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THE INTERACTION MANAGEMENT FUNCTION OF NONVERBAL CUES

Theory and Research About Mutual Behavioral Influence in Face-to-Face Settings

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There are two important senses in which conversations are regulated. The more typical connotation of the word *regulate* implies that a person seeks intentionally to alter the content, tenor, or events of a conversation toward some preordained end. Regulation of this type exhibits control in the sense that actions are undertaken to achieve what one perceives to be an important need or purpose. Such conversational behaviors are sometimes called "deliberate." The second sense assumes that regulation of interaction is more "automatic" (i.e., weighed less cognitively; for more on this topic, see Lakin, this volume).

The research that will be reviewed in this chapter will show that this automatic sense of management involves control over the more microscopic events during interaction. People are, in general, quite unaware that such influences exist and, under most circumstances, do not employ such responses intentionally (Berger & Roloff, 1980; Langer, 1978). More generally, this chapter updates recent reviews of the

patterns of behavioral coordination that characterize social interaction and focuses on the explanations behind these patterns. We will show that recent research has added to the fact base about coordination in ways that strengthen and extend previous research while, at the same time, offering some new empirical puzzles that need resolving. We will explore some possible answers beyond those available in the current theoretical literature.

◆ Coordination in Interaction

Interaction is not simply the generation of social symbols or signals; neither is it reducible solely to the reception or interpretation of such symbols or signals. In this chapter, interaction is conceptualized as *the regularized patterns of messages from one person that influence the messages sent in turn by the other over and above what they would otherwise be* (Cappella, 1985). This definition emphasizes the *pattern* of exchange between two persons and *not* the behavior of one or the other person, even though that behavior occurred in the context of an interaction with another. These regularized patterns are labeled *coordination.*

◆ Research on Coordination

Numerous reviews of the literature on coordination in adult dyads and adult-infant dyads have appeared. These include reviews by Cappella (1981, 1991, 1993, 1994) and by Burgoon (1978, 1993, 1994) and her colleagues (Burgoon, Stern, & Dillman, 1995), among others (Bernieri & Rosenthal, 1991; Hatfield, Cacioppo, & Rapson, 1994; Hess, Philippott, & Blairy, 1999; Patterson, 1976, 1982, 1999). These reviews have focused on vocal and kinesic behaviors primarily, but

some linguistic behaviors have been included as well (see especially Burgoon et al., 1995; Cappella, 1994). This section will not repeat the content of these prior detailed reviews but instead will report selectively on key studies that advance the research base on coordination.

Recent research in three broad arenas pertinent to mutual coordination of behavior will be presented in this section: studies of (1) mutual coordination, (2) the relationship between behavioral coordination and outcome for the relationship or social group, and (3) the first two types but focused on infants and children. In contrast to previous reviews, this one will not focus on behavioral coordination exclusively but will expand to include emotional contagion in the sense of yoked emotional response (i.e., self-reported affect) among interactants. This expansion recognizes that behavioral coordination in emotions may also produce emotional synchrony, which in turn can be consequential in relational connection and performance.

MUTUAL COORDINATION

A substantial body of research indicates that social interactions exhibit mutual coordination for behaviors as diverse as accents, speech rate, vocal intensity, postural and gestural behaviors, movement, gaze, facial affect, self-disclosure, excuses, and other behaviors (Cappella, 1981, 1985, 1998). The variety of behaviors implicated is testimony to the centrality of this process, and the mechanisms behind it, in human behavior. Recent research in this area has developed in two directions: one increasingly microscopic and physiological and the other more macroscopic and less behavioral. Both developments are welcome.

The first moves from the study of nonverbal behaviors, such as eye gaze, that

are often "multifunctional." These behaviors often have several interpretations depending on the context. The physiological responses are less susceptible—but certainly not immune—to interpretive variation. The less behavioral, more macroscopic behaviors, move the research on coordination into a different research domain (e.g., the role of emotional and other types of contagion in groups, organizations, and other social units). The implication of these two developments is to direct that theories be capable of explaining both the automatic responses characteristic of physiological coordination and the more subjective, deliberate processes of emotional yoking between partners, perhaps with expressive imitation mediating the subjective yoking of emotional experience. The following details examples of research with these characteristics.

The first of these concerns *microcoordination*. Electromyography (EMG) is the study of facial muscle activity in response to various stimuli. Visual stimuli can elicit facial muscle activity depending on the affective valence of the stimuli to the subject. For example, studies suggest that stimuli related to positive affect increase activity in the cheek muscle region—smiling—and stimuli related to negative affect increase activity in the brow muscle region—frowning (Hietanen, Surakka, & Linnankoski, 1998). Some studies have investigated facial electromyographic responses during actual interaction. Lundqvist (1995), for example, explored whether people exposed to facial expressions responded with specific facial muscle reaction patterns that correspond to specific emotional experiences. Participants were shown pictures of faces expressing sadness, anger, fear, surprise, disgust, happiness, as well as neutral facial expressions. At the same time, facial electromyographs from the M. zygomaticus major, the

M. levator labii, the frontal M. lateralis, and the M. corrugator supercilii muscle regions were obtained as were emotional experiences. The results revealed that people both mimicked and experienced an emotion similar to that expressed by the stimulus person.

The focus on coordination in emotions has extended to vocal emotion. Neuman and Strack (2000) had people listen to philosophical essays read in a slightly happy or slightly sad tone of voice. Listeners reported a more positive mood with the happier reading and a more negative mood with the sadder reading. In a second study, they also repeated the essay in a tone that independent raters found to be happier or sadder depending on hearing the slightly happy or sad initial rendition—a kind of vocal coordination of emotion. Additionally, Hietanen et al. (1998) obtained facial EMG responses to vocal affect expressions as participants listened to single words uttered by two actors stimulating different emotions. Three categories of expressions were selected: emotional neutrality, anger, and contentment. The EMG activity over two facial muscle regions was measured: corrugator supercilii (the muscle that knits the brows together) and orbicularis oculi (the muscle that produces bagging below the eyes and wrinkles in the corners of the eyes). Hearing the expression of anger increased EMG activity in the participants' brow region more than did hearing the expression of contentment. In contrast, the expression of contentment activated the periocular muscle region more than did anger. The results support the view that negative and positive affects are "contagious" from hearing human vocal affect expressions.

The linkage between emotional expression and felt emotion within the person is an important set of facts that theories must explain. In interpersonal contexts, if person A mimics person B and if both A and B

experience emotion consistent with their facial displays, then we might reasonably expect coordination between A and B in their subjective experiences of emotional or mood. This *coordination in subjective emotion and mood* is examined next. Specifically, Totterdell, Kellett, Teuchmann, and Briner (1998) explored "mood linkage" in the context of work groups. They investigated whether people's moods are influenced by the collective mood of their work teammates over time.

In their first study, a time-series analysis showed a significant association between the nurses' moods and the collective mood of their teammates independent of shared hassles. In their second study, a team of accountants rated their own moods and the moods of their teammates three times a day for 4 weeks using pocket computers. The accountants' moods and their judgments of their teammates' moods were significantly associated with the collective mood of their teammates. The findings suggest that people's moods can become linked to the mood of their coworkers, offering a compelling line of evidence for affective or, in this case, mood synchrony during adult interaction.

Similar effects have been reported for teacher burnout (i.e., emotional exhaustion and depersonalization; Bakker & Schaufeli, 2001), in sales contexts (Verbeke, 1997), and in clinical environments (Hsee, Hatfield, Carlson, & Chemtob, 1992). Thompson, Nadler, and Kim (1999), for example, argued that the ability of negotiators at the bargaining table is enhanced to the extent that they are successful in perceiving emotions of participants, reacting appropriately to them, and being "in tune" with those emotions. Pugh (1998) found that in a service context sales people were more effective when they were emotionally congruent with their customers. Furthermore, Ingram (1997) studied the coordination of

depression between spouses where one was primarily the caretaker and one the caregiver. Depression scores for the care receiver tended to determine those of the caretaker at a later point in time, suggesting coordination but with the caregiver dominant. The opposite influences were not found with regard to depression or a variety of other emotional states. Specifically, Goodman and Shippy (2002) studied elderly spouses where one was experiencing serious vision problems. After controlling for other factors, depression by one spouse predicted the partner's depression.

Individual differences in sensitivity to emotions from others and the ability to transmit emotions to others may affect the existence and strength of observed contagion. Verbeke (1997) explored whether these individual differences are assets or liabilities over the long term for salespersons. Doherty (1997) explored the individual differences in susceptibility to emotional coordination by crafting an Emotional Contagion Scale, a 15-item measure of individual differences in susceptibility to catching others' emotions. Participants were videotaped while watching videotapes of emotionally expressive stimulus persons relating their happiest and saddest memories. Doherty found that susceptibility to emotional contagion was positively related to reactivity, emotionality, sensitivity to others, social functioning, and self-esteem. Doherty, Orimoto, Singelis, Hatfield, and Hebb (1995) showed further that women in a variety of occupations illustrated higher total emotional contagion scores than did men.

Findings on mood transfer observed in more applied settings have also been obtained in more controlled environments (Gump & Kulik, 1997). In one study (Neuman & Strack, 2000), participants were tested on their listening comprehension in response to a neutral text that was read to them in a happy or sad tone of

voice. Listeners reported being in an emotional state that was like that of the read materials and when required to repeat portions of the text read to them, employed a vocal tone similar to the one they had heard. Similar findings by Hess and Blairy (2001) suggest that aspects of facial mimicry of emotion may account for the subjective emotional reactions that viewers of the videotaped faces reported. Direct evidence of mediation from facial stimuli to facial mimicry by viewers to reports of emotional state by viewers was not obtained. These reactions to facial displays are likely to occur quickly (presentations less than half a second) and exhibit a dose-response relationship with more intense displays eliciting more intense emotional reactions (Wild, Erb, & Bartels, 2001).

Summary. Overall, four conclusions can be drawn from the recent literature: (1) relatively automatic responses to emotional stimuli are manifest in facial and vocal reactions; (2) these automatic reactions are sometimes accompanied by subjective feelings of emotion; (3) mood and emotional contagion in subjective experience—emotional yoking—is common in applied and more controlled settings; and (4) the question of which mechanisms might account for emotional yoking is an open question, although the possibility of expressive mimicry is suggested.

MUTUAL COORDINATION IN INFANT-MOTHER INTERACTION

Studies reviewed by Cappella (1997, 1998) and Field (1987) show that infants weeks and, in a few cases, even hours old adapt to their adult partners in vocal, gaze, facial, and movement behaviors. Such evidence underscores the centrality of mutual coordination in human social interaction

(but see Ullstadius, 1998, who offered contrary evidence for the imitation of tongue protrusions and mouth openings in 18 newborn infants). Other studies support the claim of mutual coordination between infants and adults. Stack and Arnold (1998), for example, focused on maternal touch and its ability to influence infants' gaze and affect during interactions. The results from this study indicated that (1) infants were sensitive to subtle changes in maternal tactile-gestural behavior, (2) maternal touch and hand gestures can attract infants' attention to their faces even when still and expressionless, and (3) there were associations between infant expressiveness and gaze at mothers' faces and hands during these periods.

Symons and Moran (1994) extended the idea of maternal influence to *mutual* influence—that is, observing infants' smiling behavior as being both responsive to and dependent on maternal smiling behavior. Twenty-five mothers were observed engaged in face-to-face interactions with their 8-, 12-, 16-, and 20-week-old infants, the ages at which face-to-face interaction is most common. Maternal dependency and infant responsiveness were not found to have occurred at significant levels, but maternal responsiveness and infant dependency were, and at all ages. Although mothers were responsive to their infants, mothers smiled a lot independently of their infants' smiling behavior; hence, infant behavior is sufficient but not necessary to elicit smiles from the mother. Infants responded to their mothers' smiles with smiles of their own. The proportion of mother smiles followed by infant smiles did not exceed the levels expected by chance. Mother smiling behavior seems necessary, but not sufficient, to elicit smiles from the infants.

In an important, and related, line of study, empathic responsiveness and affective

reactivity to infant stimuli were studied in mothers at high and low risk for physical child abuse (Milner, Halsey, & Fultz, 1995). Compared with baseline, high-risk mothers reported no change in empathy across infant conditions such as baseline, smiling, quiet, and crying. Low-risk mothers did report an increase in empathy. Following the presentation of a crying infant, high-risk mothers reported more distress and hostility. These data agree with other studies showing that child abusers are less empathic and more hostile in response to a crying child.

Although these conclusions are compelling, one of the problems with many of the studies of infant-adult interaction is that the samples are usually small and unrepresentative of the population at large. The National Institute of Child Health and Human Development (NICHD), however, has undertaken a large-scale study of more than 1,100 infants and their mothers at 10 different sites around the country. One of the first reports from this study (NICHD Early Child Care Research Team, 1997) focused on the relationship between child care and quality of later attachment between the mother and her infant. Although the quality, amount, and type of child care outside the home (6–15 months) were unrelated to attachment quality at 15 months, maternal responsiveness to the infant did interact with child care arrangements. When mothers were low in responsiveness and their children also experienced poor quality child care outside the home, the infants tended to be less securely attached at 15 months.

Parents can also be trained to be more responsive to their infants. Wendland-Carro, Piccinini, and Millar (1999) exposed parents of newborns (2–3 days old) to a video on the importance of parental interaction or a video on basic caregiving. One month later, those exposed to the interaction video exhibited more behavioral co-occurrences between infant and mother involving vocal, touch, and gaze behaviors. A meta-analysis tracked the value of interventions in improving parental sensitivity in interacting with their infants across available studies (Bakermans-Kranenburg, van Ijzendoorn, & Juffer, 2003). Interventions that altered parental sensitivity also had favorable consequences on subsequent attachment, adding evidence to the claim that responsive interactions are important for the development of attachment.

The absence of responsive interaction in the early weeks and months of an infant's life can be deleterious to the infant's development in the absence of other buffering social and psychological conditions. Despite this understanding, many parents may not be responsive to their child. There are many reasons for lower responsiveness by parents, including depression. Field (1998) argues that early maternal depression is associated with two different interactional styles: withdrawn or intrusive. Both can affect the infant's physiology and biochemistry through inadequate stimulation or its opposite, overstimulation. Field argues that others in the infant's life who are not themselves depressed may buffer the negative consequences of interaction with a depressed mother.

In addition to the more one-sided responsiveness, synchrony in the expressed behaviors between infants and their caregivers has become a staple of researchers and is slowly achieving the stature of a diagnostic tool in assessing developmental progression and responsive parenting. Some recent studies have used synchrony between infant and mother (and sometimes father) to assess the risk status of triplets in comparison to twins and singletons (Feldman & Eidelman, 2004), the development of symbolic competence at 2 years from synchrony at 3 and 9 months

(Feldman & Greenbaum, 1997), the development of self-control at 2 years (Feldman, Greenbaum, & Yirmiya, 1999), and the development of emotional differentiation with mothers and with fathers (Feldman, 2003). Not only does infant-adult coordination occur early in the infant's development, but the presence of these behaviors is also predictive of subsequent attachment and, very possibly, other cognitive and behavioral advances. The fact that parents can be primed to be responsive and sensitive to their infants' behaviors is evidence that intervention can benefit infants and their parents by enhancing the bonding process as well as other desirable social and cognitive competencies.

Summary. Despite the occasional contrary study, research on coordination between infants and adults (1) has been consistent with earlier research; (2) has been consistent across studies in meta-analytical summaries; (3) has been manifest in more representative populations; and (4) has begun to be treated as an indicator of normal behavioral, emotional, and cognitive development. These conclusions imply that coordination in adult social interaction has its roots in infant-adult social interaction.

MUTUAL COORDINATION AND RELATIONAL AND INDIVIDUAL CONDITIONS

Coordination between partners in expressed emotion (and other behaviors) and in subjectively experienced emotion does not imply necessarily desirable or undesirable outcomes for the persons or their relationship. Earlier research on this issue (e.g., Cappella, 1991, 1998) has shown mostly, but not exclusively, beneficial outcomes for infants and mostly favorable outcomes in adult relationships. Positive social

evaluations have been associated, for example, with coordination in speech latency (Welkowitz & Kuc, 1973), speech rate and duration (Street, 1982), and pronunciation (Giles & Smith, 1979). Generalized responsiveness is associated with attraction (Davis & Martin, 1978) and the provision of pleasurable stimulation (Davis & Perkowitz, 1979). Movement synchrony and mimicry are associated with rapport (Bernieri, 1988; Hess et al., 1999; see Tickle-Degnen, this volume). Our own research has produced modest positive correlations between measures of dynamic coordination and interpersonal attraction (see Cappella, 1996, 1998; Cappella & Flagg, 1992; Cappella, Palmer, & Donzella, 1991).

In the context of marital relationships, Gottman's (1979) widely cited findings are still the exemplar. Although all his couples tended to show reciprocity in hostile affect in discussions about common problems in their marriages, the less well-adjusted couples showed greater hostile affect than did the better-adjusted couples. Pike and Sillars (1985) also found greater reciprocity in negative vocal affect for dissatisfied as opposed to satisfied married couples. Using face-directed gaze rather than negative affect, Noller's (1984) satisfied couples exhibited greater correlation between partners than did the dissatisfied couples (see also Manusov, 1995). Overall, partners in satisfying, established relationships appear to differ in the type of mutual influence that their interaction shows relative to those in less satisfied relationships.

Some of the recent studies in emotional contagion and relational outcomes have focused more on the similarity of reported emotion than on expressed emotion (e.g., Totterdell, 2000; Totterdell, Wall, Holman, Diamond, & Epitropaki, 2004). Anderson, Keltner, and John (2003) completed a controlled version of the contagion hypothesis. Their study evaluated the development of

emotional similarity over time. They defined emotional similarity as the coordination of thoughts and behaviors leading to greater understanding and cohesion among partners. Studies 1 and 2 in Anderson et al. were longitudinal, investigating dating partners and college roommates at two points in time separated by 6 months. The third was experimental. Study 1 showed an increase in reported emotional similarity—both positive and negative—over time, whereas personality similarity remained relatively stable in the same time period. Over the same time period, positive emotional convergence was associated with relational satisfaction, but negative emotional similarity was not. Relational breakup from Time 1 to Time 2 was also predicted by emotional similarity at Time 1: Couples with greater emotional similarity at Time 1 stayed together, whereas those without emotional similarity tended to part.

Although emotional contagion is common among coworkers, dating couples, college roommates, and spouses, and its suppression can disrupt communication and relationship formation and elevate blood pressure (Butler et al., 2003), it is less clear whether emotional contagion and synchrony in behavior are as consequential to the success of a relationship. Gottman and Levenson (1999) compared four classes of predictors in accounting for deterioration in marital interaction over a 4-year period. Two classes of predictors were physiological, one cognitive, and one interactional. The *ratio* of positive to negative expressions was the best predictor of deterioration of interaction, which, in turn, was an excellent predictor of future marital dissolution and dissatisfaction.

Despite the association between some type of coordination and some form of rapport or attachment for adult and infant-adult dyads, a strong claim of a causal relationship between the two cannot be made from the available empirical results without inducing some skepticism. The "causality problem" is both theoretical and empirical. On empirical grounds, even if there is both covariation and temporal order, as is the case in Gottman's research and in many of the infant-adult studies, these criteria do not eliminate the possibility of spurious correlation or mutual attraction prior to the interaction affecting the initial levels of coordination. Whereas the data for infants are more convincing, those for adults are less convincing. On theoretical grounds, the mechanisms through which rapport might grow from behavioral coordination between partners are not well described by prevailing explanations. In the remainder of this section, we will focus on empirical considerations.

Although this issue was not their primary motivation, Chartrand and Bargh (1999) have taken on the causal question directly in a series of studies. In their first study, the authors established a mimicry effect between confederate and respondent using two uncommon behaviors: face rub and foot shake. When confederates used one of the unusual behaviors, then so did the respondent. In effect, there was imitation of the behavior over and above baseline. These imitations were independent of whether the confederate was smiling or not. In their second study, confederates imitated the "posture, movement, and mannerisms" (p. 902) of the respondent while maintaining a neutral facial expression and avoiding gaze. Results indicated that when the confederates imitated the behavior of the participants, the participants rated the interactions as smoother and reported liking the confederate more. Careful checking of the confederates' other nonverbal behaviors indicated no differences in rated eye contact, smiling, friendliness, or liking of the participant by the confederates across the mimicry/no mimicry conditions. The

authors employed a careful debriefing procedure to determine whether the participants were aware of imitation by the confederate. They were not.

The results of this study establish a clear causal relationship between imitation and positive relational consequences. What differentiates this study from several others that seem to test the same hypothesis is the careful control over confederate behavior and attention to initial levels of liking or cues to liking and attraction (such as smiling or other nonverbal cues). Other studies have used confederates to enact behaviors that are themselves clear indicators of positive feeling, such as eye gaze and smiling. These behaviors can create positive regard right away. Instead of studying the impact of coordination on subsequent positive feeling, a design allowing initially positive nonverbal behavior confounds initial positive regard with coordination. In the Chartrand and Bargh (1999) study, however, the imitated behaviors are hardly noticed by participants, and initial behaviors by the confederate are not inherently positive. Yet they create positive social perceptions automatically. The authors argue strongly for an automatic perception-behavior linkage based on these and other data.

This recent work in social psychology on imitation of behaviors has produced a surge of other studies operating under the label *mimicry*. These studies have reinvigorated the study of contagion and coordination processes but have done so, at least initially, in ignorance of a long history of research on similar, if not exactly the same, processes. New findings supporting and extending Chartrand and Bargh's initial work have cascaded into the literature. Van Baaren, Holland, Kawakami, and van Knippenberg (2004), for example, found in three separate studies that people who were mimicked by others were more helpful and generous toward third parties not involved in the

mimicry. Their results suggest that being mimicked enhanced a prosocial attitude in general. Several personality and situation factors enhance or retard the likelihood of mimicry, including self-monitoring (Cheng & Chartrand, 2003), context dependence (Van Baaren, Horgan, Chartrand, & Dijkmans, 2004), self-construal orientation (Van Baaren, Maddux, Chartrand, de Bouter, & van Knippenberg, 2003), affiliation goals (Lakin & Chartrand, 2003), and attachment patterns (Sonnby-Borgstrom & Jonsson, 2004).

Summary. The research on the association between coordination and relational outcomes finds that at both the micro- and macrolevels, coordination affects relational outcomes. Studies at the microlevel show clearly that mimicry of unobtrusive behaviors is causally linked to rapport, and those at the macrolevel show that emotional yoking between partners is a necessary condition for bonding.

◆ Implications for Theory

The review of previous and newer empirical findings produces four broad conclusions that should guide our tour into the theoretical realms. The first of these is *automaticity.* Many behaviors produce coordination between partners automatically, operating well below conscious awareness (see Lakin, this volume). The consistent observation of automatic coordination of behaviors suggests strongly that theory must be based on mechanisms that allow for automatic, nonconscious behavioral and emotional coordination. Second, the evidence establishing a *causal linkage between behavioral coordination and some form of positive relational outcome, particularly rapport,* is difficult to treat with skepticism any longer. The

absence of a good explanation for this relationship leaves the empirical causal findings without a strong explanatory basis, however, and therefore undermines their believability.

Third, research in various domains has begun to produce findings showing that persons in work groups, in relationships, in social groups, living together, and so on develop (and report) similar emotional responses over the course of time. This suggests an *emotional yoking in social groups.* The impact for successful relationships and performance of emotional similarity and dissimilarity is only beginning to be understood. Theories must begin to explain the mechanisms through which yoked emotion develops (other than through spurious external events that must be controlled), especially given the failure of several studies to show that expressed emotion mediates the relationship between partners' reports of yoked emotion. Theory must account for the link between synchrony in expressed emotion and emotional contagion. Finally, the strong and consistent findings of synchrony in infant-adult interactions and the possibility that synchrony (or its absence) might be a diagnostic tool for normal developmental progression of infants argue that *coordination is a deep-seated and abiding process in human social and behavioral life.* Explaining how and why these processes came to be is an important goal for theory, particularly evolutionary theories, which aim to explain how processes came to be in the first place (Cappella, 1991; Buck & Renfrow Powers, this volume).

◆ Theories About Coordination

In this section, we take up theoretical approaches to explaining the existing data on coordination in social interaction. Space

limitations will not allow a comprehensive review, but we will discuss extant theories in terms of their ability to account for the recent findings reported above (see Patterson, this volume). Specifically, what can theories tell us about automatic responding, the linking between synchrony and outcome, emotional yoking, and how coordination came to be so central a process in human social interaction?

EVALUATING THEORIES OF COORDINATION

A number of competing accounts have been put forward to meet the basic requirements of explaining coordination. These include drive explanations (Argyle & Dean, 1965; Firestone, 1977), arousal-mediated explanations (Andersen, 1985; Burgoon, 1978; Burgoon & Jones, 1976; Burgoon & Hale, 1988; Cappella & Greene, 1982; Patterson, 1976, 1982), cognitive explanations (Giles & Powesland, 1975; Giles, Mulac, Bradac, & Johnson, 1987; Street & Giles, 1982), and various combinations of these (Andersen, Guerrero, Buller, & Jorgensen, 1998; Burgoon et al., 1995). With the upsurge of research emphasizing the automatic nature of certain aspects of coordination in the adult (Chartrand & Bargh, 1999) and in the infant-adult arenas (De Wolff & van Ijzendoorn, 1997), however, and the clear causal evidence for a coordination-rapport link, theories must be capable of accounting for these developments, not as an afterthought but as a central feature.

Despite their elegance, careful attention to the research literature, and attempts to be comprehensive, none of these theories has risen to the top of the empirical heap in contrastive tests. In three such tests, the findings are mostly mixed, with one or the other theory taking precedence in some

results but no one theory clearly accounting for all findings. O'Connor and Gifford (1988) tested their social cognitive approach against arousal labeling and discrepancy arousal theories, reporting that the social cognitive model fared best in accounting for behavioral responses but the self-report results were less clearly supported. Other contrastive tests have produced a mixture of findings favoring no one explanation indicative of the complexity of realistic social interactions or the difficulty of producing true critical tests (Andersen et al., 1998; Le Poire & Burgoon, 1996).

One possible explanation for the inability of one of the several extant theories to account successfully for the results is not only the complexity of the testing environments and the requirements of careful, controlled manipulation by confederates but also the breadth of the theories themselves. Each of the theories makes a concerted effort to encompass the full range of behaviors, explain the conditions promoting compensation and reciprocity, and take into account mitigating and aggravating conditions. For example, discrepancy-arousal theory (Cappella & Greene, 1982) particularly tries to offer an account of infant-adult as well as adult-adult patterns of coordination. This very strength, however, might produce generalities in the theories that make them less able to predict particular outcomes in particular social contexts. A different strategy is to craft theories of much narrower scope that seek to provide very specific predictions of specific empirical phenomena. We turn now to such a case, which provides explanations for results about behavioral mimicry.

EXPLAINING MIMICRY

The intriguing findings reported by Chartrand and Bargh (1999) beg for an explanation. In particular, two components of their findings need explaining: mimicry and rapport. What explains people's mimicry of each other's (inconsequential) behaviors? Furthermore, what explains why mimicry should be associated with positive social regard for the partner? Other issues arise as we interrogate this process. Do people always imitate? The answer of course is "no," but what are the conditions promoting mimicry and its absence? Can mimicry create hostility rather than rapport?

Bargh and his colleagues have offered some answers (Bargh, 2003; Bargh & Chartrand, 1999; Bargh & Ferguson, 2000; Ferguson & Bargh, 2004), even carrying their views into the evolutionary domain (Lakin, Jefferis, Cheng, & Chartrand, 2003). Their essential claim is that a much larger proportion of human activity is driven by automatic processes than people and psychology have been willing to admit. Although there has been a very rich tradition of environmental primes stimulating cognitions and evaluations automatically (Bargh & Ferguson, 2000), it is only recently that automatic primes for behavior have been investigated and found operational.

Bargh and his colleagues posit a perception-behavior linkage that shows itself in media effects on behavior (Berkowitz, 1984, 1997), in behavior consistent with the activation of stereotypes (Dijksterhuis & van Knippenberg, 1998), and, of course, in social interaction (Chartrand & Bargh, 1999). The mechanisms through which perception leads to behavior and the limiting conditions are as yet not completely explored or understood. "Mirror neurons" are a viable candidate for perception-behavior activation and interpersonal facial feedback (IFF) a potential mechanism for establishing rapport through imitation.

INTERPERSONAL
FACIAL FEEDBACK

The interpersonal facial feedback hypothesis (IFFH; Cappella, 1993) offers a speculation that accounts for the development of relational outcomes from behavioral coordination. None of the causal theories currently in the literature accounts specifically for the association between coordination patterns and relational outcomes, either in adults or in children. Neither do the mimicry-rapport explanations make a good case for the mechanism through which mimicry might breed rapport. The IFFH may help with this set of issues.

The IFFH is a series of simple claims. First, facial displays, especially emotional ones, tend to be imitated by both infants and adults. Imitation can be overt (i.e., observable by others) or covert (i.e., observable only via micromomentary displays or through changes in muscle potential [EMG]). Second, the act of producing a facial display of emotion alters the underlying experience of emotion, intensifying it toward the more positive or more negative valence. The mechanism for this intensification effect may be through the phenomenon of facial efferance (Adelman & Zajonc, 1989). Third, if person A expresses a valenced emotion, and B imitates with a similar display, the subjective experiences of emotion between A and B are yoked through facial feedback, so that subjective emotional similarity accompanies expressive similarity. If the IFFH is correct, it explains several results from the coordination-mimicry literature, including (1) the link between coordination and relational outcomes, at least for facial displays; (2) how attachment between infants and their parents might come about; and (3) how the recent observations of subjective emotional contagion (e.g., coworkers having yoked emotional responses) might be produced.

The IFFH has, to our knowledge, never been tested directly. A study by Kleinke and Walton (1982), however, comes closest. They used techniques of reinforcement to alter the frequency of smiles emitted by subjects. Those who emitted more smiles gave the interview and the interviewer higher ratings than those who emitted fewer smiles even though they were not able to ascertain that they were being reinforced to smile. Although suggestive, this study did not check the quality and number of reinforcements, and so the results could be due to differences in reinforcement frequency or quality rather than differences in smiling.

Although we have not carried out a serious test of the IFFH, a secondary analysis of some previous data is suggestive. To assess whether one's own smiling affects one's attraction to a conversational partner, as the IFFH would suggest, we began with the predictors that accounted for variance in attraction due to experimental condition (attitude similarity, relational history, and their interaction) and to effects from the partner's behavior (in this case the interaction of the partner's gaze) (Cappella & Palmer, 1990, p. 175). We added one's own smiling at the partner to this regression predicting one's attraction (in both linear and quadratic forms). The results (Cappella, 1993) suggest that the effects of experimental condition and partner's behavior are roughly the same as reported previously by Cappella and Palmer (1990) without any additional predictors, but that there is a positive linear effect and a negative, albeit small and marginal, quadratic effect of one's own smiling on one's own attraction to the partner. In effect, one's own smiling adds significant and positive variation to the prediction of attraction to the partner.

With the IFFH and its more speculative counterparts pertinent to vocal and physical imitation (see Cappella, 1993), certain puzzles in the interactional literature are

explained. The IFFH assumes that behavioral adaptation is temporally prior to one's own affective response. By invoking the IFFH, physiological and, as we will see below, neurological pathways are implicated as the causal linkages from behavioral activation in the muscles of the face and voice to the subjective affective response (Zajonc, Murphy, & Englehart, 1989). In effect, a clear, if controversial, causal mechanism is posited to account for the association between behavioral coordination and interpersonal affect.

NEUROLOGICAL BASES FOR INTERPERSONAL FACIAL FEEDBACK, INTERPERSONAL VOCAL FEEDBACK, AND MIMICRY

One line of research that supports Bargh's (2003) explanation of mimicry as well as the IFFH is found in recent work in neuroscience, specifically the isolation of a mirror neuron reflex. In the mid-1990s, neuroscientist Vitorio Gallese was observing neural activity in the cortex of a macaque monkey during object manipulation. After returning to his laboratory with an ice-cream cone, Gallese noticed that each time he licked the ice-cream cone, the neurons in the monkey's premotor cortex fired. This was intriguing, given that the monkey was not making any motor movements.

Further study revealed a set of 92 neurons in the premotor cortex that were active both when the monkey performed an action and when the experimenter performed the same action (Gallese, Fadiga, Fogassi, & Rizzolatti, 1996; Rizzolatti, Fadiga, Gallese, & Fogassi, 1996). Although canonical neurons in the premotor cortex would activate only when the monkey performed a motor hand action, these neurons were described as mirror neurons because of their apparent ability to represent the action of another. Additional research soon identified clusters of mirror neurons in a number of different locations in the brain (Rizzolatti & Craighero, 2004). Support for the theory that these neurons were providing mental representations of the action increased when it was discovered that neurons representing the final part of a motor sequence continued to fire even when the final portion of the sequence was hidden from the monkey's view (Umilta et al., 2001).

Mirror neurons have been posited as the foundation on which imitation (Buccino et al., 2004), empathy (Carr, Iacoboni, Dubeau, Mazziotta, & Lenzi, 2003), and even our capacity to understand another's state of mind rests (Gallese & Goldman, 1998; Schulkin, 2000; Williams, Whiten, Suddendorf, & Perrett, 2001). Evidence from a variety of sources including neurological impairment, direct neuron recordings, evolutionary biology, and neuroimaging have been marshaled in support of these arguments, at least in part because mirror neurons enable a plausible story to be told about how we have come to the capacity to communicate emotionally.

There is also mounting evidence suggesting that mirror neurons allow humans to use the same neural mechanisms both to express emotions and perceive the expression of emotion in others. Furthermore, these neural substrates appear connected to the emotion (changes in body and brain states triggered by the content of perceptions) as well as feelings (those changes in brain state that reach sufficient intensity to be perceived by conscious awareness) (Damasio, 1999, 2003). The insula, for instance, appears to become activated not only when we experience a disgusting smell but also when we perceive someone else's experience of disgust or imitate a disgusted expression. The region appears to facilitate our recognition of our physical, emotional,

and mental states and the physical, emotional, and mental states of others. And it may well be that the insula is one part of the network involved in the experience of disgust after adopting a disgusted facial expression.

Mirror neurons offer a plausible, causal mechanism for explaining the "perception-behavior" linkage that is central to the new research on automatic mimicry and older research on automatic responding in infants and adults as well. Coupled with the IFF hypothesis, the two mechanisms provide a plausible, if speculative, account of automatic behavioral responding, imitation (both gestural and facial), the occurrence of rapport, and emotional yoking. Empirical testing for these regulative processes awaits.

◆ Conclusions

In this chapter, we have tried to bring previous reviews of the literature on nonverbal coordination up to date by highlighting key studies and trends in the literature. In addition, we have tried to offer some speculations for theory development that would help to resolve some puzzles and paradoxes in the existing literature. In closing, however, three empirical conclusions should be brought out, lest they be lost in the details that the review entails. First, *yoked emotional response among social actors characterizes work groups, dating and longer term relationships, roommates, and even professional sports teams.* The mechanism of the production of this yoking of emotion is less well established and its consequences—for good or ill—have not yet been fully explored. Second, *coordination shows itself through mimicry of unnoticed behaviors.* Mimicry, in turn, produces a sense of rapport with the person mimicking that may even generalize to

others in the social environment. Importantly, the evidence is strong with causal direction clear and possible confounders minimized. Third, *coordination in the form of synchrony between infants and their parents has become sufficiently well established as to be a sign of normal (and, in its absence, abnormal) social development.* These findings are evidence of the maturation of a field of study.

At the theoretical level, the active formulation of general explanations of coordination that has marked the past 40 years of its study has not produced conceptual or theoretical consensus on which of several similar competitors is the most effective. We speculate that the move toward broad theories that encompass the range of behaviors and circumstances characteristic of coordination may be part of the problem along with the difficulty of providing unequivocal contrastive tests. One alterative is explanations that are more limited in scope. We explored "automatic perception-behavior" account of mimicry, arguing that it offers clear predictions and links well with other theories of automatic responding. Whereas the perception-behavior link works well, it is also clear that the behavior-rapport link is less obvious a consequence of mimicry. As a suggestive resolution, we presented IFFH to account for the behavior-rapport link and some evidence from the neurosciences on mirror neurons to strengthen the association between perception and behaviors enacted through imitation (or coordination).

◆ References

Adelman, P. K., & Zajonc, R. B. (1989). Facial efference and the experience of emotion. *Annual Review of Psychology, 40,* 249–280.

Andersen, P. A. (1985). Nonverbal immediacy in interpersonal communication. In

A. W. Siegman & S. Feldstein (Eds.), *Multichannel integrations of nonverbal behavior* (pp. 1–36). Hillsdale, NJ: Erlbaum.

Andersen, P. A., Guerrero, L. K., Buller, D. B., & Jorgensen, P. F. (1998). An empirical comparison of three theories of nonverbal immediacy exchange. *Human Communication Research, 24,* 501–535.

Anderson, C., Keltner, D., & John, O. P. (2003). Emotional convergence between people over time. *Journal of Personality and Social Psychology, 84,* 1054–1068.

Argyle, M., & Dean, J. (1965). Eye contact, distance, and affiliation. *Sociometry, 28,* 289–304.

Bakermans-Kranenburg, M. J., van Ijzendoorn, M. H., & Juffer, F. (2003). Less is more: Meta-analyses of sensitivity and attachment interventions in early childhood. *Psychological Bulletin, 129,* 195–215.

Bakker, A. B., & Schaufeli, W. B. (2001). Burnout contagion processes among teachers. *Journal of Applied Social Psychology, 30,* 2289–2308.

Bargh, J. A. (2003). Why we thought we could prime social behavior. *Psychological Inquiry, 14,* 216–218.

Bargh, J. A., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist, 54,* 462–479.

Bargh, J. A., & Ferguson, M. J. (2000). Beyond behaviorism: On the automaticity of higher mental processes. *Psychological Bulletin, 126,* 925–945.

Berkowitz, L. (1984). Some effects of thoughts on anti- and prosocial influences of media events: A cognitive neo-association analysis. *Psychological Bulletin, 95,* 410–427.

Berkowitz, L. (1997). Some thoughts extending Bargh's argument. In R. S. Wyer (Ed.), *Advances in social cognition* (Vol. 10, pp. 83–94). Mahwah, NJ: Erlbaum.

Berger, C. R., & Roloff, M. E. (1980). Social cognition, self awareness, and interpersonal communication. In B. Dervin & M. J. Voight (Eds.), *Progress in communication sciences* (Vol. 2, pp. 1–50). Norwood, NJ: Ablex.

Bernieri, F. J. (1988). Coordinated movement and rapport in teacher-student interactions. *Journal of Nonverbal Behavior, 12,* 120–138.

Bernieri, F., & Rosenthal, R. (1991). Interpersonal coordination: Behavior matching and interactional synchrony. In R. S. Feldman & B. Rime (Eds.), *The fundamentals of nonverbal behavior* (pp. 401–432). New York: Cambridge University Press.

Buccino, G., Vogt, S., Ritzl, A., Fink, G. R., Zilles, K., Freund, H. J., et al. (2004). Neural circuits underlying imitation learning of hand actions: An event-related fMRI study. *Neuron, 42,* 323–334.

Burgoon, J. K. (1978). A communication model of interpersonal space violations: Explication and initial test. *Human Communication Research, 4,* 129–142.

Burgoon, J. K. (1993). Interpersonal expectations, expectancy violations, and emotional communication. *Journal of Language and Social Psychology, 12,* 30–48.

Burgoon J. K. (1994). Nonverbal signals. In M. L. Knapp & G. R. Miller (Eds.), *Handbook of interpersonal communication* (2nd ed., pp. 229–271). Thousand Oaks, CA: Sage.

Burgoon, J. K., & Hale, J. L. (1988). Nonverbal expectancies violations: Model elaboration and application to immediacy behaviors. *Communication Monographs, 55,* 58–79.

Burgoon, J. K., & Jones, S. B. (1976). Toward a theory of personal space expectations and their violations. *Human Communication Research, 2,* 131–146.

Burgoon, J. K., Stern, L. A., & Dillman, L. (1995). *Interpersonal adaptation: Dyadic interaction patterns.* New York: Cambridge University Press.

Butler, E. A., Egloff, B., Wilhelm, F. H., Smith, N. C., Erickson, E. A., & Gross, J. J. (2003). The social consequences of expressive suppression. *Emotion, 3,* 48–67.

Cappella, J. N. (1981). Mutual influence in expressive behavior: Adult and infant-adult dyadic interaction. *Psychological Bulletin, 89,* 101–132.

Cappella, J. N. (1985). The management of conversations. In M. L. Knapp & G. R. Miller (Eds.), *The handbook of interpersonal communication* (pp. 393–438). Beverly Hills, CA: Sage.

Cappella, J. N. (1991). The biological origins of automated patterns of human interaction. *Communication Theory, 1,* 4–35.

Cappella, J. N. (1993). The facial feedback hypothesis in human interaction: Review and speculations. *Journal of Language and Social Psychology, 12,* 13–29.

Cappella, J. N. (1994). The management of conversational interaction in adults and infants. In M. L. Knapp & G. R. Miller (Eds.), *Handbook of interpersonal communication* (2nd ed., pp. 380–419). Thousand Oaks, CA: Sage.

Cappella, J. N. (1996). Dynamic coordination of vocal and kinesic behavior. In J. Watt & C. A. VanLear (Eds.), *Dynamic patterns in communication processes* (pp. 353–386). Thousand Oaks, CA: Sage.

Cappella, J. N. (1997). The development of theory about automated patterns of face-to-face human interaction. In G. Philipsen & T. Albrecht (Eds.), *Theories in human communication* (pp. 57–84). Albany, NY: SUNY Press.

Cappella, J. N. (1998). The dynamics of nonverbal coordination and attachment: Problems of causal direction and causal mechanism. In M. T. Palmer (Ed.), *Progress in communication sciences: Vol. 14. Mutual influence in interpersonal communication: Cognitive, behavioral, and affective components* (pp. 19–37). Greenwich, CT: Ablex.

Cappella, J. N., & Flagg, M. E. (1992, July). *Interactional adaptation, expressiveness and attraction: Kinesic and vocal responsiveness patterns in initial liking.* Paper presented at the 6th International Conference on Personal Relationships, University of Maine, Orono.

Cappella, J. N., & Greene, J. O. (1982). A discrepancy-arousal explanation of mutual influence in expressive behaviors for adult-adult and infant-adult interactions. *Communication Monographs, 49,* 89–114.

Cappella, J. N., & Palmer, M. T. (1990). Attitude similarity, relational history, and attraction: The mediating effects of kinesic and vocal behaviors. *Communication Monographs, 57,* 161–183.

Cappella, J. N., Palmer, M. T., & Donzella, B. (1991, May). *Individual consistency in temporal adaptations in nonverbal behavior in dyadic conversations: High and low expressive groups.* Paper presented at the International Communication Association conference, Chicago.

Carr, L., Iacoboni, M., Dubeau, M. C., Mazziotta, J. C., & Lenzi, G. L. (2003). Neural mechanisms of empathy in humans: A relay from neural systems for imitation to limbic areas. *Proceedings of the National Academy of Sciences, 100,* 5497–5502.

Chartrand, T. L., & Bargh, J. A. (1999). The chameleon effect: The perception-behavior link and social interaction. *Journal of Personality and Social Psychology, 76,* 893–910.

Cheng, C. M., & Chartrand, T. L. (2003). Self-monitoring without awareness: Using mimicry as a non-conscious affiliation strategy. *Journal of Personality and Social Psychology, 85,* 1170–1179.

Damasio, A. R. (1999). *The feeling of what happens: Body and emotion in the making of consciousness.* New York: Harcourt Brace.

Damasio, A. R. (2003). *Looking for Spinoza: Joy, sorrow, and the feeling brain.* New York: Harcourt.

Davis, D., & Martin, H. J. (1978). When pleasure begets pleasure: Recipient responsiveness as a determinant of physical pleasuring between heterosexual dating couples and strangers. *Journal of Personality and Social Psychology, 36,* 767–777.

Davis, D., & Perkowitz, W. T. (1979). Consequences of responsiveness in dyadic interaction: Effects of probability of response and proportion of content-related responses on interpersonal attraction. *Journal of Personality and Social Psychology, 37,* 534–550.

De Wolff, M. S., & van Ijzendoorn, M. H. (1997). Sensitivity and attachment: A meta-analysis on parental antecedents of infant attachment. *Child Development, 68,* 571–591.

Dijksterhuis, A., & van Knippenberg, A. (1998). The relation between perception and behavior, or how to win a game of Trivial Pursuit. *Journal of Personality and Social Psychology, 74,* 865–877.

Doherty, R. W. (1997). The Emotional Contagion Scale: A measure of individual

differences. *Journal of Nonverbal Behavior, 21,* 131–153.

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.

Feldman, R. (2003). Infant-mother and infant-father synchrony: The coregulation of positive arousal. *Infant Mental Health Journal, 24,* 1–23.

Feldman, R., & Eidelman, A. I. (2004). Parent-infant synchrony and the social-emotional development of triplets. *Developmental Psychology, 40,* 1133–1147.

Feldman, R., & Greenbaum, C. W. (1997). Affect regulation and synchrony in mother-infant play as precursors to the development of symbolic competence. *Infant Mental Health Journal, 18,* 4–23.

Feldman, R., Greenbaum, C. W., & Yirmiya, N. (1999). Mother-infant affect synchrony as an antecedent of the emergence of self-control. *Developmental Psychology, 35,* 223–231.

Ferguson, M. J., & Bargh, J.A. (2004). How social perception can automatically influence behavior. *Trends in Cognitive Sciences, 8,* 33–39.

Field, T. (1987). Affective and interactive disturbances in infants. In J. D. Osofsky (Ed.), *Handbook of infant development* (2nd ed., pp. 972–1007). New York: Wiley.

Field, T. (1998). Maternal depression effects on infants and early interventions. *Preventive Medicine: An International Journal Devoted to Practice & Theory, 27,* 200–203.

Firestone, I. (1977). Reconciling verbal and nonverbal models of dyadic communication. *Environmental Psychology and Nonverbal Behavior, 2,* 30–44.

Gallese, V., Fadiga, L., Fogassi, L., & Rizzolatti, G. (1996). Action recognition in the premotor cortex. *Brain, 119,* 593–609.

Gallese, V., & Goldman, A. (1998). Mirror neurons and the simulation theory of mind reading. *Trends in Cognitive Science, 2,* 493–501.

Giles, H., & Powesland, P. F. (1975). *Speech style and social evaluation.* London: Academic Press.

Giles, H., Mulac, A., Bradac, J. J., & Johnson, P. (1987). Speech accommodation theory: The first decade and beyond. In M. L. McLaughlin (Ed.), *Communication yearbook 10* (pp. 13–48). Newbury Park, CA: Sage.

Giles, H., & Smith, P. M. (1979). Accommodation theory: Optimal levels of convergence. In H. Giles & R. St. Clair (Eds.), *Language and social psychology* (pp. 45–65). Baltimore, MD: University Park Press.

Goodman, C. R., & Shippy, R. A. (2002). Is it contagious? Affect similarity among spouses. *Aging & Mental Health, 6,* 266–274.

Gottman, J. M. (1979). *Marital interaction.* New York: Academic Press.

Gottman, J. M., & Levenson, R. W. (1999). What predicts change in marital interaction over time? A study of alternative models. *Family Process, 38,* 143–158.

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

Hatfield, E., Cacioppo, J., & Rapson, R. L. (1994). *Emotional contagion.* Paris: Cambridge University Press.

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.

Hess, U., Philippot, P., & Blairy, S. (1999). Mimicry: Facts and fiction. In P. Philippot, R. S. Feldman, & E. J. Coats (Eds.), *The social context of nonverbal behavior* (pp. 213–241). New York: Cambridge University Press.

Hietanen, J. K., Surakka, V., & Linnankoski, I. (1998). Facial electromyographic responses to vocal affect expressions. *Psychophysiology, 35,* 530–536.

Hsee, C. K., Hatfield, E., Carlson, J. G., & Chemtob, C. (1992). Assessments of the emotional state of others—Conscious judgments versus emotional contagion. *Journal of Social and Clinical Psychology, 11,* 119–128.

Ingram, L. A. (1997). Congruence and contagion of affect in elderly caregiver-care recipient spousal pairs. *Dissertation Abstracts International, 58* (3-B), 1595B.

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.

Lakin, J. L., & Chartrand, T. L. (2003). Using non-conscious behavioral mimicry to create affiliation and rapport. *Psychological Science, 14*, 334–339.

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.

Langer, E. J. (1978). Rethinking the role of thought in social interaction. In J. H. Harvey, W. J. Ickes, & R. F. Kidd (Eds.), *New directions in attribution research* (Vol. 2, pp. 35–58). Hillsdale, NJ: Erlbaum.

Le Poire, B. A., & Burgoon, J. K. (1996). Usefulness of differentiating arousal responses within communication theories: Orienting response or defensive arousal within nonverbal theories of expectancy violation. *Communication Monographs, 63*, 208–230.

Lundqvist, L.O. (1995). Facial EMG reactions to facial expressions: A case of facial emotional contagion. *Scandinavian Journal of Psychology, 36*, 130–141.

Manusov, V. (1995). Reacting to changes in nonverbal behaviors: Relational satisfaction and adaptation patterns in romantic dyads. *Human Communication Research, 21*, 456–477.

Milner, J. S., Halsey, L. B., & Fultz, J. (1995). Empathic responsiveness and affective reactivity to infant stimuli in high- and low-risk for child abuse mothers. *Child Abuse and Neglect, 19*, 767–780.

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

NICHD Early Child Care Research Team. (1997). The effects of infant child care on infant-mother attachment security: Results of the NICHD study of early child care. *Child Development, 68*, 860–879.

Noller, P. (1984). *Nonverbal communication and marital interaction.* Oxford: Pergamon Press.

O'Connor, B. P., & Gifford, R. (1988). A test among models of nonverbal immediacy reactions: Arousal-labeling, discrepancy-arousal, and social cognition. *Journal of Nonverbal Behavior, 12*, 6–30.

Patterson, M. L. (1976). An arousal model of interpersonal intimacy. *Psychological Review, 83*, 235–245.

Patterson, M. L. (1982). A sequential functional model of nonverbal exchange. *Psychological Review, 89*, 231–249.

Patterson, M. L. (1999). The evolution of a parallel process model of nonverbal communication. In P. Philippot, R. S. Feldman, & E. J. Coats (Eds.), *The social context of nonverbal behavior* (pp. 317–347). New York: Cambridge University Press.

Pike, G. R., & Sillars, A. L. (1985). Reciprocity and marital communication. *Journal of Personal and Social Relationships, 2*, 303–324.

Pugh, S. D. (1998). Service with a smile: The contagious effects of employee affect on customer attitudes. *Dissertation Abstracts International, 58* (11-B), 6267B.

Rizzolatti, G., & Craighero, L. (2004). The mirror-neuron system. *Annual Review of Neuroscience, 27*, 169–192.

Rizzolatti, G., Fadiga, L., Gallese, V., & Fogassi, L. (1996). Premotor cortex and the recognition of motor actions. *Cognitive Brain Research, 3*, 131–141.

Schulkin, J. (2000). Theory of mind and mirroring neurons. *Trends in Cognitive Science, 4*, 252–254.

Sonnby-Borgstrom, M., & Jonsson, P. (2004). Dismissing-avoidant pattern of attachment and mimicry reactions at different levels of information processing. *Scandinavian Journal of Psychology, 45*, 103–13.

Stack, D. M., & Arnold, S. L. (1998). Changes in mothers' touch and hand gestures influence infant behavior during face-to-face interchanges. *Infant Behavior and Development, 21*, 451–468.

Street, R. L. (1982). Evaluation of noncontent speech accommodation. *Language and Communication, 2,* 13–31.

Street, R. L., & Giles, H. (1982). Speech accommodation theory: A social cognitive approach to language and speech behavior. In M. Roloff & C. R. Berger (Eds.), *Social cognition and communication* (pp. 193–226). Beverly Hills, CA: Sage.

Symons, D., & Moran, G. (1994). Responsiveness and dependency are different aspects of social contingencies: An example from mother and infant smiles. *Infant Behavior and Development, 17,* 209–214.

Thompson, L. L., Nadler, J., & Kim, P. H. (1999). Some like it hot: The case for the emotional negotiator. In L. L. Thompson & J. M. Levine (Eds.), *Shared cognition in organizations: The management of knowledge* (pp. 139–161). Mahwah, NJ: Erlbaum.

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

Totterdell, P., Kellett, S., Teuchmann, K., & Briner, R. B. (1998). Evidence of mood linkage in work groups. *Journal of Personality and Social Psychology, 74,* 1504–1515.

Totterdell, P., Wall, T., Holman, D., Diamond, H., & Epitropaki, O. (2004). Affect networks: A structural analysis of the relationship between work ties and job-related affect. *Journal of Applied Psychology, 89,* 854–867.

Ullstadius, E. (1998). Neonatal imitation in a mother-infant setting. *Early Development and Parenting, 7,* 1–8.

Umilta, M. A., Kohler, E., Gallese, V., Fogassi, L., Fadiga, L., Keysers, C., et al. (2001). I know what you are doing: A neurophysiological study. *Neuron, 31,* 155–165.

Van Baaren, R. B., Holland, R. W., Kawakami, K., & Van Knippenberg, A. (2004). Mimicry and prosocial behavior. *Psychological Science, 15,* 71–74.

Van Baaren, R. B., Horgan, T. G., Chartrand, T. L., & Dijkmans, M. (2004). The forest, the trees, and the chameleon: Context dependence and mimicry. *Journal of Personality & Social Psychology, 86,* 453–459.

Van Baaren, R. B., Maddux, W. W., Chartrand, T. L., de Bouter, C., & van Knippenberg, A. (2003). It takes two to mimic: Behavioral consequences of self-construals. *Journal of Personality and Social Psychology, 84,* 1093–1102.

Verbeke, W. (1997). Individual differences in emotional contagion of salespersons: Its effect on performance and burnout. *Psychology & Marketing, 14,* 617–636.

Welkowitz, J., & Kuc, M. (1973). Interrelationships among warmth, genuineness, empathy, and temporal speech patterns in interpersonal interaction. *Journal of Consulting and Clinical Psychology, 41,* 472–473.

Wendland-Carro, J., Piccinini, C. A., & Millar, W. S. (1999). The role of an early intervention on enhancing the quality of mother-infant interaction. *Child Development, 70,* 713–721.

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.

Williams, J. H., Whiten, A., Suddendorf, T., & Perrett, D. I. (2001). Imitation, mirror neurons and autism. *Neuroscience Biobehavior Review, 25,* 287–295.

Zajonc, R. B., Murphy, S. T., & Englehart, M. (1989). Feeling and facial efference: Implications of the vascular theory of emotion. *Psychological Review, 96,* 395–416.