:

(1) Number of counter offers: The number of times Participant A responded with a counter offer to a request by Participant B.

Table 2
Means, standard deviations and inter-correlations of study variables.

	Mean	*SD*	1	2	3	4	5	6	7	8	9
1. Ratings of confederate anger	3.68	2.19	–	–	–	–	–	–	–	–	–
2. Ratings of confederate happiness	3.17	1.77	−.53**	–	–	–	–	–	–	–	–
3. Negative Affect at Time 1 (pre-manipulation)	1.69	.78	−.04	.26*	–	–	–	–	–	–	–
4. Positive affect at time 1 (pre-manipulation)	3.93	1.18	.03	.12*	.25**	–	–	–	–	–	–
5. Negative affect at time 2 (post-manipulation)	3.17	1.27	.38**	−.21**	.15**	.13*	–	–	–	–	–
6. Positive affect at time 2 (post-manipulation)	3.92	1.04	−.19*	.37**	.14**	.32**	−.27**	–	–	–	–
7. Team anger	2.81	1.08	.61**	−.18**	.17**	.10	.59**	−.24**	–	–	–
8. Team happiness	3.27	1.17	−.14*	.65**	.23**	.24**	−.08	.52**	.08	–	–
9. Number of negative messages	4.29	5.28	.20**	−.21**	−.06	.00	.37**	−.18**	.25**	−.08	–
10. Number of positive messages	4.53	4.1	−.29**	.31**	.03	−.01	−.08	.28**	−.07	.26**	−.02

* $p < .05$.
** $p < .01$.

(2) Total amount sold is the number of shapes Participant B sold to participant A.
(3) Total amount bought is the number of shapes Participant B bought from Participant A.
(4) Mean selling price: The averages price paid by Participant A for a shape bought from Participant B.
(5) Mean purchase price: The average price paid by Participant B for a shape bought from Participant A.

Measures 4 through 8 are useful indicators of participants' style of behavior in the negotiation task. A high score for variable 4 (number of counter offers) is an indicator of resoluteness, since it suggests the participant was determined to obtain the best price. Low scores for variables 5 and 6 (number of shapes sold or bought) likewise indicate resoluteness, as fewer parts traded means the participant was firm in holding out for the best deal – i.e., lower purchase prices or higher selling prices. (Recall that the experimental design meant that demand was greater than supply, so participants were never forced to sell their parts at bargain prices, while competition among buyers meant a resolute player might lose out on a deal to a more flexible one.) Finally, high mean selling prices and low mean purchase prices (variables 7 and 8) indicate resoluteness, by the same reasoning as above: namely, a resolute player is more likely to hold out for agreements that will reduce expenditures and increase profit margins. In each case, the reverse would be true for flexibility: a lower number of counter offers, a higher volume of trading, and so on would indicate more flexible behavior.

Overview of analyses

We tested Hypothesis 1– positing that emotion contagion will occur in the absence of non-verbal cues – by comparing *PANAS* and team mood (*Team Anger*, *Team Happiness*, *Positively Toned Messages*, and *Negatively Toned Messages*) for participants who interacted with an angry confederate (cells A and C in Table 1) and with a happy confederate (cells B and D). Hypotheses 2 and 3 – predicting that resolute and flexible behaviors will lead to attributions of anger and happiness respectively – were tested by assessing the emotions attributed to the confederate and to the other participants based on the dyadic relationships (comparing cells A and B to cells C and D in Table 1). Hypothesis 4 – predicting negative reactions to incongruence – was tested by assessing *PANAS* and the four team mood variables in cells B and C. A comparison to the Control condition (cell E) was included in all the analyses, to test the effects of manipulated emotion as compared to spontaneously occurring emotions. In addition, we compared all five conditions on all study measures.

Results

Table 2 presents the means, standard deviations and inter-correlations among the study variables. Data analysis was at two levels. At the team level the sample size was 123 teams and analyses followed a multilevel nested model to account for the experience of individual participants within different teams, and to allow for simultaneous consideration of both individual and group-level factors. A mixed-model analysis enables consideration of random intercepts and random slopes effects for each group while also considering variances within groups. The *F*-tests we report represent differences between predictors (Betas) in each condition that show the significant differences between conditions. At the dyadic level the sample size was 1173 (of possible 1182 due to missing data).

Manipulation checks

Both manipulation checks confirmed that the manipulation worked as intended. First, the *emotion attributed to confederate* index, constructed from participants' ratings of the confederate's emotion, confirmed that the confederate in the Angry conditions was rated as significantly more angry ($M = 5.06$, $SD = 1.89$) than in the Happy ($M = 2.28$, $SD = 1.53$) conditions ($t(96.2) = 12.64$, $p < .001$, $d = 1.03$), and significantly more happy in the Happy ($M = 4.12$, $SD = 1.68$) than in the Angry ($M = 2.22$, $SD = 1.34$) conditions ($t(96.3) = 10.51$, $p < .001$, $d = 0.84$).

Second, significantly more of the messages sent by the confederate in the Angry conditions ($M = 43.92$, $SD = 11.82$) than in the Happy conditions ($M = 0.18$, $SD = 0.70$) were rated by the blind coders as negatively toned ($t(95) = 25.87$, $p < .001$, $d = 5.31$). Similarly, significantly more messages sent by the confederate in the Happy ($M = 46.57$, $SD = 9.27$) than in the Angry ($M = 0.19$, $SD = 0.79$) conditions were rated as positively toned ($t(95) = 35.69$, $p < .001$, $d = 7.32$).

Contagion effects in text-based communication

Effects on individual mood

Hypothesis 1 predicted that emotion contagion would occur in text-based communication, so that the apparent anger and happiness of the confederate would spread to other participants, and the mood of fellow team participants (as assessed by PANAS scores) would reflect the experimental condition. The hypothesis was supported: A nested repeated measures analysis of Time 1 and Time 2 PANAS scores verified that there was a significant difference between the conditions in both negative affect ($F(2, 660) = 22.87$, $p < .001$) and positive affect ($F(2, 667) = 7.89$, $p < .01$) in the predicted direction (see Table 3). Pair-wise comparisons of participant NA showed no significant difference at Time 1 between the

Table 3
Means and *SD*'s of affect measures in angry and happy conditions and control.

	Happy[A]	Angry[B]	Control	*F* value
NA Time 1 (pre-manipulation)	1.73[a] (0.75)	1.64[a] (0.82)	1.70[a] (0.73)	22.87**
NA Time 2 (post-manipulation)	2.68[b] (1.14)	3.62[c] (1.26)	3.23[d] (1.21)	
PA Time 1 (pre-manipulation)	3.87[a] (1.20)	3.90[a] (1.17)	4.08[a] (1.19)	7.89*
PA Time 2 (post-manipulation)	4.24[b] (1.02)	3.57[c] (0.96)	3.96[a] (1.05)	
Aggregated team anger	2.40[a] (1.03)	3.38[b] (0.85)	2.56[a] (1.14)	39.81**
Aggregated team happiness	3.70[a] (1.14)	3.02[b] (1.04)	3.01[b] (1.28)	17.14**
Number of negatively toned messages	3.24[a] (3.03)	5.88[b] (4.13)	3.56[a] (4.32)	12.14**
Number of positively toned messages	6.97[a] (6.53)	3.22[b] (4.07)	2.83[b] (2.94)	29.02**

Note: Different letters indicate a significant difference between the conditions, $p < .05$.
Numbers represent means, with *SD*'s in parentheses.
* $p < .05$.
** $p < .01$.
[A] The "happy" column covers cells B and D in Table 1, where the confederate was happy and resolute or happy and flexible.
[B] The "angry" column covers cells A and C in Table 1, where the confederate was angry and resolute or angry and flexible.

experimental conditions ($t(258) = 0.66$, $p = .51$) or between the two experimental conditions and the Control condition (Angry–Control $t(211) = 0.24$, $p = .81$; Happy–Control $t(211) = 0.34$, $p = .74$), confirming that the random assignment of participants to conditions was effective in preventing bias. Yet at Time 2, NA was significantly higher in the Angry than in the Happy conditions ($t(258) = 6.92$, $p < .001$, $d = 0.86$), supporting H1. Moreover, the Control condition at Time 2 differed significantly from both the Angry and Happy conditions in terms of NA (Angry–Control $t(213) = 2.47$, $p < .05$, $d = 0.34$; Happy–Control $t(213) = 3.53$, $p < .001$, $d = 0.48$). This suggests that the experimental task itself created NA, which was negated by the positive atmosphere generated by the confederate in the Happy conditions. A within-subject analysis confirmed an increase in NA between Time 1 and Time 2 in all conditions, but the increase was greatest in the Angry conditions ($t(660) = 18.22$, $p < .001$, $d = 1.42$), followed by the Control condition ($t(660) = 11.63$, $p < .001$, $d = 0.91$); it was lowest in the Happy conditions ($t(660) = 8.65$, $p < .001$, $d = 0.67$).

Hypothesis 1 was also supported by the PA analyses. Pair-wise comparisons show no difference in PA between the experimental conditions at Time 1, pre-manipulation (Angry–Happy: $t(384) = 0.18$, $p = .86$; Angry–Control: $t(301) = 1.22$, $p = .22$; Happy–Control: $t(301) = 1.37$, $p = .17$), and a significant difference between the two experimental conditions at Time 2, post-manipulation, in the expected direction (Angry–Happy: $t(385) = 5.00$, $p < .001$, $d = 0.51$). The Time 2 PA in the Control condition was only marginally different from the Happy conditions ($t(305) = 1.86$, $p = .06$, $d = 0.21$) and significantly different from the Angry conditions ($t(304) = 2.58$, $p < .05$, $d = 0.30$). Here as well the within-subjects analysis supports H1, since PA increased in the Happy conditions ($t(667) = 2.92$, $p < .01$, $d = 0.23$), did not change in the Control condition ($t(667) = 0.78$, $p = .43$), and decreased in the Angry conditions ($t(667) = -2.58$, $p < .05$, $d = 0.20$).

Effects on team emotion

Hypothesis 1 was also supported with analyses of team-level mood – *Team Anger and Team Happiness* – which indicated adequate within-team agreement (Rwg(j) = 0.77),[4] allowing analyses of aggregated measures. Team anger differed significantly between the three conditions ($F(2118) = 39.81$, $p < .001$), and pair-wise comparisons confirmed higher team anger in the Angry ($M = 3.38$, $SD = 0.85$) than Happy ($M = 2.40$, $SD = 1.03$) conditions ($t(146) = 8.45$, $p < .001$, $d = 1.40$), and in the Angry than Control ($M = 2.56$, $SD = 0.14$) conditions ($t(104) = 6.33$, $p < .001$, $d = 1.24$). There was no significant difference between the Happy and Control conditions ($t(105) = 1.23$, n.s) (Table 3). Team happiness ($F(2389) = 17.14$, $p < .001$) was also significantly different between the conditions in the expected direction, with higher values in the Happy ($M = 3.70$, $SD = 1.14$) than Angry ($M = 3.02$, $SD = 1.04$) conditions ($t(389) = 5.23$, $p < .001$, $d = 0.53$), and in the Happy than Control ($M = 3.01$, $SD = 1.28$) conditions ($t(389) = 4.71$, $p < .001$, $d = 0.48$). The difference between Angry and Control conditions was not significant ($t(389) = 0.00$).

A comparison of the *Negatively* and *Positively Toned Messages* also supported H1 ($F(2, 116) = 12.14$, $p < .001$, $F(2, 388) = 29.02$, $p < .001$, respectively), with more negatively toned messages in the Angry ($M = 5.88$, $SD = 4.13$) than Happy ($M = 3.24$, $SD = 3.03$) conditions ($t(129) = 4.64$, $p < .001$, $d = 0.82$) and in the Angry than Control ($M = 3.56$, $SD = 0.52$) conditions ($t(109) = 3.50$, $p < .001$, $d = 0.67$), and no difference in the number of negatively toned messages between the Happy and Control conditions ($t(109) = 0.49$, $p = .49$). The pattern of results with the number of positively toned messages similarly confirmed the hypothesis: There were many more positive messages in the Happy ($M = 6.97$, $SD = 6.53$) than Angry ($M = 3.22$, $SD = 4.07$) conditions ($t(388) = 6.48$, $p < .001$, $d = 0.66$) and in the Happy than Control ($M = 2.83$, $SD = 2.94$) conditions ($t(388) = 6.48$, $p < .001$, $d = 0.66$), with no significant difference between the Angry and Control conditions ($t(388) = 0.61$, $p = .54$) (see Table 3).

Emotions attributed to others following resolute and flexible behaviors

Hypotheses 2 and 3 – which predicted that behaviors expressing resoluteness or flexibility will lead people to assume another person feels anger or happiness, respectively – were also supported. A first analysis to test these hypotheses was conducted with the anger and happiness attributed to the confederate. A second analysis was conducted with the emotions that participants attributed to fellow teammates in their dyadic interactions.

The analyses of anger and happiness attributed to the confederate supported H2 and H3. The confederate was viewed as angrier in the Resolute conditions ($M = 4.11$, $SD = 2.25$) than in the Flexible conditions ($M = 3.25$, $SD = 2.05$; $t(96.1) = 2.47$, $p < .05$, $d = 0.40$) and as happier in the Flexible ($M = 3.45$, $SD = 1.85$) than in the Resolute conditions ($M = 2.87$, $SD = 1.77$; $t(95.9) = 2.26$, $p < .05$, $d = 0.32$) (see Table 4).

As noted, we followed the analysis of emotion attributed to the confederate with a regression analysis using the dyadic interaction data (the inter-correlations of the dyadic variables are shown in Table 5). As can be seen in Table 6, this analysis further supported H2 and H3.The analysis included three steps, in each of which we

[4] The differences between teams within conditions was not high (ICC1 = 0.21, ICC2 = 0.45), showing that within conditions only 21% of the variance in individual ratings was due to being a member of a specific team. This is not surprising, since members had no previous familiarity with each other and the task was highly structured, so the differences between teams within conditions were negligible.

Table 4
Ratings of confederate anger and happiness and confederate behavior.

	Flexible behavior[A]	Resolute behavior[B]	*T* value
Ratings of confederate anger	3.25[a] (2.05)	4.11[b] (2.25)	2.47*
Rating of confederate happiness	3.45[a] (1.85)	2.87[b] (1.77)	2.26*

Note: Different letters indicate a significant difference, $p < .05$.
Numbers represent means, with *SD*'s in parentheses.
[A] The "flexible" column covers cells C and D in Table 1, where the confederate was angry and flexible or happy and flexible.
[B] The "resolute" column covers cells A and B in Table 1, where the confederate was angry and resolute or happy and resolute.

Table 5
Means, standard deviations and inter-correlations of dyadic variables.

	Mean	*SD*	1	2	3	4	5	6	7	8	9
1. Ratings of partner anger	2.94	1.80	–	–	–	–	–	–	–	–	–
2. Ratings of partner happiness	3.16	1.58	−.18**	–	–	–	–	–	–	–	–
3. Number of negatively toned messages received from partner	2.63	4.66	.28**	−.18**	–	–	–	–	–	–	–
4. Number of positively toned messages received from partner	2.81	4.82	−.02	.17**	−.24**	–	–	–	–	–	–
5. Total number of messages received from partner	15.07	7.74	.15**	−.10**	.28**	.11**	–	–	–	–	–
6. Number of counter offers received from partner	4.90	3.76	.19**	−.06*	.29**	.28**	.38**	–	–	–	–
7. Total amount sold to partner	8.04	3.17	−.23**	.15**	−.10**	.02	−.09**	−.29**	–	–	–
8. Total amount bought from partner	8.04	3.17	−.15**	.17**	−.28**	−.08**	−.18**	−.24**	.22**	–	–
9. Mean selling price to partner	22.25	4.31	−.12**	.08**	.03	.06*	.01	−.03	.43**	.08**	–
10. Mean purchasing price from partner	22.25	4.31	.00	.05	−.18**	−.08**	−.05*	−.10**	.08**	.43**	.02

* $p < .05$.
** $p < .01$.

Table 6
Participants' assessments of emotion of negotiation partners.

	DV = rating of anger of dyad negotiation partner			DV = rating of happiness of dyad negotiation partner		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Number of negatively toned messages received from partner	.26**	.25**	.22**	−.16**	−.16**	−.12**
Number of positively toned messages received from partner	−.02	−.03	−.03	.17**	.17**	.16**
Total number of messages received from partner	.04	−.05	−.03	−.05†	−.05	−.05
Number of counter offers received from partner	–	.15**	.09*	–	−.01	.04
Total amount sold to partner	–	–	−.07*	–	–	.12**
Total amount bought from partner	–	–	−.15**	–	–	.11**
Mean selling price to partner	–	–	.00	–	–	−.01
Mean purchasing price from partner	–	–	.05†	–	–	−.02
R^2	.08	.09	.12	.06	.06	.09
Adjusted R^2	.08	.09	.12	.06	.06	.08
F	33.06**	29.87**	20.07**	25.15**	18.85**	13.74**
Change in R^2	–	.02**	.03**	–	.00	.03**
N	1179	1179	1173	1179	1179	1173

Note: The dependent variable is the evaluation of anger displayed by a negotiation partner. Numbers presented are standardized beta scores.
† $p < .10$.
* $p < .05$.
** $p < .01$.

added an additional component. Step 1 (Model 1 in Table 6) assessed the effects of text-based communication of emotion on attributed anger and happiness (using the number of negatively and positively toned messages and total messages sent – variables 1 2, and 3 of the dyadic interaction indices given above). Step 2 (Model 2) assessed the effect of engaging in negotiation (using the number of counter offers – variable 4 of the indices given above). Step 3 (Model 3) assessed the effects of negotiation outcomes on attributed emotion (using the mean price and volume of sales and purchases – variables 5 through 8 above). The analyses confirm that attributions of anger were influenced by partners' verbal, text-based communication of emotions. Moreover, the analyses confirm that resolute or flexible behaviors influenced attributions of anger (H2) or happiness (H3).

Regarding anger, nearly all the dyadic interaction indices pointed in the expected direction: for example, the fewer shapes exchanged by two players, the higher the attributed anger (Model 3). Perhaps surprisingly, there was no relationship between attribution of anger and one index – namely, selling price. Overall, however, it is clear from the three models that both textual communication of emotion and resolute behavior have an independent effect on the attribution of anger to another person, supporting H2.

The analyses of attributed happiness similarly support H3. Negatively toned messages reduced attributions of happiness (as evident by the significant negative betas), while positively toned messages increased attributions of happiness (as evident by the significant positive betas). The number of counter offers had no effect on attributed happiness, contrary to our prediction of a negative effect. However, a greater number of parts bought or sold (which we view as a sign of greater flexibility) was positively related to attributions of happiness (as evident from the significant betas in Model 3). As with the attribution of anger, we did not find prices (either purchase or selling price) to be significant predictors. Altogether, the dyadic analyses demonstrated that participants

Table 7
Means and *SD*'s of individual NA and PA in congruent and incongruent conditions.

	Congruent[B]	Incongruent[A]	Control	*F* value
NA Time 1 (pre-manipulation)	1.63a (0.74)	1.75[a] (0.85)	1.70[a] (0.73)	7.03**
NA Time 2 (post-manipulation)	2.79[b] (1.35)	3.50[c] (1.13)	3.23[d,†] (1.21)	
PA Time 1 (pre-manipulation)	3.88[a] (1.15)	3.89[a] (1.19)	4.08[a] (1.19)	1.98
PA Time 2 (post-manipulation)	4.07[a,b] (1.06)	3.75[a,c] (1.00)	3.96[a] (1.05)	
Team anger	2.75[a] (1.00)	3.03[b] (1.08)	2.56[a] (0.61)	4.64*
Team happiness	3.52[a] (1.09)	3.20[b] (1.14)	3.02[b] (1.28)	5.86**
Number of negatively toned messages	4.50[a] (3.98)	4.60[a] (4.11)	3.56[a] (2.94)	1.16 n.s.
Number of positively toned messages	5.21[a] (5.76)	5.01[a] (5.75)	2.83[b] (4.32)	5.66**

Notes: Different letters indicate a significant difference, $p < .05$.
A significant difference was found between the Congruent and Incongruent conditions in PA-Time 2, but this difference is not significant within subjects (meaning that there was no significant change within individuals).
Numbers represent means with *SD*'s in parentheses.
† The difference between the Incongruent and the Control conditions is significant in a one-tailed test.
A The "incongruent" column covers cells B and C in Table 1, where the confederate was angry and flexible or happy and resolute.
B The "congruent" column covers cells A and D in Table 1, where the confederate was angry and resolute or happy and flexible.

who acted in a more rigid or resolute manner were viewed as angrier, while participants who acted more flexibly were generally viewed as displaying more happiness.

Effects of Incongruence between text and behavior

Hypothesis 4 predicted that incongruence between the content of text-based communication and behavioral style would evoke negative emotions in others. We tested this hypothesis with three different measures.

Incongruence and individual mood

A repeated measures analysis of reported NA confirmed a significant change in NA ($F(2, 660) = 7.03$, $p < .01$) from Time 1 to Time 2 within the conditions (Table 7), with no significant difference at Time 1 between the conditions. Within subjects, NA increased in all conditions, but the Time 2 NA is highest in the Incongruent conditions ($M = 3.50$, $SD = 1.13$), and significantly different from the Congruent conditions ($M = 2.79$, $SD = 1.35$; $t(265) = 5.16$, $p < .001$, $d = 0.57$). NA in the Incongruent conditions was also higher and significantly different from the Control condition ($M = 3.23$, $SD = 1.21$; $t(217) = 1.69$, $p < .05$ one-tailed, $d = 0.23$).

A repeated measures analysis of PA confirmed no significant change from Time 1 to Time 2 within conditions ($F(2, 666) = 1.98$, $p = .14$), but a significant difference in Time 2 PA. Time 2 PA was significantly lower in the Incongruent conditions ($M = 3.75$, $SD = 1.00$) than in the Congruent conditions ($M = 4.07$, $SD = 1.06$; $t(372) = 2.39$, $p < .05$, $d = 0.25$), supporting H4. There was no difference between the Control condition ($M = 3.96$, $SD = 1.05$) and the other two conditions.

Incongruence and team emotion

Further support for H4 was afforded by the *Team Anger* index, which differed significantly between the experimental conditions ($F(2112) = 4.64$, $p < .05$). Team anger was higher in the Incongruent ($M = 3.03$, $SD = 1.08$) than in the Congruent conditions ($M = 2.75$, $SD = 1.00$; $t(129) = 2.03$, $p < .05$, $d = 0.27$) and the Control condition ($M = 2.56$, $SD = 0.61$; $t(103) = 2.93$, $p < .01$, $d = 0.54$). There was no difference between the Congruent and Control conditions ($t(103) = 1.16$, $p = .25$).

Similarly, the *Team Happiness* index confirmed a significant difference between conditions ($F(2110) = 5.86$, $p < .01$) and a higher value in the Congruent ($M = 3.52$, $SD = 1.09$), than the Incongruent ($M = 3.20$, $SD = 1.14$; $t(136) = 2.33$, $p < .05$, $d = 0.29$) and Control conditions ($M = 3.02$, $SD = 1.28$; $t(97.1) = 3.28$, $p < .01$, $d = 0.42$). There was no significant difference between the Incongruent and Control conditions ($t(97.5) = 1.19$, n.s.). However, the second measure of team negative emotion – the number of *Negatively and Positively Toned Messages* – did not support H4. There were no differences between the Congruent, Incongruent or Control conditions in negatively toned messages ($F(2, 115) = 1.16$, $p = .32$). Regarding positively toned messages, we found no difference between the Congruent and Incongruent conditions ($t(122) = 0.29$, $p = .77$), though we did find significant differences between the Control condition and the other two ($F(2, 103) = 5.66$, $p < .01$): pair-wise comparisons showed significantly fewer positive messages in the Control condition ($M = 2.83$, $SD = 4.32$) than in both the Congruent ($M = 5.21$, $SD = 5.76$, $t(92.7) = 3.14$, $p < .01$, $d = 0.47$) and Incongruent conditions ($M = 5.01$, $SD = 5.75$, $t(92.9) = 2.87$, $p < .01$, $d = 0.43$). Thus, two of the three measures supported H4, confirming that incongruence generates negative emotion.[5]

Additional analyses: effects on individual mood

In addition to testing our hypotheses, we also analyzed the differences between all five conditions on each of our dependent measures separately. Table 8 reports all of these results. Here we will describe in more detail the more interesting findings, which deal with effects on individual mood.

A nested repeated measures analysis of Time 1 and Time 2 PANAS verified a significant difference between all conditions in both negative affect ($F(4, 659) = 15.19$, $p < .001$) and positive affect ($F(4, 665) = 4.88$, $p < .001$). Pair-wise comparisons of participants' NA confirm no significant differences between any conditions at Time 1. At Time 2, participants in the Angry Flexible condition showed the highest NA; this was significant vis-à-vis all the other conditions (Angry_Flexible – Angry_Resolute $t(265) = 2.33$, $p < .05$, $d = 0.29$). There was no significant difference between the Angry Resolute, Happy Flexible and Control conditions. Interestingly, the Happy Resolute condition was lowest in Time 2 NA (Happy_Resolute – Happy_Flexible $t(267) = 4.47$, $p < .001$, $d = 0.55$).

[5] It could be argued that congruence between words and actions simply strengthens the effect of whatever emotion is directly conveyed. Indeed, our analyses found that levels of anger or happiness attributed to the confederate were higher in the Congruent than in the Incongruent conditions: attributed confederate anger in the Angry Resolute condition ($M = 5.57$) was significantly higher than in the Angry Flexible condition ($M = 4.57$) ($t(93.9) = 3.47$, $p < .001$, $d = 0.55$), and attributed confederate happiness was significantly higher in the Happy Flexible condition ($M = 4.48$) than in the Happy Resolute condition ($M = 3.73$) ($t(289) = 3.06$, $p < .001$, $d = 0.36$). Yet as far as contagion is concerned, this was not the trend: overall, incongruence led to greater negative affect while congruence increased positive affect (see Table 7). Thus, the alternative explanation can be rejected.

Table 8
Means and *SD*'s of individual and group affect across all 5 conditions.

	Angry–resolute	Angry–flexible	Happy–flexible	Happy–resolute	Control
Ratings of confederate anger	5.57[a] (1.80)	4.57[c] (1.85)	1.93[b] (1.22)	2.65[d] (1.63)	
Rating of confederate happiness	2.01[e] (1.36)	2.43[e] (1.30)	4.48[f] (1.47)	3.73[g] (1.73)	
NA Time 1 (pre-manipulation)	1.56[a] (0.72)	1.75[a] (0.90)	1.77[a] (0.81)	1.70[a] (0.75)	1.70[a] (0.73)
NA Time 2 (post-manipulation)	3.40[b] (1.42)	3.84[d] (1.06)	3.11[b] (1.07)	2.27[c] (1.06)	3.23[b] (1.21)
PA Time 1 (pre-manipulation)	3.80[d,1] (1.22)	3.99[d,1] (1.12)	3.82[d,1] (1.36)	3.93[d,1] (1.09)	4.08[d,1] (1.19)
PA Time 2 (post-manipulation)	3.71[d,1,d,2,e] (1.06)	3.44[d,2] (0.83)	4.37[f] (0.98)	4.01[d,1,e,f] (1.03)	3.96[d,1,e,f] (1.05)
Team anger	3.29[a] (0.80)	3.47[a] (0.41)	2.22[b] (0.89)	2.58[c] (0.63)	2.56[c] (0.61)
Team happiness	3.11[a] (1.06)	2.92[a] (0.52)	3.91[b] (0.96)	3.50[c] (0.63)	3.02[a] (0.59)
Number of negatively toned messages	6.24[b] (4.13)	5.65[b] (4.57)	2.83[a] (3.03)	3.67[a] (3.37)	3.56[a] (2.94)
Number of positively toned messages	2.82[b] (3.74)	3.79[b] (4.37)	7.51[a] (6.41)	6.40[a] (6.60)	2.83[b] (4.32)

Note: Different letters indicate a significant difference, $p < .05$.
Numbers represent means, with *SD*'s in parentheses.

Summary of results

Hypothesis 1, which predicted that emotion contagion could occur in virtual teams with text-based communication, was confirmed with both individual-level and team-level measures of affect. Hypotheses 2 and 3, which predicted that others' behaviors will lead to attributions of particular emotions, were confirmed, supporting the idea that resoluteness in behavior is construed as a display of anger, and flexibility as a display of happiness. This was supported both by measures of emotions attributed to a confederate and measures of emotions attributed to naïve participants. Hypothesis 4, which predicted that incongruence between text and behavioral cues would elevate negative emotion, was supported by two of three indices.

Discussion

This study addressed three research questions: (1) Can emotion contagion occur when communication is only text-based? (2) Do interpersonal behaviors influence the emotions people attribute to others? (3) How is the emotion of others influenced by the congruence (or incongruence) between the emotions conveyed in text-based communication and behaviors that are perceived to be emotionally charged? Our empirical study of virtual teams working on a negotiation task demonstrates that emotion contagion does occur when communication is only text-based, that behaviors of others are assessed as conveying emotion, and that incongruence between verbal and behavioral cues to emotion has a negative influence on several aspects of team emotion. These findings challenge but also extend the presumption that non-verbal cues are the critical mechanism for the communication of emotion. The challenge lies in that we position text-based communication as fully able to inspire emotion contagion. The extension lies in that we highlight aspects of behavior that on the surface seem completely divorced from emotion – resoluteness and flexibility – as potential cues to emotion.

To our knowledge, this study is the first to show contagion to occur in teams relying only on text-based electronic communication. Our results show that both happiness and anger can spread in teams communicating via text, despite previous findings that individuals overestimate their ability to convey emotion in text-based communication (Kruger et al., 2005). Emotion contagion has previously been documented in computer-mediated communication (Hancock et al., 2008); however, that work focused on dyads in particular, and involved richer communication options (synchronicity) which were not present in our study. We tested a more impoverished communication channel (Daft & Lengel, 1986) – asynchronous text-based email – and we focused on four-member teams, in which the emotion of one member (a confederate) was "caught" by the other members. Comparison to a control condition, where all teammates were naïve and all emotional expressions were authentic and spontaneous, confirms that one individual on a team can increase the negative or positive affect of fellow members and of the team as a whole.

Our results promote the understanding of affect dynamics in computer-mediated communication (Byron, 2008; Hancock et al., 2008) and beyond. As noted by Staples and Webster (2008) and Webster and Wong (2008), the use of electronic means of communication, and more specifically email, is not characteristic of virtual teams alone, but is present today in any form of teamwork. Therefore, our findings regarding emotion contagion based on textual communication and the emotional charge of behavior are relevant to all teamwork.

Building on Epstude and Mussweiler (2009) and Parkinson and Simons (2009), it may be that in the absence of non-verbal cues, people naturally compare themselves to others and use these comparisons as cues for their own emotions. That is, when facing a novel situation, like the participants in our experiment, people search for cues about how they ought to feel. The absence of non-verbal cues triggers a spontaneous process of social comparison (Mussweiler & Epstude, 2009; Mussweiler, Rüter, & Epstude, 2004) based on whatever sources of information are available – in this case, the affective tone of others' text-based communication and/or behavior.

A key strength of our study is the use of multiple level measures of emotion contagion. In addition to the traditional measures of individual-level NA and PA, we used both a "bottom-up" measure of group affect (aggregated individual responses) and a group-level measure (coding of all interactions among members). The results

were similar with all three measures, adding reliability to our findings. One technique we did not employ in this study is the "top-down" perspective, in which outside observers provide top-down ratings of overall group affect (see Barsade, 2002; Barsade & Gibson, 1998; Bartel & Saavedra, 2000). This is clearly an important angle, but we must leave it for future research.

A finding we did not expect is the increased participant NA at Time 2 in all of the experimental conditions, including the control. It may be that participants felt greater negative affect at the end of the session because they felt the task was overly complex or frustrating. But the increased negative affect may also be a reflection of the negativity bias mentioned by Byron (2008), wherein negative email communications draw readers' attention and so have a stronger effect than positive messages. We did find that a happy team member can enhance the happiness of fellow team members. But our results suggest that relying solely on written communications from people working on a complex task is likely to lead to negative emotions.

Emotionally charged behaviors as cues to others' emotion

Our study advances the classic notion that emotions and behaviors are intertwined (Frijda, 1988; James, 1884), taking this concept to another realm. We look at the social aspect of emotion and show that people infer the emotions of others based on observation of their behavior. In this, our study furthers the traditional notion that non-verbal cues convey emotion (Mehrabian, 1972). Our theory and results identify behavioral styles that have an "emotional charge," at least in terms of the emotion attributions and reactions they evoke in other people. Specifically, we show that in a negotiation setting, behavior that is resolute inspires an assessment that others are angry, while flexible behavior conveys an impression of happiness. Our study shows that the influence of these behaviors is distinct from the effects of textual communication of emotion. Thus, behaviors may now be viewed as indirect expressions of emotion, additional to direct verbal communications. Ekman's work (Ekman, 2009; Ekman et al., 1976) has long showed facial, body and voice cues to be valuable indirect indicators of emotion. We extend this to suggest that general patterns of work behavior, such as resoluteness or flexibility in a negotiation situation, are also read as cues to emotion, or at least also influence the emotion attributed to others (Hareli & Rafaeli, 2008).

Our results further show that others' behavior can enhance or interfere with the effects of the verbal text they use to convey emotion. Specifically, an incongruence of behavior and text elevates observers' negative affect. Put simply, people have a hard time when others' actions do not match their words. It seems intuitive that such incongruence engenders anger or frustration in face-to-face interactions. We show that such negative emotions surface when confusion is created by mismatched verbal and behavioral cues even in interactions involving only text-based communication.

In this regard, it is interesting that at the individual level, participants' negative affect increased more in the Angry Flexible than in the Angry Resolute conditions. This seems counter-intuitive, as one might assume that the key issue for participants in our trading game should have been whether needed resources were difficult or easy to obtain. This would be captured most by the confederate's behavior (holding firm vs. easy agreement), meaning that under this assumption, negative affect should have been greatest when a resolute behavioral style was augmented by verbal communication of anger. However, that is not what we found. It may be that the incongruence effect discussed earlier is sufficient to explain this finding. However, we may also look for insight from another area – namely, the availability of cognitive resources. Van Kleef and colleagues (2004b) found that when individuals were less motivated or were working under time constraints, they paid less attention to the emotions of others. In our case, it may be that the Angry Resolute condition was more cognitively taxing than the Angry Flexible condition, and that participants therefore paid less attention to emotional signals from their negotiation partners. Under the Angry Flexible condition, by this reasoning, participants would have had more available cognitive resources, and therefore were able to pay more attention to emotional signals.

Limitations

Our study has several limitations that call for further research. First, the design of our study did not allow us to unravel whether what we were observing had to do more with the *detection* or the *attribution* of emotion. Detection of text-based, computer-mediated emotion has been documented (e.g., Hancock et al., 2008). To our knowledge there has been no research on the detection of emotion from charged behaviors. This was also outside the scope of the current research, since we did not measure how participants displaying resolute or flexible behavior actually felt. We only know that when people (both the confederate and other participants) displayed resoluteness they were viewed as angry, and when they displayed flexibility they were viewed as happy.

Second, for convenience and to ease the analysis process, our study involved a single type of electronic communication and limited scope for non-verbal cues. Future research might explore whether our findings hold up in contexts involving richer media options and greater room for non-verbal signaling (Daft & Lengel, 1986).

Third, the groups we studied were not truly virtual teams. All participants were in the same lab together, and although they did not interact face-to-face during the experiment, they were physically in the same room. Additionally, the team interaction we studied was condensed and relatively rapid, hardly the case in many virtual teams, where geography (e.g., differences in time zone) tends to slow down communication, and where tasks may take days, weeks or months to accomplish. The interactions in our study were longer and less controlled than in many lab studies, extending the external validity of our findings. Here as well, however, further research with real-world teams would be an important extension of our effort.

A fourth potential limitation is that the Resolute conditions by default generated more interactions, which may have given rise to a sense of greater time pressure in participants. We know, for example, that reaching an agreement with a resolute confederate took longer than with confederates in the Flexible conditions. This could not be avoided, as negotiating with a partner who stands his or her ground – the definition of resoluteness – by nature requires repeated attempts at persuasion. However, we are certain that participants in all conditions had ample time to complete the task, so that even if some participants had a subjective sense of time pressure, this was not an objective limitation to task performance.

Finally, we could not, within the scope of this study, examine the effects of the emotion dynamics we depict on task performance. Emotion has been shown to influence group performance when non-verbal cues are available (e.g., Barsade, 2002; Totterdell, 2000). We provide evidence that emotion spreads in virtual teams, and that behavior in such teams has emotional effects. A critical next step is to examine effects of these emotion dynamics on individual and team performance.

Summary

Our study advances the theoretical understanding of emotion contagion, identifying and extending the boundaries of the conditions in which contagion occurs to include instances where

communication is only text based, and to incorporate the emotional cues conveyed by behavior. The study thus challenges the existing belief that non-verbal cues are required for emotion contagion, while also adding elements of behavior to the inventory of signals at work in emotion dynamics. Organizations increasingly rely on communication via email and other electronic means, so understanding the emotion dynamics that occur with such methods is critical. As technology advances, research will be needed on other forms of computer-mediated communication and other behaviors that may be viewed as emotional cues.

Acknowledgments

This work was facilitated by a grant from the Israeli Science Foundation (ISF 429/07) and with the help of The Johns Hopkins Applied Physics Lab. We would like to thank Roy Israely for his contribution to this project. Moreover, we thank three anonymous reviewers for their valuable comments on a pervious version.

Appendix A

Sample sentences used by the confederate.

Angry resolute	Angry flexible	Happy flexible	Happy resolute
What is so hard to understand? This is my price!!!	Whatever... but send those shapes fast! I am tired of waiting!!!	I am happy when you are happy. Enjoy!	Thanks for the offer, but it is a little low...
Are you serious? NO WAY!!! This is making me upset!	How long does it take you to respond??? I agreed to your awful request.	O.k. I can live with this. It is a pleasure working with you!	I will be happy to sell to you, but not at this price.
You've got to be kidding me! Your offer is making me angry.	OK... but you are starting to get on my NERVES!	This is acceptable. I enjoy doing business with you. ☺	I know we can close this deal... we have done it before partner ☺ Please give me a better offer.
Your offers are unacceptable and are driving me CRAZY!	Well, ok... I will give in this time... But this is really making me MAD!	I guess I can agree to this... I am happy we reached an agreement.	I am sorry but I cannot accept at this price. If you can make the price higher we have a deal ☺
This offer really makes me MAD! There is no way I am selling for this price!	I am so angry at you! You are taking advantage of me... but ok, take the parts...	I am willing to settle. Here you go teammate – have a good one!	We are almost there; it will be great if you can agree on this price...

Appendix B

Behavior rules for the confederate

Confederate rules: resolute

- Don't create or change group policy. Try to blend in.
- When receiving a request (someone wanting to buy from you) ALWAYS negotiate and ask for more money. NEVER sell more than 3 shapes at once.
- When sending a request (buying from someone) always try to get a better deal (see details below).
- Always make sure you sell all your shapes each round (this should not be a problem as there is greater demand than supply). If you do not receive any more requests, offer your shapes to others but only in the last 2 min of the round.
- Don't be the first to act. Wait for a request from someone. This means first sell then buy. If you have received no new requests more than a minute after responding to a request, you can move along and send a new request.
- When you cannot receive any shapes, fill orders on your own.
- Don't over buy shapes!

Specific guidelines for interactions:

Selling shapes

1. Upon receiving a request to sell a part to a participant – respond with a counter offer of +4 of the original suggested price.
2. If the participant does not agree and sends another offer, respond with a counter offer of +3 of original price.
3. If the participant does not agree and sends another offer, respond with a counter offer +2 of original price.
4. Do this up to 3 times and then do not budge from the price you stated.

Buying shapes

1. Make an offer that is only +3 above the price it costs you to produce your specialty part on your own.
2. If the participant does not agree respond with a counter offer of +1 above the original price you requested (+4 above your production cost)
3. If the participant does not agree send a counter offer of +2 above the original price you requested (+5 above your production cost)
4. Do this up to 3 times and then do not budge from the price you stated.

Confederate rules: flexible

- Don't create or change group policy. Try to blend in.
- When receiving a request (someone wanting to buy from you) do NOT negotiate unless the price is below your production cost (see specific details below).
- When sending a request (buying from someone) don't appear to be looking for the best deal (see specific details below). Accept any counter offer as long as it is not above your production cost.
- Always make sure you sell all your shapes each round (this should not be a problem as there is greater demand than supply). If you do not receive any more requests, offer your shapes to others but only in the last 2 min of the round.

- Don't be the first to act. Wait for a request from someone. This means first sell then buy. If you have received no new requests more than a minute after responding to a request, you can move along and send a new request.
- When you cannot receive any shapes, fill orders on your own.
- Don't over buy shapes!

Specific guidelines for interactions:

Selling shapes

1. Upon receiving a request to sell a part – accept the request as long as there is no loss involved.
2. If there is a loss, then propose a counter offer for a minor gain of +2.

Buying shapes

1. Send a request that is +7 above the price it costs you to produce your specialty part on your own.
2. If a counter offer is sent, agree to it as long as there is no loss involved.
3. If there is a loss, then propose a counter offer for a minor gain of +2.

References

Barsade, S. G. (2002). The ripple effect: Emotional contagion and its influence on team behavior. *Administrative Science Quarterly, 47*, 644–675.

Barsade, S. G., & Gibson, D. E. (1998). Group emotion: A view from top and bottom. In D. Gruenfeld, B. Mannix, & M. Neale (Eds.), *Research on managing on groups and teams* (pp. 81–102). Stamford, CT: JAI Press.

Bartel, C., & Saavedra, R. (2000). The collective construction of work team moods. *Administrative Science Quarterly, 45*, 197–231.

Bos, N. D., Olson, J. S., Nan, N., & Cheshin, A. (2009). Subgroup biases in partially distributed collaboration. *Journal of Information Technology Research, 2*(1), 1–18.

Brown, W. M., Palameta, B., & Moore, C. (2003). Are there nonverbal cues to commitment? An exploratory study using the zero-acquaintance video presentation paradigm. *Evolutionary Psychology, 1*, 42–69.

Byron, K. (2008). Carrying too heavy a load? Communication and miscommunication of emotion by email. *Academy of Management Review, 33*, 309–327.

Byron, K., & Baldridge, D. C. (2005). Toward a model of nonverbal cues and emotion in email. In *Academy of management proceedings, B1–B6. Academy of management best conference paper*.

Cropanzano, R., Weiss, H., Hale, J., & Reb, J. (2003). The structure of affect: Reconsidering the relationship between negative and positive affectivity. *Journal of Management, 29*, 831–857.

Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements, media richness and structural design. *Management Science, 32*, 554–571.

DeSanctis, G., & Poole, M. S. (1994). Capturing the complexity in advanced technology use: Adaptive structuration theory. *Organization Science, 5*(2), 121–147.

Ekman, P. (2009). *Telling lies: clues to deceit in the marketplace, politics, and marriage*. W.W. Norton Press.

Ekman, P., Friesen, W. V., & Scherer, K. (1976). Body movement and voice pitch in deceptive interaction. *Semiotica, 16*, 23–27.

Elfenbein, H. A. (2007). Emotion in organizations: A review and theoretical integration. *Academy of Management Annals, 1*, 371–457.

Ellseberg, D. (1961). Risk, ambiguity, and the savage axioms. *Quarterly Jounral of Economics, 75*(4), 643–669.

Ellsworth, P. C., & Scherer, K. R. (2003). Appraisal processes in emotion. In R. J. Davidson, H. H. Goldsmith, & K. R. Scherer (Eds.), *Handbook of the affective sciences* (pp. 572–595). New York: Oxford University Press.

Epstude, K., & Mussweiler, T. (2009). What you feel is how you compare: How comparisons influence the social induction of affect. *Emotion, 9*(1), 1–14.

Festinger, L. (1954). A theory of social comparison processes. *Human Relations, 7*, 117–141.

Fineman, S., Maitlis, S., & Panteli, N. (2007). Themed articles: Virtuality and emotion: Introduction. *Human Relations, 60*(4), 555–560.

Forgas, J. P. (1995). Mood and judgment: The affect infusion model (AIM). *Psychological Bulletin, 117*(1), 39–66.

Foroni, F., & Semin, G. R. (2009). Language that puts you in touch with your bodily feelings: The multimodal responsiveness of affective expressions. *Psychological Science, 20*(8), 974–980.

Fredrickson, B. L. (2003). The value of positive emotions. *American Scientist, 91*, 330–335.

Frijda, N. H. (1988). The laws of emotion. *American Psychologist, 43*(5), 349–358.

Frijda, N. H., Kuipers, P., & ter Schure, E. (1989). Relations among emotion, appraisal, and emotional action readiness. *Journal of Personality and Social Psychology, 57*(2), 212–228.

Gross, J. J. (1998). Antecedent- and response-focused emotion regulation. *Journal of Personality and Social Psychology, 74*, 224–237.

Gump, B., & Kulik, J. A. (1997). Stress, affiliation, and emotional contagion. *Journal of Personality and Social Psychology, 72*(2), 305–319.

Hancock, J. T., Gee, K., Cicaccio, K., & Lin, J. M. H. (2008). I'm sad you're sad: Emotional contagion in CMC. In *Proceedings of the 2008 ACM conference on computer supported cooperative work*.

Hareli, S., & Rafaeli, A. (2008). Emotion cycles: On the social influence of emotion in organizations. *Research in Organizational Behavior, 28*, 35–59.

Hatfield, E., Cacioppo, J. T., & Rapson, R. L. (1992). Primitive emotional contagion. In M. S. Clark (Ed.). *Emotion and social behavior review of personally and social psychology* (Vol. 14, pp. 151–177). Newbury Park, CA: Sage Publications.

Hatfield, E., Cacioppo, J. T., & Rapson, R. L. (1993). Emotional contagion. *Current Directions in Psychological Science, 2*, 96–99.

Hunstinger, J. R., Lun, J., Sinclair, S., & Clore, G. L. (2009). Contagion without contact: Anticipatory mood matching in response to affiliative motivation. *Personality and Social Psychology Bulletin, 35*, 909–922.

James, W. (1884). What is an emotion? *Mind, 9*, 188–205.

Johnson, N. A., Cooper, R. B., & Chin, W. W. (2009). Anger and flaming in computer-mediated negotiations among strangers. *Decision Support Systems, 46*, 660–672.

Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1991). Anomalies: The endowment effect, loss aversion, and status quo bias. *The Journal of Economic Perspectives, 5*(1), 193–206.

Kelly, J. R., & Barsade, S. G. (2001). Mood and emotions in small team and work teams. *Organizational Behavior and Human Decision Processes, 86*, 99–130.

Kiesler, S., & Sproull, L. (1992). Group decision making and communication technology.

Kopelman, S., Rosette, A., & Thompson, L. (2006). The three faces of eve: Strategic displays of positive negative and neutral emotions in negotiations. *Organizational Behavior and Human Decision Processes, 99*(1), 81–101.

Kramer, R. M. (1995). Power, paranoia, and distrust in organizations: The distorted view from the top. In R. J. Bies, R. J. Lewicki, & B. H. Sheppard (Eds.). *Research on negotiation in organizations* (Vol. 5, pp. 119–154). Greenwich, CT: JAI.

Kruger, J., Epley, N., Parker, J., & Ng, Z. (2005). Egocentrism over e-mail: Can we communicate as well as we think? *Journal of Personality and Social Psychology, 89*(6), 925–936.

Malone, T. W. (2004). *The future of work: How the new order of business will shape your organization, your management style, and your life*. Boston, Massachusetts: Harvard Business School Press.

Mehrabian, A. (1972). *Nonverbal communication*. Chicago: Aldine-Atherton.

Mehu, M., Grammer, K., & Dunbar, R. I. (2007). Smiles when sharing. *Evolution and Human Behavior, 28*, 415–422.

Mussweiler, T., & Epstude, K. (2009). Relatively fast! Efficiency advantages of comparative thinking. *Journal of Experimental Psychology: General, 138*, 1–21.

Mussweiler, T., Rüter, K., & Epstude, K. (2004). The man who wasn't there – Subliminal social comparison standards influence self evaluation. *Journal of Experimental Social Psychology, 40*, 689–696.

Neumann, R., & Strack, F. (2000). Mood contagion: The automatic transfer of mood between persons. *Journal of Personality and Social Psychology, 79*, 211–223.

Newcombe, M. J., & Ashkanasy, N. M. (2002). The role of affect and affective congruence in perception of leaders: An experimental study. *The Leadership Quarterly, 13*(5), 601–614.

Parkinson, B. (1996). Emotions are social. *British Journal of Psychology, 87*, 663–683.

Parkinson, B. (2005). Interpersonal emotions. In B. Parkinson, A. Fischer, & A. S. R. Manstead (Eds.), *Emotion in social relations: Cultural, group, and interpersonal processes*. Philadelphia, PA: Psychology Press.

Parkinson, B. (2008). Emotions in direct and remote social interaction: Getting through the spaces between us. *Computers in Human Behavior, 24*(4), 1510–1529.

Parkinson, B., & Simons, G. (2009). Affecting others: Social appraisal and emotion contagion in everyday decision making. *Personality and Social Psychology Bulletin, 35*, 1071–1084.

Pugh, S. D. (2001). Service with a smile: Emotional contagion in the service encounter. *Academy of Management Journal, 44*(5), 1018–1027.

Reinig, A. B., Briggs, R. O., & Nunamaker, J. F. (1997). Flaming in the electronic classroom. *Journal of Management Information Systems, 14*(3), 45–59.

Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology, 39*(6), 1161–1178.

Salanick, R. G., & Pfeffer, J. (1978). A social information processing approach to job attitudes and task design. *Administrative Science Quarterly, 23*(2), 224–254.

Schachter, S. (1959). *The psychology of affiliation – Experimental studies of the sources of gregariousness*. Stanford, California: Stanford University Press.

Schachter, S., & Singer, J. E. (1962). Cognitive, social, and physiological determinants of emotional state. *Psychological Review, 69*, 379–399.

Scherer, K. (1984). On the nature and function of emotion: A component process approach. In K. R. Scherer & P. E. Ekman (Eds.), *Approaches to emotion* (pp. 293–317). Hillsdale, NJ: Erlbaum.

Schwarz, N. (1990). Feelings as information: Informational and motivational functions of affective states. In E. Higgins & R. Sorrentino (Eds.). *Handbook of*

motivation and cognition: Foundations of social behavior (Vol. 2, pp. 229–264). New York: Guilford Press.

Schwarz, N., & Clore, G. L. (1996). Feelings and phenomenal experiences. In E. Higgins & A. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 433–465). New York: Guilford Press.

Short, J., Williams, E., & Christie, B. (1976). *The social psychology of telecommunications*. New York: Wiley.

Sinaceur, M., & Tiedens, L. Z. (2006). Get mad and get more than even: The benefits of anger expressions in negotiations. *Journal of Experimental Social Psychology, 42*, 314–322.

Smith, C. A., & Ellsworth, P. C. (1985). Patterns of cognitive appraisal in emotion. *Journal of Personality and Social Psychology, 48*, 813–838.

Staples, S. D., & Webster, J. (2008). Exploring the effects of trust, task interdependence and virtualness on knowledge sharing in teams. *Information Systems Journal, 18*, 617–640.

Stouten, J., & De Cremer, D. (2010). "Seeing is believing": The effects of facial expression of emotion and verbal communication in social dilemmas. *Journal of Behavioral Decision Making, 23*(3), 271–287.

Strack, F., Martin, L. L., & Stepper, S. (1988). Inhibiting and facilitating conditions of human smile: A nonobtrusive test of the facial feedback hypothesis. *Journal of Personality and Social Psychology, 54*, 768–777.

Sullins, E. S. (1991). Emotional contagion revisited: Effects of social comparison and expressive style on mood convergence. *Personality and Social Psychology Bulletin, 17*, 166–174.

Totterdell, P. (2000). Catching moods and hitting runs: Mood linkage and subjective performance in professional sport teams. *Journal of Applied Psychology, 85*(6), 848–859.

Turner, J. C. (1985). Social categorization and the self-concept: A social cognitive theory of group behavior. In E. J. Lawler (Ed.). *Advances in group processes: Theory and research* (Vol. 2, pp. 77–121). Greenwich, CT: JAI Press.

Van Kleef, G. (2009). How emotions regulate social life: The emotions as social information (EASI) model. *Current Directions in Psychological Science, 18*, 184–188.

Van Kleef, G. A., De Dreu, C. K. W., & Manstead, A. S. R. (2004a). The interpersonal effects of anger and happiness in negotiations. *Journal of Personality and Social Psychology, 86*(1), 57–76.

Van Kleef, G. A., De Dreu, C. K. W., & Manstead, A. S. R. (2004b). The interpersonal effects of emotions in negotiations: A motivated information processing approach. *Journal of Personality & Social Psychology, 87*(4), 510–528.

Walther, J. B., & Addario, K. P. (2001). The impact of emoticons on message interpretation in computer-mediated communication. *Social Science Computer Review, 19*, 324–347.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS Scales. *Journal of Personality and Social Psychology, 54*, 1063–1070.

Webster, J., & Wong, W. K. P. (2008). Comparing traditional and virtual group forms: Identity, communication and trust in naturally occurring project teams. *The International Journal of Human Resource Management, 19*(1), 41–62.

Weick, K. (1995). *Sensemaking in organizations*. Thousand Oaks, CA: Sage.

Weiner, B. (1985). An attributional theory of achievement motivation and emotion. *Psychological Review, 92*(4), 548–573.