



Articles

New Perspectives on Emotional Contagion: A Review of Classic and Recent Research on Facial Mimicry and Contagion

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Abstract

Recently, scholars from a wide variety of disciplines, using a variety of scientific techniques, have begun to study the influence of attention, facial mimicry, and social context on emotional contagion. In this paper we will review the classic evidence documenting the role of attention, facial mimicry, and feedback in sparking primitive emotional contagion. Then we will discuss the new evidence which scholars have amassed to help us better understand the role of facial mimicry in fostering contagion and the ability to “read” others’ thoughts, feelings, and emotions. Finally, we will briefly speculate as to where future research might be headed.

Keywords: emotional contagion, facial mimicry, components of emotion

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Introduction

Recently, scholars from a wide variety of disciplines, using a variety of scientific techniques, have begun to study the influence of attention, social context, and facial mimicry on emotional contagion. These far-flung disciplines include cultural psychology, anthropology, primatology, the neurosciences, biology, social psychology, and history. Primitive emotional contagion appears to be a basic building block of human interaction—assisting in “mind-reading” (allowing people to understand and share the thoughts and feelings of others), and facilitating the coordination and synchronization of those interactions. Such contagion is also an important component of empathy.

In this paper we will review the classic evidence documenting the role of attention, facial mimicry, and feedback in sparking primitive emotional contagion¹. Then we will discuss the new evidence which scholars from a variety of disciplines have amassed to help us better understand the role of facial mimicry in fostering contagion. Finally, we will briefly speculate as to where future research might be headed.

Let us begin by defining “emotion” and “primitive emotional contagion,” and reviewing the premises of the theory of emotional contagion.

Emotional Contagion

Defining Emotion

Most social psychologists would probably agree that emotional “packages” are comprised of many components—including conscious awareness; facial, vocal, and postural expressions; neurophysiological and autonomic nervous system activity; and instrumental behaviors. Different areas of the brain process the various aspects of emotion. Yet, because the brain integrates the emotional information it receives, each of the components acts on and is acted upon by the others (Hatfield, Cacioppo, & Rapson, 1994).

Early emotion theorists focused on the question of sequence: Which comes first, the cognitive, somatovisceral, or behavioral aspects of emotion (Buck, 2014)? Recent theorists have moved away from such linear, uni-deterministic reasoning and have decided, instead, that “it depends.” Emotional stimuli may well trigger all three aspects of emotion almost simultaneously. Which appears first depends on the person and the context. Thus, theorists are increasingly asking how the components interact. Laird and Bresler (1992) summarized their position this way:

All components of the emotional episode are ordinarily generated, more or less independently, by some central mechanism, but activation of any one may increase activity of any other. Their interactive effects might arise because of the way the organism is built ... or because of classical conditioning, produced by the long history of paired occurrence of emotional responses (p. 49, original MS.)

Our definition of emotion, then, stresses the importance of all the elements of the emotional “package” in shaping emotional experience and behavior.

Defining Emotional Contagion

Emotional contagion, we believe, is best conceptualized as a multiply determined family of cognitive, psychophysiological, behavioral, and social phenomena. Since contagion can be produced by innate stimulus features, acquired stimulus features, and/or mental simulations or emotional imagery, we say it is *multiply determined*.

Because contagion manifests in a complex of responses, it represents a *family* of phenomena. (An angry stimulus face, for example, may spark an angry face *and* an angry voice: Hawk, 2010; Hawk, Fischer, & van Kleef, 2012). Emotional contagion is also a *multilevel phenomenon*: The precipitating stimuli arise from one individual, act upon (i.e., be perceived and interpreted by) one or more other individuals, and yield corresponding or corresponding/complementary emotions in these individuals. Thus, an important consequence of emotional contagion is an attentional, emotional, and behavioral synchrony that has the same adaptive utility (and drawbacks) for social entities (dyads or groups) as has emotion for any individual.

Some critics have asked, “Why does an angry stimulus sometimes spark not anger but fear in others?” (what some have called *countercontagion*), see Lanzetta and his colleagues (e.g., McHugo, Lanzetta, Sullivan, Masters, & Englis, 1985). We contend that when faced by a powerful and angry adversary, targets *would* “catch” that anger but that anger is likely to be extremely fleeting. People would quickly recognize that they were in trouble, and fear would soon swamp those angry feelings. In brief, contagious anger would be replaced by a flood self-protective fear and a desire to appease the powerful one or to flee.

The focus in this article will be on rudimentary or *primitive emotional contagion*—that process which is relatively automatic, unintentional, uncontrollable, and largely inaccessible to conversant awareness. Hatfield and her colleagues (1994) defined *primitive emotional contagion* as:

The tendency to automatically mimic and synchronize facial expressions, vocalizations, postures, and movements with those of another person's and, consequently, to converge emotionally.

The *Emotional Contagion Scale* was designed to assess people's susceptibility to catching joy and happiness, love, fear and anxiety, anger, and sadness and depression, as well as emotions in general (Doherty, 1997; Hatfield, Cacioppo, & Rapson, 1994, p. 157). This scale has been translated into a variety of languages—including Finnish, German, Greek, Telugu and Hindi (the state language of India), Japanese, Portuguese, and Swedish.

Mechanisms of Emotional Contagion

There is considerable evidence that the process of primitive emotional contagion occurs in three stages: Mimicry → Feedback → Contagion.

Proposition 1. In conversation, people tend to automatically and continuously mimic and synchronize their movements with the facial expressions, vocal productions, postures, movements, and instrumental behaviors of others.

In this paper, we will be considering only facial mimicry. (The literature on the link between any and all forms of mimicry and contagion is simply too large to review it all here.) For a quick but thorough review of the evidence that mimicry is innate, instantaneous, and ubiquitous, see Hatfield, Cacioppo, and Rapson (1994) and Hatfield, Carpenter, and Rapson (2014).

Proposition 2. Subjective emotional experiences are affected, moment-to-moment, by the activation and/or feedback from such mimicry.

Edgar Allan Poe (1915), in "The Purloined Letter," contended that if people consciously imitate others' facial expressions, they will soon come to feel as the others do:

When I wish to find out how wise, or how stupid, or how good, or how wicked is any one, or what are his thoughts at the moment, I fashion the expression of my face, as accurately as possible, in accordance with the expression of his, and then wait to see what thoughts or sentiments arise in my mind or heart, as if to match or correspond with the expression (p. 100).

There is considerable evidence that people do in fact tend to feel emotions consistent with the facial, vocal, and postural expressions they adopt. When people mimic expressions of fear, anger, sadness, joy, love, or disgust, they tend to feel a pale reflection of those *specific* emotions. Evidence for Edgar Allan Poe's contention, that the feedback from mimicry causes us to feel what another feels, comes from a wide variety of sources (see Ekman, Levenson, & Friesen, 1983; Hatfield et al., 1994; Laird, 1984. Additional evidence will be discussed later in this review.)

Proposition 3. Thus, people tend to "catch" others' emotions, moment-to-moment.

Scholars from a variety of disciplines (clinical observers, neuroscientists, primatologists, social psychologists, sociologists, life span researchers, and historians) provide evidence that people do in fact frequently catch one another's emotions (for reviews see Chartrand, Maddux, & Lakin, 2005; Hatfield et al., 1994, 2009, 2014; Hess

& Fischer, 2013; Lundqvist, 1993). This feedback and contagion assists them in understanding the thoughts and feelings of others (Hsee, Hatfield, & Chemtob, 1992).

In light of current researchers' interests, we will add a fourth proposition:

Proposition 4: In attempting to divine another's emotions, people rely on cognitive assessments as well as feedback from the emotions they have caught.

The research on contagion underscores the fact that people use multiple means to gain information about others' cognitive and emotional states. Conscious analytic skills can help one figure out what makes other people "tick". But if people pay careful attention to the emotions they themselves experience in the company of others, they may well gain an extra edge into "feeling themselves" into others' emotional states. Both sources of information provide invaluable information. There is considerable social-psychological and social-psycho-physiological evidence that both what people *think* and what they *feel* may provide valuable, and different, information about others. In one experiment by Hsee, Hatfield, and Chemtob (1992), for example, the authors found that people's conscious assessments of what others "must be" feeling were heavily influenced by what the others claimed to be experiencing. People's own emotions, however, were more influenced by the others' non-verbal and unconscious clues as to what they were really feeling. Other researchers who have explored the role of mimicry, feedback, and contagion on people's ability to read others' emotions include Neal and Chartrand (2011).

The Relationship Between Attention, Mimicry, Feedback, and Emotional Contagion

How important is facial mimicry/feedback for primitive emotional contagion? Is it necessary, sufficient, or merely a small part of emotional experience? Exactly how are the two linked? There is considerable evidence indicating that *generally* the manipulation of people's emotional expressions does spark dramatic changes in their emotional experience.

Ideally, we would expect the most mimicry and contagion when a person, in a natural setting, views someone experiencing and expressing strong emotion via facial, vocal, and postural indicants. Ideally, the stimulus person would be in motion and the emotional display would last for some seconds (for evidence that static expressions produce less contagion than faces in motion, see Ambadar, Schooler, & Cohn, 2005; Sato, Fujimura, & Suzuki, 2008). Since most theorists have assumed that it is the face that is the "mirror of the soul" and the most potent indicator of emotion, they have studied people's reactions to facial displays. Other researchers have argued that other sources are important too—perhaps even more powerful than facial displays. Let us consider that research now.

Evidence supporting a facial mimicry → contagion link

In a variety of studies, researchers have demonstrated that people tend to feel emotions consistent with the facial expressions they adopt and to have difficulty experiencing emotions inconsistent with those they adopt. Furthermore, the link between facial expression and emotion appears to be quite specific: when people produce a facial expression of fear, anger, sadness, or disgust, they are more likely to feel the emotion associated not with just any emotion, but with that specific expression. Let us now consider this research.

In attempting to determine whether facial mimicry does indeed spark contagion, scientists have used a variety of strategies to induce participants to adopt specified facial expressions. Some scholars simply ask participants to

exaggerate or to play down their naturally occurring emotional facial expressions. They then try to find out what effect this has on the subjects' emotional responses. Generally, subjects report that a film was funnier or shocks were more painful when they exaggerated their amusement or pain than when they muted their facial reactions (Kopel & Arkowitz, 1974; Kraut, 1982; Lanzetta, Biernat, & Kleck, 1982; Lanzetta, Cartwright-Smith, & Kleck, 1976; Zuckerman, Klorman, Larrance, & Spiegel, 1981). Others try to "trick" participants into adopting a given emotional expression (Duclos et al., 1989; Kellerman, Lewis, & Laird, 1989; Laird, 1974; Laird, 1984; Laird, Wagener, Halal, & Szegda, 1982; Larsen, Kasimatis, & Frey, 1992; Strack, Martin, & Stepper, 1988). Others arrange things so subjects will unconsciously mimic others' emotional facial expressions (Hsee, Hatfield, Carlson, & Chemtob, 1990, 1993; Hsee et al., 1992).

In all three types of experiments, evidence for the Sherlock Holmes' contention that mimicry and feedback cause people to feel at least faint traces of the emotions another expresses is plentiful. Scholars find that people are affected by the facial expressions they adopt—be they happy or sad (Bush, Barr, McHugo, & Lanzetta, 1989; Hsee et al., 1990, 1992, 1993; Laird et al., 1982; Larsen et al., 1992; Strack et al., 1988; Uchino, Hatfield, Carlson, & Chemtob, 1991), angry (Laird, 1984; Lanzetta & Orr, 1980), or expressing romantic love (Kellerman, Lewis, & Laird, 1989). For more general reviews, see Adelman and Zajonc (1989), Ekman et al. (1983), Hatfield et al. (1994), and Laird (1984).

The Impact of Botox on Emotional Perception and Experience

Theorists have long been interested in the impact of various disabilities say, Bell's Palsy or the Moebius syndrome (which produce facial paralysis), or spinal-cord injuries (which reduce or eliminate peripheral feedback), or the effect of various medications (say, beta-blockers), or the curare derivative succinylcholine (which paralyzes muscles) on the experience of emotion (Reisenzein & Stephan, 2014).

In the past few years, in an intriguing set of experiments, researchers have begun to study the impact of Botox injections on the ability to identify the emotions of others and the readiness to experience emotions oneself. Neal and Chartrand (2011) explored the impact of Botox injections on mimicry and facial feedback on amplifying or dampening emotions. In Experiment 1 they observed people who had recently received Botox injections (which paralyze facial muscles). They found that Botox patients were less successful at identifying emotions than were their peers. In a second experiment, they applied a gel that made the skin resistant to underlying muscle contractions. In this situation, participants were forced to exaggerate their facial reactions and, as predicted, emotion perception improved. (Additional evidence that Botox also shapes people's emotional experiences can be found in Finzi & Rosenthal, 2014)

In a series of experiments, researchers have found that the link between facial expression and emotion is generally quite specific: When people produce a facial expression of fear, anger, sadness, or disgust, they are more likely to feel the emotion associated not just with any emotion, but with that specific expression - i.e., those who adopt a sad expression feel sad, not angry (Duclos et al., 1989; Duncan & Laird, 1977; Kellerman et al., 1989; Kleinke & Walton, 1982; Laird, 1974, 1984; Laird & Bresler, 1992; Laird & Crosby, 1974; Laird et al., 1982; Larsen et al., 1992; McArthur, Solomon, & Jaffe, 1980; Rhodewalt & Comer, 1979; Rutledge & Hupka, 1985; Strack et al., 1988). Only a few researchers have failed to secure such results. For a critique of the facial feedback research, see Matsumoto (1987), Tourangeau and Ellsworth (1979), and Winton (1986).

Cross-Channel Mimicry and Contagion

Hawk, Fischer, and van Kleef (2012), utilizing the theory of embodied responses, argues that emotion is an integrated process. They observe:

Embodiment theories ... propose that individuals process emotion-related information by reactivating neural states involved in their own prior perceptual, expressive, and affective experiences. Facial and vocal expressions hold differential associations with the visual and auditory perceptual modalities, respectively, but both represent examples of behaviors that bridge motoric and affective modalities. When individuals experience a combination of emotional states and nonverbal expressions with sufficient frequency, such as feeling happy, smiling, and laughing, later introspection about a stimulus (e.g., another's laughter) can activate dynamic simulations of associated behaviors and feelings. This pattern completion "fills in" unperceived elements of the original experience ... and may manifest as overt motor behavior (e.g., smiling) and subjective states (e.g., feeling happy). These simulations, based on limited perceptual information, facilitate cognitive, emotional, and behavioral engagement with related stimuli (p. 796).

On the basis of this reasoning, the authors postulate the existence of cross-channel mimicry. (For example, in a dark and smoky comedy club, when a patron witnesses the laughter of those around him, he is likely to smile as well as mimicking the audience's laughter. Both sensory modalities combine to lighten his mood.)

In a series of studies, focusing on facial and emotional reactions to nonverbal emotion vocalizations, Hawk and his colleagues demonstrated that: (1) both hearing and reproducing vocalizations of anger, disgust, happiness, and sadness produced specific, congruent, facial behaviors, as well as congruent self-reported emotions; (2) the inhibition of congruent facial actions impaired listeners' processing of emotion vocalizations, as well as their experiences of congruent subjective states. Results supported the idea that cross-channel simulations of others' states serve facilitative functions similar to more strict imitations of observed expressive behavior, suggesting flexibility in the motoric and affective systems involved in emotion processing and interpersonal emotion transfer. Additional documentation of cross-channel contagion comes from Hietanen, Surakka, and Linnankoski (1998).

Summary: Thus far, we have focused on reviewing the voluminous research documenting that people do indeed tend to mimic the facial expressions of others and that the feedback from such mimicry (and the resulting emotional contagion) provides valuable information as to others thoughts and feelings. In a recent survey of facial mimicry-contagion research conducted since the previous research, Schneider (2008, p. 8) concluded:

There is overwhelming evidence not only that viewing emotional facial expressions elicits facial expressions in the viewer (Blairy, Herrera, & Hess, 1999; Dimberg & Thunberg, 1998; Dimberg, Thunberg, & Elmehed, 2000; Hess & Blairy, 2001; Lundqvist & Dimberg, 1995; Sloan, Bradley, Dimoulas, & Lang, 2002; Weyers, Muhlberger, Hefele, & Pauli, 2006; Wild, Erb, & Bartels, 2001), but that viewing emotional facial expressions elicits changes in emotional state (Blairy et al., 1999; Hess & Blairy, 2001; Laird et al., 1994; Lundqvist & Dimberg, 1995; Wild et al., 2001). Furthermore, several studies have shown that the facial expressions elicited when viewing emotional faces are difficult to suppress (Dimberg, Thunberg, & Grunedal, 2002; Kappas, Bherer, & Thériault (2000)

"Sounds definitive ... but science always moves on and what was once so obvious becomes open to dispute. Let us now turn to a review of the new directions that emotional contagion research has taken, focusing on mimicry."

Recent Developments in Mimicry/Contagion Research: Mimicry and Contagion in Social Context

Although mimicry and contagion are ubiquitous, theorists have pointed out that culture, gender, and social context can enhance or inhibit these processes. Evolutionary psychologists have argued that mimicry serves the adaptive function of aiding social survival. According to them, mimicry is a kind of social glue that binds people together (Chartrand et al., 2005; Lakin & Chartrand, 2003; Lakin, Jefferis, Cheng, & Chartrand, 2003).

Today, the scholars who are most systematically studying the impact of social factors on mimicry and emotional contagion are Ursula Hess and Agneta Fischer (2013), who take a cognitive approach to mimicry, arguing that it is a case of embodied simulation. They claim that:

... emotion recognition naturally occurs within a social context. We suggest that emotional mimicry is related to the understanding of an emotion in context and is involved in regulating one's relation with the other person, rather than being the synchronization of individual muscle actions ... In other words, emotional mimicry involves the interpretation of signals as *emotions*, conveying emotional intentions, in a specific context (pp. 144, 146).

The authors review 40 social-psycho-physiological studies. Generally, in such studies researchers present a flash of a face (displaying, say, a happy or sad expression) and then measure, say, the viewers' zygomaticus major (happiness) or corrugator supercilii (sadness) activity. Although most critics would assume that in such traditional studies social context is entirely absent—challenging their contention that context is the *sine qua non* of mimicry—the Hess and Fischer (2013) argue that:

Finally, even in research in which contextual cues are not provided, as has been the case for most facial mimicry research, context information is necessarily implied because faces themselves implicitly provide social context by informing us about the social identity of the expresser (ethnicity age, gender, etc.). This categorization then activates stereotypic expectations regarding the person's likely emotional reactions. (p. 147)

Given such a generous definition of “context,” it is almost impossible to imagine an emotional display that doesn't include information as to “context.” In any case, the authors argue that whether or not mimicry occurs depends on: the stimulus's head orientation and gaze direction; his or her facial expressions, how positively the subject views the stimulus, how competitive they are, and how similar they are.

Recently an impressive array of excellent experiments have been conducted to determine what impact (if any) culture, gender, and social context have on various types of mimicry and contagion.ⁱⁱ Sparked by current theories they have investigated such questions as:

- Are people in different cultures equally likely to mimic and catch others' emotions?
- What about men and women—do they differ in susceptibility to contagion?
- Does a person's desire to affiliate with the stimulus person affect emotional contagion?
- Are the participants friends, strangers, or enemies? Are participants with people who are similar or dissimilar? Are they with people from an in-group or an out-group?)
- Who has power in the relationship? (The one sending the emotion or the one receiving it?)

- What is the goal of the interaction?
- How willing are the sender and receiver to have the other read his or her emotions? (Does one wish to communicate one's true thoughts and feelings or to mislead the other?)

All of these factors have been found to have an impact on mimicry (facial, vocal, and behavioral mimicry) and contagion (see [Chartrand et al., 2005](#); [Chartrand & Lakin, 2013](#); [Hatfield et al., 1994](#)).

Alas, once again whether these cultural, gender, and contextual factors shape not just mimicry and contagion (separately) but alter the precise nature of the relationship between the two, we do not know. The results of this research are suggestive but not definitive.

Culture

The spontaneous mimicry of facial expression and subsequent emotional contagion appears to be a cultural universal. Facial mimicry and emotional contagion have been observed in American, Finnish, Dutch, Western European, and Japanese participants as well as in participants from a number of other countries ([Stel & van Knippenberg, 2008](#); [Surakka & Hietanen, 1998](#); [Tamura & Kameda, 2006](#)). Many theorists, however, have speculated that culture should have at least some impact on people's tendency to mimic others' facial expressions. They contend, for example, that people in individualistic cultures should be less prone to mimicry and contagion than are people in collectivist cultures (see [Markus & Kitayama, 1991](#); [Singelis, 1995](#), for an elaboration of this argument). Evidence in support of these reasonable sounding hypotheses is limited, however (again, see [Singelis, 1995](#)). Often no cultural differences are found.

Gender

Many theorists have proposed that women pay more attention to others' emotions, and thus are more susceptible to mimicry and emotional contagion than are men ([Buck, 1984](#); [Doherty, Orimoto, Singelis, Hatfield, & Hebb, 1995](#); [Hall, 1978](#); [Surakka & Hietanen, 1998](#)). Alas, many other scholars have found *no* gender differences in susceptibility to mimicry and feedback; some even finding that men are more susceptible to facial mimicry and contagion than are women ([La France & Ickes, 1981](#); [Lundqvist & Dimberg, 1995](#)). We have speculated that apparent gender differences may not necessarily be due to gender but to the type of stimuli that researchers typically employ in assessing mimicry and contagion. Often scholars show people, expressing strong emotion, as they describe highly emotional events, and watch subjects' responses. We know there are differences in men's and women's comfort with such personal revelations. We speculated that if subjects were to watch a sports event—with winners jubilant and losers heartbroken—gender differences might reverse or even disappear. In a preliminary study using a sports setting we, in fact, found both men and women equally susceptible to mimicry and contagion using such stimuli ([Arakawa, 2012](#)).

Power

Several scholars have speculated that the powerful have no particular reason to care about the thoughts and feelings of their subordinates; thus, they may pay little attention to them. Subordinates, on the other hand, have every reason to be interested in discovering what makes their superiors tick. Because they must understand those with power over them if they are to win their favor, they pay close attention to them. At the time of the Selma marches, Martin Luther King expressed surprise that whites often had very little insight into the thoughts, feelings, and experiences of blacks. Blacks *had* to know a great deal about whites. Thus, theorists argue, the powerful should be less likely to attend to, mimic their facial expressions, and share the emotions of their inferiors. Research-

ers have assembled some evidence that possessing power and being sensitive to others' feelings are negatively correlated (Hall, 1979; Snodgrass, 1985). In fact, however, power appears to have paradoxical effects on contagion (Carr, Winkielman, & Oveis, 2014; Hsee et al., 1990), sometimes sparking nurturance, sometimes sparking exploitation. This, naturally, produces a different relationship between power, mimicry, and contagion (Hsee et al., 1990). Clearly, subsequent research must investigate these factors.

Liking, Similarity, and Ingroup Versus Outgroup Status

Recently theorists have come to realize the critical importance of liking, similarity, and ingroup versus outgroup status in influencing a wide range of social behavior. So too with mimicry and contagion. The consensus is that pre-existing rapport and/or a desire to affiliate (see Aylward, 2008; Bailenson & Yee, 2005; and Hess & Fischer, 2013, for a summary of this research), similarity (see Stockert, 1994, for a summary of this research), and group membership do indeed have a profound impact on mimicry and contagion (Chartrand & Lakin, 2013; Hess & Fischer, 2013; van der Schalk et al., 2011). Yet, in our own work and that of our graduate students, we have come to recognize that these factors might be weaker than one might expect. Decade after decade we have tried to demonstrate that these factors matter (as logically it seems they must) only to fail yet again to secure them in carefully crafted experiments (see Aylward, 2008 and Stockert, 1994). After each failure, our designs grew more complex and our research methodology more sophisticated ... to no avail. Our research group has never been able to demonstrate that these factors matter.

Ideally, given the checkered history of research in this area, scholars should collect examples of success and failure, and conduct meta-analyses, to determine how important these factors are—if at all. It seems that contagion is often simply too ubiquitous to be influenced by such factors.

How Tightly Linked Are Mimicry and Contagion?

We began our paper by observing that emotional packages are complex bio-behavioral systems, comprised of many components—including conscious awareness, facial, vocal, and postural expressions; neurophysiological and autonomic nervous system activity; and instrumental behaviors—and that all may well contribute to emotional experience. Different areas of the brain process the various aspects of emotion. Yet, because the brain integrates the emotional information it receives, each of the components acts on and is acted upon by the others. Our definition of emotion, then, stresses the importance of *all* the elements of an emotional “package” in shaping emotional experience and behavior. Which are most important in any given situation “depends.”

Other researchers have been more ambitious. Brilliant logicians, possessing a vast knowledge of the scientific literature, have crafted creative experiments, using state-of-the-art techniques, in hopes of understanding the nature of emotion. (More than 4,000 studies have been conducted on the topic [Schneider, 2008]). They have speculated about the importance of various aspects of emotion, asking if a given component is a necessary cause, a sufficient one, or just a correlate? A first system or one of many? A conditioned response or an innate characteristic? Can scholars integrate all the existing theories—in sort of an Einsteinian Unified Theory of emotion (see Schneider, 2008, and Whissell, 1985, for a discussion of these issues)?

As yet, however, no one has managed to provide a cognitive map through this maze. One of the oldest theories, dating from Aristotle, Spinoza, Descartes, and James, is the notion that people's emotions arise from a perception of their circumstances—be they delightful or dire. In more recent years, theorists have argued that “emotions

consist of patterns of perception, or rather interpretation, and their correlates in the central and peripheral nervous systems (see [Ellsworth & Scherer, 2009](#), p. 572). Modern day theorists who have taken this approach include [Ellsworth and Scherer \(2009\)](#); [Frijda \(1986\)](#), and [Lazarus \(1966\)](#),

For other traditional arguments as to the primacy of one or another of these systems, and exactly how they interact, see: [Kihlstrom \(2007\)](#): conscious/unconscious triggers of emotion; [Winkielman and Schooler \(2012\)](#): for the role of conscious awareness in emotional experience; [Halberstadt, Winkielman, Niedenthal, and Dalle \(2009\)](#) and [Schachter and Singer \(1962\)](#): cognitive interpretations of ambiguous arousal; [James \(1890/1984\)](#): visceral changes; [Laird \(1974\)](#): expressive muscular feedback; [Bloch, Orthous, and Santibañez \(1987\)](#): facial, breathing, and postural feedback; [de Groot, Smeets, Kaldewaij, Duijndam, and Semin \(2012\)](#): chemosignals; [Zajonc, Murphy, and Inglehart \(1989\)](#): venal blood flow to the brain; and [Ekman et al. \(1983\)](#): activities of the Autonomic Nervous System; among others. Of course, all of these theories have been subject to sharp critiques.

In 1923, Alfred North Whitehead and Bertrand Russell published their great *Principia Mathematica*, probably the most famous text ever written on the foundation of mathematics. In later years, in commenting on the mental labor required to craft the book, Russell confessed: “The difficulty and the labour were too great for any pleasure to be possible. [M]y intellect never quite recovered from the strain.” He admitted that during his labors he would stand on the footbridge at Kennington, near Oxford, and feel close to putting himself under the trains. Twenty-five years later he remarked that, due to the level of concentration involved in writing *Principia*, he “had actually damaged his brain” (quoted in [Blackwell, 2011](#), pp. 152-153).

In truth, that is how we feel when asked to answer a multitude of questions about the precise nature of the link between facial (and all other kinds of mimicry), feedback, and contagion of the various emotions. In our initial formulation, we defined primitive emotional contagion as:

The tendency to automatically mimic and synchronize facial expressions, vocalizations, postures, and movements with those of another person's and, consequently, to converge emotionally.

We argued that cognitive processes plus cues from emotional contagion can provide immensely valuable insights into others' thoughts and feelings ([Hsee et al., 1992](#)). About the importance of all possible causes of emotion, compared to the subtle running “print-out” of facial feedback, and the exact process of the facial mimicry, feedback, contagion process, as well as how all the various components of emotion interact, we had little to say. It simply seemed (and seems) too early to make a definitive statement. Today, however, other more intrepid theorists are still boldly attacking the tough questions.

[Hess and Fischer \(2013\)](#) have long been interested in the impact of social context on facial mimicry. They focus on such antecedents as one's positive or negative attitude toward others (Are people in a relationship? Do they like one another? Is their relationship cooperative or competitive? Do they wish to affiliate?). [Hess and Blairy \(2001\)](#) argue that in everyday life, people's facial expressions are relatively weak and idiosyncratic and may not spark contagion. It is cartoons and staged, prototypic expressions that account for the mimicry-contagion link so often documented in the literature. (The reader may recall that we, like [Sato, Fujimura, and Suzuki \(2008\)](#) take the opposite position, arguing that the more naturalistic an emotional expression, the more modalities in which the expression appears, and the more movement the person displays, the more powerful emotional contagion should be.)

In one study, [Hess and Blairy \(2001\)](#) asked women to rate a series of short video clips of people expressing anger, sadness, disgust, and happiness. They found that while mimicry was robust (people mimicked the faces of people expressing anger, sadness, disgust, and happiness) and emotional contagion was prevalent (people were swept up in others' happiness and sadness), the link between the two (i.e., mimicry and contagion) was tenuous. A meditational analysis found no link between mimicry and contagion. Why that is so, we do not know.

One problem is, of course, that in any small collection of studies we can never be certain if (in a given experiment) there is truly no correlation between two variables or if there were design or measurement flaws that accounted for the lack of results (see [Cacioppo, Berntson, Lorig, Norris, Rickett, & Nusbaum, 2003](#) and [Cumming, 2012](#), for a discussion of the statistical and methodological problems that plague emotion researchers). In the above case, how do we make sense of the fact that in, say, 50 experiments a brief flash of a face (say 300–400 msec of exposure: [Dimberg & Thunberg, 1998](#)), produced mimicry and emotional contagion while in the 51st it did not? Were the 50 studies merely statistical artifacts (that may be the case, since only positive studies are published), or is it the single study that is more likely dubious? What about measurement errors? In a recent issue of *Emotion Review* ([Russell & Harris, 2013](#)), a plenitude of papers reported that in studying subjects' expressions of "basic emotions," the correlations between subjects' self-reports, experimenters' ratings, [Ekman, Friesen, and Hager's \(2002\)](#) FAC scores, fMRI measures, and the like were typically weak or non-existent. Given these difficulties, only more rigorous and fine-tuned research will answer the question as to what is the exact link between mimicry and emotional contagion (see [Lundqvist, 1993](#) for a fine discussion of this argument.) Nonetheless, the Hess and Fischer theory should certainly be added to all the other theories we have just surveyed, which attempt to articulate the nature of emotion.

A few other studies have also found that experimental stimuli (be their faces, etc.) may produce only mimicry, only contagion, neither one, or both. They also sometimes find mimicry/contagion for some emotions and not for others ([Blairy, Herrera, & Hess, 1999](#); [Gross & Levenson, 1993, 1997](#); [Gump & Kulik, 1997](#); [Lundqvist, 1993](#)). For an extensive review of this research, see [Hess and Fischer \(in press\)](#).

We should note that some theorists go further than preceding theorists in questioning the link between mimicry and contagion. They insist that, under the right conditions, people may mimic and "catch" emotions very different from the ones that they are observing ([Hess & Fischer, in press](#); [Lanzetta & Englis, 1989](#)). A few studies have even demonstrated counter-mimicry. People may feel amusement when another sobs dramatically, feel terrified with encountering an aggressive thug in a dark alley, feel Schadenfreude when seeing an enemy suffering, or be jealous when seeing a rival smirk in victory. In one study, for example, participants who were engaged in a cooperative activity exhibited traditional mimicry while those who were competing exhibited counter-mimicry: they experienced joy at their rival's suffering ([Lanzetta & Englis, 1989](#)). Unfortunately, here again, we do not really know whether participants initially showed a flash of mimicry, while subsequently a recognition of the fulfillment (or thwarting) of their own selfish interests swept in and swamped the delicate moment-to-moment mimicry and primitive emotional contagion or if they displayed counter-mimicry from the start. Again, only subsequent research will illuminate this process. That is what makes this whole area so exciting. There is much work yet to be done to settle these basic questions. Our best guess at the moment, however, is that facial, vocal, and postural mimicry generally produce emotional feedback that sparks contagion. In our own research, the link seems to be a powerful one.

Development of Standardized Materials for Sparking Mimicry-Contagion

One appealing development in mimicry/contagion research is the development of a standard set of stimuli for sparking mimicry/contagion. Thirty years ago, when we began research on mimicry/contagion, we wrote to many stars in the field to find out if we could use their emotional stimuli. Generally, scholars such as John Lanzetta informed us that they had used clips from popular movies or some such. Looking at the clips the researchers provided, however, we were dumbfounded to discover that they reflected a mish-mash of emotions. Clips from *Five Steps*, for example displayed surprise, fear, and anger. Later researchers tried to solve this problem by using single faces, often based on Ekman's prototypes, or tapes of men and women from various ages and ethnic groups describing their emotional experiences, as their stimuli. In almost all cases, often because of IRB strictures, these tapes are not available to other researchers.

Recently, Skyler Hawk, Job van der Schalk, and colleagues (Hawk, van Kleef, Fischer, & van der Schalk, 2009; van der Schalk et al., 2011) attempted to remedy this defect, producing standard stimuli for the various emotions: providing prototypic video clips of faces and voices. These are now available from the first authors (s.t.hawk@cuhk.edu.hk, VanderSchalkJ@cardiff.ac.uk).

For those who wish to minimize gender differences, clips of ecstatic and disconsolate baseball audiences (using the finale of Game 6, of the 2011 World's series—a tremendously suspenseful game) contact Dr. Dana Arakawa Dana.arakawa@gmail.com.

Discoveries From New Disciplines, Utilizing New Technologies, for Establishing the Mimicry-Contagion Link

Recently, cognitive neuroscientists, chemists, and medical researchers have entered the debate as to the role of mimicry in mimicry/feedback/and contagion. They have used such traditional methods as functional magnetic resonance imaging (fMRI), electroencephalography (EEG), or transcranial magnetic stimulation (TMS), but increasingly psychopharmacological, psychoneuroendocrinological, and genetic methods to investigate the processes of contagion and empathy (Lamm & Silani, 2014). Their perspectives have greatly enhanced our understanding of these processes (see Hatfield, Rapson, & Le, 2009; Levenson, 1988).

Neuroscientists recently made a big splash with their discovery of mirror neurons and their role in emotion. Their discoveries provide some insight into why people may so readily “catch” the emotions of others and why it is so easy for people to be in sync with other people's thoughts, emotions, and behaviors. Neuroscientists point out that certain neurons (canonical neurons) provide a direct link between perception and action. Other types of neurons (mirror neurons) fire when primates perform certain actions *and* when they observe other animals perform the same kinds of action.

Rizzolatti (2005) and his colleagues at the University of Parma, for example, monitored the brains of macaque monkeys as they watched another monkey performing an activity (grasping a peanut). They made a fascinating discovery: mirror neurons—a type of brain cell that responds the same way when monkeys (or humans) perform an action as when they merely witness another monkey (or human) performing the same action! Researchers have suggested that these brain structures may well be responsible for “mind-reading” (understanding the intentions

of others), emotional contagion, and empathy in humans (see Blakemore & Frith, 2005; Glenberg, 2011; Iacoboni, 2005; Rizzolatti, 2005; Wild et al., 2003).

One important question pertains to the sequential order of mirror neuron firing and mimicry. Iacoboni and his colleagues contend that their monkeys were “doing nothing”—simply observing the other animal—when the mirror neuron firing occurred (see Iacoboni, 2005; Rizzolatti, 2005; Wild et al., 2001, 2003). We suspect that this may not be so. In films of these sessions, it appears that at every instant, the primate was mimicking the stimulus person’s (or monkey’s) grasping action.

Depending on the timing, the mirror neuron firing may have *caused* the monkey’s grasping OR the animal’s mimicked grasping may have caused the neuronal firing. That is, the same brain areas may fire when an animal intentionally acts and when it performs the same action via mimicry. Only subsequent research will tell us which order is the correct one. Both processes, of course, would be of great interest to emotional contagion researchers.

Recently, other theorists (such as embodied cognition theorists) have suggested that the act of imagining, perceiving, or mentally representing a behavior will excite the motor programs necessary for the activation of that behavior, thus causing automatic imitation of that behavior (Blakemore & Frith, 2005; Chartrand et al., 2005; Gallese, Fadiga, Fogassi, & Rizzolatti, 1996; Jeannerod, 1994; Rizzolatti, Fadiga, Fogassi, & Gallese, 1996). There is evidence that such automatic mimicry is innate (Field, Woodson, Greenberg, & Cohen, 1982; Termine & Izard, 1988).

These “mirror neurons” also create interference in participants’ behavior when participants are instructed to perform a contradictory behavior while perceiving an incongruent behavior—for example when one is asked to shake one’s head “No” while watching another person nod “Yes” (Brass, Bekkering, & Prinz, 2001; Craighero, Bello, Fadiga, & Rizzolatti, 2002; Kilner, Paulignan, & Blakemore, 2003).

Conclusions

The quest to discover the nature of emotion, facial, vocal, postural, and expressive mimicry has fascinated researchers since Darwin’s time. An abundance of theories exist. Many of the theoretical and research questions have been debated. There is clear evidence that if participants are attending, emotional stimuli spark mimicry, feedback, and contagion. What is now in question is (1) Are their social and contextual factors that shape primitive emotional contagion, or does contagion always occur? Is it simply the fact that social and contextual factors shape subsequent emotion? (2) *If* social and contextual factors matter in shaping the prevalence and intensity of emotional contagion, what are the factors that matter? Are culture, gender, power, attraction, positiveness/negativeness of the relationship, familiarity, and motivations important precursors? How much do they matter? (3) What accounts for counter-contagion?

We have proposed that primitive contagion is always immediate and ubiquitous. It is simply the fact that *after an initial burst of mimicry/feedback/contagion*, appraisal processes and an awareness of one’s own desires and motivations may then enter the picture and swamp (or reverse) primitive contagion?

We can only hope that the entry of scholars from a wide variety of disciplines, using a wide array of new techniques, can help answer these questions. One caveat: There is a tendency for researchers to be aware only of research done from their own perspective. It would be a tragedy if scholars ignored the wide array of carefully crafted research that that gone before and spent their time reinventing the wheel. In reading the hundreds of papers that we reviewed

for this article, we have found that there is some evidence that new entrants into emotion research are guilty of neglecting their predecessors' work. It is hoped that review papers such as this one will give scholars the tools they need so that they can familiarize themselves with what has gone before and spend their intellectual capital and research energies on moving the field forward.

Notes

- i) For brevity's sake, throughout this paper we will use the term "emotional contagion" as shorthand for "primitive emotional contagion."
- ii) Although this chapter is primarily concerned with *facial mimicry* and contagion, in this section—since the same sort of logic suggests that culture, gender, and social factors should affect mimicry of all types (including facial mimicry)—we will cite all potentially the relevant research here, regardless of the type of mimicry involved and regardless of how contagion (or the lack thereof) is assessed.

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References

- Adelmann, P. K., & Zajonc, R. B. (1989). Facial efference and the experience of emotion. *Annual Review of Psychology*, *40*, 249-280. doi:10.1146/annurev.ps.40.020189.001341
- Ambadar, Z., Schooler, J. W., & Cohn, J. F. (2005). Deciphering the enigmatic face: The importance of facial dynamics in interpreting subtle facial expressions. *Psychological Science*, *16*, 403-410. doi:10.1111/j.0956-7976.2005.01548.x
- Arakawa, D. R. (2012). *Emotional contagion and its relationship to mood* (Doctoral dissertation, University of Hawaii at Manoa, Honolulu, HI). Available from ProQuest Dissertations and Theses database. (UMI No. 3569048)
- Aylward, A. G. (2008). *Effect of context on mimicry and emotional contagion: Does disliking inhibit mimicry and emotional contagion?* (Unpublished master's thesis). University of Hawaii, Honolulu, HI.
- Bailenson, J. N., & Yee, N. (2005). Digital chameleons: Automatic assimilation of nonverbal gestures in immersive virtual environments. *Psychological Science*, *16*, 814-819. doi:10.1111/j.1467-9280.2005.01619.x
- Blackwell, K. (2011). The wit and humour of *Principia Mathematica*. *Russell: The Journal of Bertrand Russell Studies*, *31*, 151-160. doi:10.15173/russell.v31i1.2198
- Blairy, S., Herrera, P., & Hess, U. (1999). Mimicry and the judgment of emotional facial expressions. *Journal of Nonverbal Behavior*, *23*, 5-41. doi:10.1023/A:1021370825283
- Blakemore, S. J., & Frith, C. D. (2005). The role of motor contagion in the prediction of action. *Neuropsychologia*, *43*, 260-267. doi:10.1016/j.neuropsychologia.2004.11.012

- Bloch, S., Orthous, P., & Santibañez, G. (1987). Effector patterns of basic emotions: A psychophysiological method for training actors. *Journal of Social and Biological Structures*, *10*, 1-19. doi:10.1016/0140-1750(87)90031-5
- Brass, M., Bekkering, H., & Prinz, W. (2001). Movement observation affects movement execution in a simple response task. *Acta Psychologica*, *106*, 3-22. doi:10.1016/S0001-6918(00)00024-X
- Buck, R. (1984). *The communication of emotion*. New York, NY: Guilford Press.
- Buck, R. (2014). *Emotion: A biosocial synthesis*. Cambridge, MA: Cambridge University Press.
- Bush, L. K., Barr, C. L., McHugo, G. J., & Lanzetta, J. T. (1989). The effects of facial control and facial mimicry on subjective reactions to comedy routines. *Motivation and Emotion*, *13*, 31-52. doi:10.1007/BF00995543
- Cacioppo, J. T., Berntson, G. G., Lorig, T. S., Norris, C. J., Rickett, E., & Nusbaum, H. (2003). Just because you're imaging the brain doesn't mean you can stop using your head: A primer and set of first principles. *Journal of Personality and Social Psychology*, *85*, 650-661. doi:10.1037/0022-3514.85.4.650
- Carr, E. W., Winkielman, P., & Oveis, C. (2014). Transforming the mirror: Power fundamentally changes facial responding to emotional expressions. *Journal of Experimental Psychology: General*, *143*, 997-1003. doi:10.1037/a0034972
- Chartrand, T. L., & Lakin, J. L. (2013). The antecedents and consequences of human behavioral mimicry. *Annual Review of Psychology*, *64*, 285-308. doi:10.1146/annurev-psych-113011-143754
- Chartrand, T. L., Maddux, W. W., & Lakin, J. L. (2005). Beyond the perception-behavior link: The ubiquitous utility and motivational moderators of nonconscious mimicry. In R. R. Hassin, J. S. Uleman, & J. A. Bargh (Eds.), *The new unconscious* (pp. 334-361). New York, NY: Oxford University Press.
- Craighero, L., Bello, A., Fadiga, L., & Rizzolatti, G. (2002). Hand action preparation influences the responses to hand pictures. *Neuropsychologia*, *40*, 492-502. doi:10.1016/S0028-3932(01)00134-8
- Cumming, G. (2012). *Understanding the new statistics: Effect sizes, confidence intervals, and meta-analysis*. New York, NY: Routledge.
- de Groot, J. H. B., Smeets, M. A. M., Kaldewaij, A., Duijndam, M. J. A., & Semin, G. (2012). Chemosignals communicate human emotions. *Psychological Science*, *23*, 1417-1424. doi:10.1177/0956797612445317
- Dimberg, U., & Thunberg, M. (1998). Rapid facial reactions to emotion facial expressions. *Scandinavian Journal of Psychology*, *39*, 39-45. doi:10.1111/1467-9450.00054
- Dimberg, U., Thunberg, M., & Elmehed, K. (2000). Unconscious facial reactions to emotional facial expressions. *Psychological Science*, *11*, 86-89. doi:10.1111/1467-9280.00221
- Doherty, R. W. (1997). The emotional contagion scale: A measure of individual differences. *Journal of Nonverbal Behavior*, *21*, 131-154. doi:10.1023/A:1024956003661
- Doherty, R. W., Orimoto, L., Singelis, T. M., Hatfield, E., & Hebb, J. (1995). Emotional contagion: Gender and occupational differences. *Psychology of Women Quarterly*, *19*, 355-371. doi:10.1111/j.1471-6402.1995.tb00080.x

- Duclos, S. E., Laird, J. D., Schneider, E., Sexter, M., Stern, L., & Van Lighten, O. (1989). Emotion-specific effects of facial expressions and postures on emotional experience. *Journal of Personality and Social Psychology*, *57*, 100-108. doi:10.1037/0022-3514.57.1.100
- Duncan, J., & Laird, J. D. (1977). Cross-modality consistencies in individual differences in self-attribution. *Journal of Personality*, *45*, 191-206. doi:10.1111/j.1467-6494.1977.tb00146.x
- Ekman, P., Friesen, W. V., & Hager, J. V. (2002). *Facial action coding system* (2nd ed.). Salt Lake City, UT: Research Nexus eBook.
- Ekman, P., Levenson, R. W., & Friesen, W. V. (1983). Autonomic nervous system activity distinguishes among emotions. *Science*, *221*, 1208-1210. doi:10.1126/science.6612338
- Ellsworth, P. C., & Scherer, K. R. (2009). Appraisal processes in emotion. In R. J. Davidson, K. R. Scherer, & H. H. Goldsmith (Eds.), *Handbook of affective sciences* (pp. 572-595). Oxford, United Kingdom: Oxford University Press.
- Field, T. M., Woodson, R., Greenberg, R., & Cohen, D. (1982). Discrimination and imitation of facial expressions by neonates. *Science*, *218*, 179-181. doi:10.1126/science.7123230
- Finzi, E., & Rosenthal, N. E. (2014). Treatment of depression with onabotulinumtoxinA: A randomized, double-blind, placebo controlled trial. *Journal of Psychiatric Research*, *52*, 1-6. doi:10.1016/j.jpsychires.2013.11.006
- Frijda, N. H. (1986). *The emotions*. Cambridge, United Kingdom: Cambridge University Press.
- Gallese, V., Fadiga, L., Fogassi, L., & Rizzolatti, G. (1996). Action recognition in the premotor cortex. *Brain*, *119*, 593-609. doi:10.1093/brain/119.2.593
- Glenberg, A. M. (2011). Introduction to the mirror neuron forum. *Perspectives on Psychological Science*, *6*, 363-368. doi:10.1177/1745691611412386
- Gross, J. J., & Levenson, R. W. (1993). Emotional suppression: Physiology, self-report, and expressive behavior. *Journal of Personality and Social Psychology*, *64*, 970-986. doi:10.1037/0022-3514.64.6.970
- Gross, J. J., & Levenson, R. W. (1997). Hiding feelings: The acute effects of inhibiting positive and negative emotions. *Journal of Abnormal Psychology*, *106*, 95-103. doi:10.1037/0021-843X.106.1.95
- Gump, B. B., & Kulik, J. A. (1997). Stress, affiliation, and emotional contagion. *Journal of Personality and Social Psychology*, *72*, 305-319. doi:10.1037/0022-3514.72.2.305
- Halberstadt, J., Winkelman, P., Niedenthal, P. M., & Dalle, N. (2009). Emotional conception: How embodied emotion concepts guide perception and facial action. *Psychological Science*, *20*, 1254-1261. doi:10.1111/j.1467-9280.2009.02432.x
- Hall, J. A. (1978). Gender effects in decoding nonverbal cues. *Psychological Bulletin*, *85*, 845-857. doi:10.1037/0033-2909.85.4.845
- Hall, J. A. (1979). Gender, gender roles, and nonverbal communication skills. In R. Rosenthal (Ed.), *Skill in nonverbal communication: Individual differences* (pp. 32-67). Cambridge, MA: Oelgeschlager, Gunn & Hain.
- Hatfield, E., Cacioppo, J. T., & Rapson, R. L. (1994). *Emotional contagion*. Cambridge, United Kingdom: Cambridge University Press.

- Hatfield, E., Carpenter, M., & Rapson, R. L. (2014). Emotional contagion as a precursor to collective emotions. In C. von Scheve & M. Salmela (Eds.), *Collective emotions: Perspectives from psychology, philosophy, and sociology* (pp. 108-122). Oxford, United Kingdom: Oxford University Press.
- Hatfield, E., Rapson, R. L., & Le, Y. L. (2009). Emotional contagion and empathy. In J. Decety & W. Ickes (Eds.), *The social neuroscience of empathy* (pp. 19-30). Boston, MA: MIT Press.
- Hawk, S. T. (2010). *Changing channels: Flexibility in empathetic emotion processes*. New York, NY: Paragon.
- Hawk, S. T., Fischer, A. H., & van Kleef, G. A. (2012). Face the noise: Embodied responses to nonverbal vocalizations of discrete emotions. *Journal of Personality and Social Psychology, 102*, 796-814. doi:10.1037/a0026234
- Hawk, S. T., van Kleef, G. A., Fischer, A. H., & van der Schalk, J. (2009). "Worth a thousand words": Absolute and relative decoding of nonlinguistic affect vocalizations. *Emotion, 9*, 293-305. doi:10.1037/a0015178
- Hess, U., & Blairy, S. (2001). Facial mimicry and emotional contagion to dynamic emotional facial expressions and their influence on decoding accuracy. *International Journal of Psychophysiology, 40*, 129-141. doi:10.1016/S0167-8760(00)00161-6
- Hess, U., & Fischer, A. (2013). Emotional mimicry as social regulation. *Personality and Social Psychology Review, 17*, 142-157. doi:10.1177/1088868312472607
- Hess, U., & Fischer, A. (Eds.). (in press). *Emotional mimicry in social context*. Cambridge, United Kingdom: Cambridge University Press.
- Hietanen, J. K., Surakka, V., & Linnankoski, I. (1998). Facial electromyographic responses to vocal affect expressions. *Psychophysiology, 35*, 530-536. doi:10.1017/S0048577298970445
- Hsee, C. K., Hatfield, E., Carlson, J. G., & Chemtob, C. (1990). The effect of power on susceptibility to emotional contagion. *Cognition and Emotion, 4*, 327-340. doi:10.1080/02699939008408081
- Hsee, C. K., Hatfield, E., Carlson, J. G., & Chemtob, C. (1993). Emotional contagion and its relationship to mood. In E. Hatfield, J. T. Cacioppo, & R. L. Rapson (Eds.), *Emotional contagion* (pp. 150-152). New York, NY: Cambridge University Press.
- Hsee, C. K., Hatfield, E., & Chemtob, C. (1992). Assessments of emotional states of others: Conscious judgments versus emotional contagion. *Journal of Social and Clinical Psychology, 11*, 119-128. doi:10.1521/jscp.1992.11.2.119
- Iacoboni, M. (2005). Understanding others: Imitation, language, and empathy. In S. Hurley & N. Chater (Eds.), *Perspectives on Imitation: From Neuroscience to Social Science: Vol. 1. Mechanisms of imitation and imitation in animals* (pp. 77-101). Cambridge, MA: MIT Press.
- James, W. (1984). What is an emotion? In C. Calhoun & R. C. Solomon (Eds.), *What is an emotion?* (pp. 125-142). New York, NY: Oxford University Press. (Original work published 1890)
- Jeannerod, M. (1994). The representing brain: Neural correlates of motor intention and imagery. *Behavioral and Brain Sciences, 17*, 187-202. doi:10.1017/S0140525X00034026
- Kappas, A., Bherer, F., & Thériault, M. (2000). Inhibiting facial expressions: Limitations to the voluntary control of facial expressions of emotion. *Motivation and Emotion, 24*, 259-270. doi:10.1023/A:1010718815960

- Kellerman, J., Lewis, J., & Laird, J. D. (1989). Looking and loving: The effects of mutual gaze on feelings of romantic love. *Journal of Research in Personality, 23*, 145-161. doi:10.1016/0092-6566(89)90020-2
- Kihlstrom, J. F. (2007). The psychological unconscious. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (3rd ed., pp. 583-602). New York, NY: The Guilford Press.
- Kilner, J. M., Paulignan, Y., & Blakemore, S. (2003). An interference effect of observed biological movement on action. *Current Biology, 13*, 522-525. doi:10.1016/S0960-9822(03)00165-9
- Kleinke, C. L., & Walton, J. H. (1982). Influence of reinforced smiling on affective responses in an interview. *Journal of Personality and Social Psychology, 42*, 557-565. doi:10.1037/0022-3514.42.3.557
- Kopel, S. A., & Arkowitz, H. S. (1974). Role playing as a source of self-observation and behavior change. *Journal of Personality and Social Psychology, 29*, 677-686. doi:10.1037/h0036675
- Kraut, R. E. (1982). Social presence, facial feedback, and emotion. *Journal of Personality and Social Psychology, 42*, 853-863. doi:10.1037/0022-3514.42.5.853
- La France, M., & Ickes, W. (1981). Posture mirroring and interactional involvement: Sex and sex typing effects. *Journal of Nonverbal Behavior, 5*, 139-154. doi:10.1007/BF00986131
- Laird, J. D. (1974). Self-attribution of emotion: The effects of expressive behavior on the quality of emotional experience. *Journal of Personality and Social Psychology, 29*, 475-486. doi:10.1037/h0036125
- Laird, J. D. (1984). The real role of facial response in the experience of emotion: A reply to Tourangeau and Ellsworth, and others. *Journal of Personality and Social Psychology, 47*, 909-917. doi:10.1037/0022-3514.47.4.909
- Laird, J. D., Alibozak, T., Davainis, D., Deignan, K., Fontanella, K., Hong, J., . . . Pacheco, C. (1994). Individual differences in the effects of spontaneous mimicry on emotional contagion. *Motivation and Emotion, 18*, 231-247. doi:10.1007/BF02254830
- Laird, J. D., & Bresler, C. (1992). The process of emotional experience: A self-perception theory. In M. S. Clark (Ed.), *Review of Personality and Social Psychology: Vol. 13. Emotion* (pp. 213-234). Newbury Park, CA: Sage.
- Laird, J. D., & Crosby, M. (1974). Individual differences in the self-attribution of emotion. In H. London & R. E. Nisbett (Eds.), *Thought and feeling: Cognitive alteration of feeling states* (pp. 45-59). Chicago, IL: Aldine.
- Laird, J. D., Wagener, J., Halal, M., & Szegda, M. (1982). Remembering what you feel: Effects of emotion on memory. *Journal of Personality and Social Psychology, 42*, 646-657. doi:10.1037/0022-3514.42.4.646
- Lakin, J. L., & Chartrand, T. L. (2003). Using nonconscious behavioral mimicry to create affiliation and rapport. *Psychological Science, 14*, 334-339. doi:10.1111/1467-9280.14481
- Lakin, J. L., Jefferis, V. E., Cheng, C. M., & Chartrand, T. L. (2003). The chameleon effect as social glue: Evidence for the evolutionary significance of nonconscious mimicry. *Journal of Nonverbal Behavior, 27*, 145-162. doi:10.1023/A:1025389814290
- Lamm, C., & Silani, G. (2014). Insights into collective emotions from the social neuroscience of empathy. In C. von Scheve & M. Salmela (Eds.), *Collective emotions* (pp. 64-77). Oxford, United Kingdom: Oxford University Press.

- Lanzetta, J. T., Biernat, J. J., & Kleck, R. E. (1982). Self-focused attention, facial behavior, autonomic arousal and the experience of emotion. *Motivation and Emotion*, 6, 49-63. doi:10.1007/BF00992137
- Lanzetta, J. T., Cartwright-Smith, J., & Kleck, R. E. (1976). Effects of nonverbal dissimulation on emotional experience and autonomic arousal. *Journal of Personality and Social Psychology*, 33, 354-370. doi:10.1037/0022-3514.33.3.354
- Lanzetta, J. T., & Englis, B. G. (1989). Expectations of cooperation and competition and their effects on observers' vicarious emotional responses. *Journal of Personality and Social Psychology*, 56, 543-554. doi:10.1037/0022-3514.56.4.543
- Lanzetta, J. T., & Orr, S. P. (1980). Influence of facial expressions on the classical conditioning of fear. *Journal of Personality and Social Psychology*, 39, 1081-1087. doi:10.1037/h0077713
- Larsen, R. J., Kasimatis, M., & Frey, K. (1992). Facilitating the furrowed brow: An unobtrusive test of the facial feedback hypothesis applied to unpleasant affect. *Cognition and Emotion*, 6, 321-338. doi:10.1080/02699939208409689
- Lazarus, R. S. (1966). *Psychological stress and the coping process*. New York, NY: McGraw-Hill.
- Levenson, R. W. (1988). Emotion and the autonomic nervous system: A prospectus for research on autonomic specificity. In H. L. Wagner (Ed.), *Social psychology and emotion: Theory and clinical applications* (p. 17-42). New York, NY: John Wiley & Sons.
- Lundqvist, L.-O. (1993). *Emotional contagion to facial expressions: A social psychophysiological examination*. Uppsala, Sweden: Acta Universitatis Upsalensis.
- Lundqvist, L.-O., & Dimberg, U. (1995). Facial expressions are contagious. *Journal of Psychophysiology*, 9, 203-211.
- Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review*, 98, 224-253. doi:10.1037/0033-295X.98.2.224
- Matsumoto, D. (1987). The role of facial response in the experience of emotion: More methodological problems and a meta-analysis. *Journal of Personality and Social Psychology*, 52, 769-774. doi:10.1037/0022-3514.52.4.769
- McArthur, L. Z., Solomon, M. R., & Jaffe, R. H. (1980). Weight differences in emotional responsiveness to proprioceptive and pictorial stimuli. *Journal of Personality and Social Psychology*, 39, 308-319. doi:10.1037/0022-3514.39.2.308
- McHugo, G. J., Lanzetta, J. T., Sullivan, D. G., Masters, R. D., & Englis, B. G. (1985). Emotional reactions to a political leader's expressive displays. *Journal of Personality and Social Psychology*, 49, 1513-1529. doi:10.1037/0022-3514.49.6.1513
- Neal, D. T., & Chartrand, T. L. (2011). Embodied emotion perception: Amplifying and dampening facial feedback modulates emotion perception accuracy. *Social Psychological and Personality Science*, 2, 673-678. doi:10.1177/1948550611406138
- Poe, E. A. (1915). The purloined letter. In *The tales and poems of Edgar Allan Poe: Vol. III. Tales and poems* (pp. 84-113). New York, NY: G. P. Putnam's Sons.
- Reisenzein, R., & Stephan, A. (2014). More on James and the physical basis of emotion. *Emotion Review*, 6, 35-46. doi:10.1177/1754073913501395
- Rizzolatti, G. (2005). The mirror neuron system and imitation. In S. Hurley & N. Chater (Eds.), *Perspectives on Imitation: From Neuroscience to Social Science: Vol. 1. Mechanisms of imitation and imitation in animals* (pp. 55-76). Cambridge, MA: MIT Press.

- Rizzolatti, G., Fadiga, L., Fogassi, L., & Gallese, V. (1996). Premotor cortex and the recognition of motor actions. *Cognitive Brain Research*, 3, 131-141. doi:10.1016/0926-6410(95)00038-0
- Rhodewalt, F., & Comer, R. (1979). Induced-compliance attitude change: Once more with feeling. *Journal of Experimental Social Psychology*, 15, 35-47. doi:10.1016/0022-1031(79)90016-7
- Russell, J. A., & Harris, C. R. (Eds.). (2013). Facial expressions [Special section]. *Emotion Review*, 5, 1-115.
- Rutledge, L. L., & Hupka, R. B. (1985). The facial feedback hypothesis: Methodological concerns and new supporting evidence. *Motivation and Emotion*, 9, 219-240. doi:10.1007/BF00991829
- Sato, W., Fujimura, T., & Suzuki, N. (2008). Enhanced facial EMG activity in response to dynamic facial expressions. *International Journal of Psychophysiology*, 70, 70-74. doi:10.1016/j.ijpsycho.2008.06.001
- Schachter, S., & Singer, J. (1962). Cognitive, social, and physiological determinants of emotional state. *Psychological Review*, 69, 379-399. doi:10.1037/h0046234
- Schneider, K. G. (2008). *Expressive control and emotion perception: The impact of expressive suppression and mimicry on sensitivity to facial expressions of emotion* (Unpublished doctoral dissertation). Department of Psychology and Neuroscience, Duke University, Durham, NC.
- Singelis, T. M. (1995). *The effects of culture, gender, and self construal on emotional contagion* (Unpublished doctoral dissertation). University of Hawaii at Manoa, Honolulu, HI.
- Sloan, D. M., Bradley, M. M., Dimoulas, E., & Lang, P. J. (2002). Looking at facial expressions: Dysphoria and facial EMG. *Biological Psychology*, 60, 79-90. doi:10.1016/S0301-0511(02)00044-3
- Snodgrass, S. E. (1985). Women's intuition: The effect of subordinate role on interpersonal sensitivity. *Journal of Personality and Social Psychology*, 49, 146-155. doi:10.1037/0022-3514.49.1.146
- Stel, M., & van Knippenberg, A. (2008). The role of facial mimicry in the recognition of affect. *Psychological Science*, 19, 984-985. doi:10.1111/j.1467-9280.2008.02188.x
- Stockert, N. (1994). *Perceived similarity and emotional contagion* (Unpublished doctoral dissertation). University of Hawaii at Manoa, Honolulu, HI.
- Strack, F., Martin, L. L., & Stepper, S. (1988). Inhibiting and facilitating conditions of the human smile: A nonobtrusive test of the facial feedback hypothesis. *Journal of Personality and Social Psychology*, 54, 768-777. doi:10.1037/0022-3514.54.5.768
- Surakka, V., & Hietanen, J. K. (1998). Facial and emotional reactions to Duchenne and non-Duchenne smiles. *International Journal of Psychophysiology*, 29, 23-33. doi:10.1016/S0167-8760(97)00088-3
- Tamura, R., & Kameda, T. (2006). Are facial expressions contagious in the Japanese? *The Japanese Journal of Psychology*, 77, 377-382. doi:10.4992/jjpsy.77.377
- Termine, N. T., & Izard, C. E. (1988). Infants' responses to their mothers' expressions of joy and sadness. *Developmental Psychology*, 24, 223-229. doi:10.1037/0012-1649.24.2.223
- Tourangeau, R., & Ellsworth, P. C. (1979). The role of facial response in the experience of emotion. *Journal of Personality and Social Psychology*, 37, 1519-1531. doi:10.1037/0022-3514.37.9.1519

- Uchino, B. C., Hatfield, E., Carlson, J. G., & Chemtob, C. (1991). *The effect of cognitive expectations on susceptibility to emotional contagion*. Unpublished manuscript, University of Hawaii, Honolulu, HI.
- van der Schalk, J., Fischer, A., Doosje, B., Wigboldus, D., Hawk, S., Rotteveel, M., & Hess, U. (2011). Convergent and divergent responses to emotional displays of ingroup and outgroup. *Emotion, 11*, 286-298. doi:10.1037/a0022582
- Weyers, P., Muhlberger, A., Hefele, C., & Pauli, P. (2006). Electromyographic responses to static and dynamic avatar emotional facial expressions. *Psychophysiology, 43*, 450-453. doi:10.1111/j.1469-8986.2006.00451.x
- Whissell, C. M. (1985). The role of the face in human emotion: First system or one of many? *Perceptual and Motor Skills, 61*, 3-12. doi:10.2466/pms.1985.61.1.3
- Wild, B., Erb, M., & Bartels, M. (2001). Are emotions contagious? Evoked emotions while viewing emotionally expressive faces: Quality, quantity, time course and gender differences. *Psychiatry Research, 102*, 109-124. doi:10.1016/S0165-1781(01)00225-6
- Wild, B., Erb, M., Eyb, M., Bartels, M., & Grodd, W. (2003). Why are smiles contagious? An fMRI study of the interaction between perception of facial affect and facial movements. *Psychiatry Research: Neuroimaging, 123*, 17-36. doi:10.1016/S0925-4927(03)00006-4
- Winkelman, P., & Schooler, J. W. (2012). Consciousness, metacognition, and the unconscious. In S. T. Fiske & C. N. Macrae (Eds.), *The Sage handbook of social cognition* (pp. 54-74). Los Angeles, CA: Sage.
- Winton, W. M. (1986). The role of facial response in self-reports of emotion: A critique of Laird. *Journal of Personality and Social Psychology, 50*, 808-812. doi:10.1037/0022-3514.50.4.808
- Zajonc, R. B., Murphy, S. T., & Inglehart, M. (1989). Feeling and facial efference: Implications of the vascular theory of emotion. *Psychological Review, 96*, 395-416. doi:10.1037/0033-295X.96.3.395
- Zuckerman, M., Klorman, R., Larrance, D. T., & Spiegel, N. H. (1981). Facial, autonomic, and subjective components of emotion: The facial feedback hypothesis versus the externalizer–internalizer distinction. *Journal of Personality and Social Psychology, 41*, 929-944. doi:10.1037/0022-3514.41.5.929