The Communication of Emotion via Touch

Matthew J. Hertenstein, Rachel Holmes,
and Margaret McCullough
DePauw University

Dacher Keltner
University of California, Berkeley

The study of emotional communication has focused predominantly on the facial and vocal channels but has ignored the tactile channel. Participants in the current study were allowed to touch an unacquainted partner on the whole body to communicate distinct emotions. Of interest was how accurately the person being touched decoded the intended emotions without seeing the tactile stimulation. The data indicated that anger, fear, disgust, love, gratitude, and sympathy were decoded at greater than chance levels, as well as happiness and sadness, 2 emotions that have not been shown to be communicated by touch to date. Moreover, fine-grained coding documented specific touch behaviors associated with different emotions. The findings are discussed in terms of their contribution to the study of emotion-related communication.

Keywords: touch, emotion, tactile, communication

Touch has been described as the most fundamental means of contact with the world (Barnett, 1972) and the simplest and most straightforward of all sensory systems (Geldard, 1960). Touch is vital in several domains of the infant's and child's life, including social, cognitive, and physical development (e.g., Field, 2001). Touch continues to play a central role in adulthood when flirting, expressing power, soothing, playing, and maintaining proximity between child and caretaker (Eibl-Eibesfeldt, 1989). As with humans, touch serves many functions in nonhuman primates. Different species groom to reconcile following aggressive encounters, to initiate sexual encounters, to reward cooperative acts of food sharing, to maintain proximity with caretakers, and to sooth conspecifics during stress (de Waal, 1989).

Despite the importance of touch in several key domains of social life, its role in the communication of emotion has received little attention compared with facial and vocal displays of emotion (Stack, 2001). In fact, one finds virtually no mention of touch in reference works in the field of affective science (e.g., Davidson, Scherer, & Goldsmith, 2003). On the basis of the limited research that has been conducted on touch and emotion, two general claims have been made regarding the role of touch in emotional communication. First, touch has been claimed to communicate the hedonic value of emotions (i.e., either positive or negative; Jones & Yarbrough, 1985; Knapp & Hall, 1997). Second, touch was thought to merely amplify the intensity of emotional displays from the face and voice (Knapp & Hall, 1997).

Recently, Hertenstein, Keltner, App, Bulleit, and Jaskolka (2006) documented that strangers in Spain and the United States could accurately decode distinct emotions when they were touched by another person. These findings challenge claims that touch solely serves as a general hedonic signaling system or an intensifier of other emotion signaling systems. In this research, two strangers interacted in a room where they were separated by a barrier. They could not see one another, but they could reach each other through a hole in the barrier. One person touched the other on the forearm, instructed to convey each of 12 different emotions. After each touch, the person touched had to choose which emotion s/he thought the encoder was communicating.

The results indicated that participants could decode anger, fear, disgust, love, gratitude, and sympathy at above-chance levels, but not tactile expressions of happiness, surprise, sadness, embarrassment, envy, and pride. Accuracy rates ranged from 48% to 83% for the accurately decoded emotions. In addition, extensive behavioral coding identified specific tactile behaviors specific to each emotion. For example, sympathy was associated with stroking and patting, anger was associated with hitting and squeezing, disgust was associated with a pushing motion, and fear was associated with trembling.

The primary purpose of the current investigation was to significantly extend our understanding of the degree to which touch can communicate distinct emotions. Our study was guided by four motivations. First, the current study provides greater ecological validity than previous studies. In Hertenstein, Keltner, and colleagues' (2006) studies, participants communicating emotion were allowed to touch the other member of the dyad only on the bottom half of the arm—a constrained context. In the current study, encoders (those attempting to communicate the emotions) were allowed to touch the other member of the dyad (i.e., the decoder) anywhere on the body that was appropriate.[1] This more closely approximates how people rely on touch to communicate in more naturalistic settings (Jones & Yarbrough, 1985).

[1] Like Banse and Scherer (1996), we use *encoder* and *decoder* because they connote the research method and the underlying process; no inference should be made that a "code" exists in the emotional signal.

Second, we sought to replicate previous findings showing that touch communicates emotion. Hertenstein, Keltner, et al. (2006) provided only one large-scale study to provide evidence that touch communicates six distinct emotions—anger, fear, disgust, love, gratitude, and sympathy. If touch, in fact, communicates these emotions in a constrained paradigm, one would expect these same emotions to be communicated in a less constrained, whole-body paradigm such as the one used in the current study.

Third, we sought to investigate whether touch on the whole body could communicate more distinct emotions than known heretofore. Hertenstein, Keltner, et al. (2006) provided evidence that touch can communicate three negatively valenced emotions—anger, fear, and disgust—and three prosocial emotions—love, gratitude, and sympathy. Because encoders in the current investigation were allowed to touch the other member of the dyad anywhere on the body, the location, as well as the types of touch used, provided decoders with additional information to interpret the tactile communications. Given the greater complexity of tactile signals permitted in the current paradigm, we predicted that touch on the whole body would allow more emotions to be communicated than in the first study of touch and emotion.

Finally, the field of emotion has advanced by developing precise descriptions of emotion-specific signals (Ekman, 1993; Scherer, Johnstone, & Klasmeyer, 2003). As mentioned, the current experimental paradigm provided encoders with more degrees of freedom to communicate various emotions than previous work. Analyses of tactile behaviors in the current study yield a more precise behavioral description of how touch communicates emotion as compared to previous work (Hertenstein, Keltner, et al., 2006).

We asked whether participants can communicate two classes of emotions via touch: (a) five emotions that have proven to be decoded in the face and voice in different cultures (anger, fear, happiness, sadness, and disgust), and (b) three prosocial emotions related to cooperation and altruism (love, gratitude, and sympathy). These emotions were chosen for two reasons. First, all of the above emotions were attempted to be communicated in the previous studies examining the communication of distinct emotions via touch (Hertenstein, Keltner, et al., 2006). Moreover, all of the emotions with the exceptions of happiness and sadness were communicated at greater than chance levels in previous work (Hertenstein, Keltner, et al., 2006). In reference to the second class of emotions—the prosocial emo-

tions—we opted to choose love, gratitude, and sympathy because of their theoretical association with cooperation and altruism. Keltner, Horberg, and Oveis (2006) have theorized that touch plays a central role in rewarding those who engage in altruistic and cooperative acts, as well as identifying those who are likely to engage in reciprocal alliances. For all emotions, we employed a modified forced-choice methodology similar to that used in studies of facial and vocal emotional communication (Frank & Stennett, 2001; Scherer et al., 2003).

Method

Participants

The sample comprised 248 participants (124 unacquainted dyads) who were predominantly White from a small educational institution. The age range for the sample was 18 to 36 years ($M = 19.93$ years, $SD = 1.92$). Participants received extra credit in an introductory psychology course for participating. One member of the dyad was randomly assigned to the role of encoder, the other to the role of decoder. The gender breakdown of the four possible dyads was as follows (encoder–decoder): female–female ($n = 44$), female–male ($n = 24$), male–male ($n = 25$), and male–female ($n = 31$).

Procedure and Materials

The designated encoder entered the laboratory to find the decoder blindfolded and standing at a predetermined location in a medium-sized room. The decoder could not see the encoder, nor were the participants allowed to talk or make any sounds, so as to preclude the possibility that they might provide nontactile clues to the emotion being communicated. Eight emotion words were displayed serially to the encoder on sheets of paper in a randomized order. The encoder was instructed to think about how he or she wanted to communicate each emotion, and then to make contact with the decoder's body, using any form of touch he or she deemed appropriate (encoders were instructed to touch only on appropriate places of the body). Decoders were not told the gender of the partner, and all tactile displays were video recorded. After each tactile display was administered, the decoder was administered a forced-choice response sheet reading, "Please choose the term that best describes what this person is communicating to you." The

Table 1
Percentage of Decoding Accuracy for All Emotions

Emotion	Encoder–decoder group				
	Male–male	Male–female	Female–female	Female–male	Average
Well-studied emotions					
Anger	80**	77**	75**	83**	78**
Fear	60**	58**	48**	67**	56**
Happiness	44*	61**	59**	75**	60**
Sadness	44*	52**	57**	42*	50**
Disgust	48**	48**	43**	67**	50**
Prosocial emotions					
Love	64**	71**	61**	79**	68**
Gratitude	76**	77**	70**	75**	74**
Sympathy	64**	65**	70**	67**	67**

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

Table 2
Percentage of Encoding Behaviors of Tactile Displays That Were Accurately Decoded

	Encoder–decoder group											
	Male–male			Male–female			Female–female			Female–male		
Emotion	Tactile behavior	M	SD	Tactile behavior	M	SD	Tactile behavior	M	SD	Tactile behavior	M	SD
Anger	Shake	38	44	Shake	32	41	Push	29	35	Push	32	42
	Push	24	39	Push	29	40	Shake	28	39	Shake	14	33
	Squeeze	20	32	Squeeze	11	25	Squeeze	21	36	Hit	12	25
	Hit	9	25	Lift	7	13	Hit	9	22	Squeeze	11	21
	Pat	4	10	Hit	6	25	Lift	4	8	Slap	10	28
Fear	Shake	29	40	Shake	14	29	Squeeze	36	40	Press	21	33
	Squeeze	21	36	Contact—NM	13	30	Shake	9	25	Contact—NM	15	34
	Contact—NM	15	27	Squeeze	13	27	Tremble	8	22	Shake	14	30
	Press	10	25	Lift	11	15	Contact—NM	8	23	Lift	11	15
	Lift	9	16	Press	5	14	Press	7	14	Squeeze	10	24
Happiness	Shake	25	32	Shake	28	35	Swing	21	29	Swing	28	36
	Squeeze	23	39	Lift	23	21	Hug	17	32	Lift	21	19
	Pat	23	32	Hug	21	35	Shake	16	24	Shake	13	29
	Lift	16	20	Swing	13	24	Squeeze	16	28	Squeeze	10	19
	Hug	13	29	Squeeze	6	22	Lift	13	16	High five	3	9
Sadness	Contact—NM	27	39	Hug	36	47	Nuzzle	23	35	Nuzzle	24	39
	Hug	27	42	Nuzzle	34	44	Contact—NM	19	33	Contact—NM	23	40
	Nuzzle	25	40	Contact—NM	16	33	Stroke	18	28	Stroke	23	30
	Squeeze	16	31	Lift	11	16	Hug	17	34	Rub	10	29
	Lift	10	17	Squeeze	5	14	Lift	8	13	Press	7	23
Disgust	Push	49	46	Push	35	41	Push	27	38	Push	28	34
	Contact—NM	12	27	Contact—NM	19	30	Squeeze	11	26	Slap	14	34
	Squeeze	10	25	Lift	11	23	Lift	11	19	Lift	8	12
	Shake	10	22	Shake	10	24	Slap	7	22	Kick	6	16
	Lift	5	14	Toss	6	17	Shake	7	18	Contact—NM	5	13
Love	Hug	61	45	Hug	53	41	Hug	59	43	Hug	34	39
	Pat	20	28	Stroke	15	27	Stroke	8	21	Contact—NM	17	32
	Stroke	8	24	Contact—NM	10	22	Lift	8	14	Stroke	11	21
	Contact—NM	6	22	Lift	8	16	Press	6	15	Lift	8	13
	Tap	5	20	Pat	8	18	Contact—NM	5	18	Nuzzle	7	21
Gratitude	Shake	49	28	Shake	49	25	Shake	29	26	Shake	31	26
	Lift	26	18	Lift	28	17	Lift	18	13	Lift	18	16
	Pat	19	29	Hug	6	13	Hug	16	26	Pat	17	30
	Contact—NM	8	21	Contact—NM	6	15	Pat	10	23	Hug	9	23
	Hug	4	20	Pat	6	12	Contact—NM	3	10	Contact—NM	9	18
Sympathy	Pat	43	34	Hug	24	38	Rub	25	32	Rub	24	29
	Hug	22	39	Rub	23	37	Hug	23	33	Hug	19	35
	Contact—NM	22	31	Contact—NM	21	31	Pat	17	21	Contact—NM	19	32
	Rub	10	23	Pat	18	30	Contact—NM	14	23	Pat	16	25
	Stroke	9	22	Stroke	12	23	Stroke	13	21	Stroke	12	18

Note. Contact—NM = contact, but no movement.

response sheet contained the following nine response options: *anger, disgust, fear, happiness, sadness, sympathy, love, gratitude*, as well as *none of these terms are correct* to reduce artificial inflation of accuracy rates (see Frank & Stennett, 2001). These emotions were listed in random order across participants. The dependent measure of interest was the proportion of participants selecting each response option when decoding the tactile stimulus.

Coding Procedure

All of the tactile displays were coded on a second-by-second basis by research assistants who were naïve to the emotion being communicated. The coding system was informed by a survey of coding systems used by researchers investigating touch (e.g., Jones & Yarbrough, 1985; Weiss, 1992). The specific types of touch that

were coded included squeezing, stroking, rubbing, pushing, pulling, pressing, patting, tapping, shaking, pinching, trembling, poking, hitting, scratching, massaging, tickling, slapping, lifting, picking, hugging, finger interlocking, swinging, and tossing (i.e., tossing the hand of the decoder). Each second the encoder touched the decoder, a code was assigned of (a) no touch, (b) light intensity, (c) moderate intensity, or (d) strong intensity.[2] In addition, the

---

[2] Intensity was defined as follows: (a) light intensity: indentation on the decoder's skin or movement of the decoder's body is not apparent or barely perceptible; (b) moderate intensity: there is some skin indentation or movement of the decoder's body but not extensive; (c) strong intensity: indentation on the decoder's skin is fairly deep or movement of the decoder's body is substantial as a result of the pressure or force of the touch.

duration that each encoder touched the decoder for each emotion was calculated. Finally, we coded the location of all administered touches. Interrater agreement on all of the codes, based on 20% overlap in coders' judgments, ranged from .81 to .99.

Results

The data analytic strategy adopted for the current study was the same as that of Hertenstein, Keltner, et al. (2006) to facilitate comparison between investigations. To assess potential gender differences, we conducted a two-way analysis of variance (ANOVA), using the gender of the encoder and the gender of the decoder as the independent variables and an overall accuracy score as the dependent variable. The latter variable was computed by summing the number of times the decoder accurately chose the target emotion across all emotions. The ANOVA revealed no main effects for the encoder's gender (men: $M = 4.95$, $SE = 0.22$; women: $M = 5.19$, $SE = 0.21$), $F(1, 120) = 0.66$, $p > .05$, $\eta_p^2 = .01$; the decoder's gender (men: $M = 5.17$, $SE = 0.23$; women: $M = 4.97$, $SE = 0.19$), $F(1, 120) = 0.45$, $p > .05$, $\eta_p^2 = .00$; as well as no significant interaction, $F(1, 120) = 2.76$, $p > .05$, $\eta_p^2 = .02$.

In addition to these analyses, we conducted binomial tests on the proportion of participants who chose each emotion for a given target emotion. Like Hertenstein, Keltner, et al. (2006), we followed Frank and Stennett's (2001) suggestion that a chance rate of 25% be set for such analyses. In Table 1, we present the accuracy rates of all dyad combinations and the overall average for each emotion. All of the well-studied emotions—anger, fear, happiness, sadness, and disgust—were decoded at greater than chance levels without significant levels of confusion with other emotions. Of these emotions, anger was most accurately communicated. All of the prosocial emotions, including love, gratitude, and sympathy, were decoded at greater than chance levels without confusion as well. In fact, as a group, the prosocial emotions were communicated more accurately, on average, than the well-studied emotions.

What were the tactile signals associated with each of the emotions? In Table 2, we display the five most frequent types of touch used for each emotion decomposed by gender–dyad combination. For the instances in which the encoder accurately conveyed the emotion to the decoder, we present the duration and intensity of touch for each emotion in Table 3, as well as the location of the

touches received by decoders in Figure 1 (again, decomposed by gender–dyad combination). Systematic differences in the quality of touch were evident for each of the communicated emotions. Anger, for example, was associated with pushing and shaking; sadness was associated with nuzzling and hugging; love was associated with hugging and stroking; and sympathy was associated with hugging and rubbing. In addition, duration and intensity differences characterized each of the emotions. For example, sadness was characterized by predominantly light intensity touch of moderate duration, whereas anger was characterized by predominantly strong and moderate intensity touch of shorter duration. Finally, the location of the touches was different depending on the emotion communicated and the gender combination type.

Discussion

The current study provides evidence that touch communicates distinct emotions and does so in a robust fashion. We documented that touch communicates at least eight emotions: anger, fear, happiness, sadness, disgust, love, gratitude, and sympathy. Moreover, the accuracy rates for the emotions ranged, on average, from 50% to 70%, which are comparable to the accuracy rates observed in facial and vocal studies of emotion (Elfenbein & Ambady, 2002; Scherer et al., 2003). Finally, fine-grained coding documented specific touch behaviors associated with each of the emotions.

The findings extend the literature on the communication of emotion in three ways. First, not only were the same emotions communicated via touch as those in previous studies, thereby replicating previous work (Hertenstein, Keltner et al., 2006), but two new emotions were reliably communicated through touch in the current study: happiness and sadness. The field of emotion has been advanced significantly by researchers who have identified new emotion signals in a variety of modalities. For example, researchers have uncovered signals for embarrassment in the face (Keltner & Buswell, 1997), varieties of laughter in the voice (Smoski & Bachorowski, 2003), and pride in gesture (Tracy & Robins, 2004). Drawing on data from Hertenstein, Keltner, et al. (2006), as well as the current investigation, touch communicates at least four negatively valenced emotions—anger, fear, sadness, and disgust—and four positive or prosocial emotions—happiness, gratitude, sympathy, and love (Lazarus, 1991).

Table 3
Duration and Intensity of Tactile Displays That Were Accurately Decoded

| | Duration (s) | | Intensity (%) | | | | | | | |
| | | | None | | Light | | Moderate | | Strong | |
Encoded emotion	M	SD	M	SD	M	SD	M	SD	M	SD
Ekman's emotions										
Anger	4.5	5.1	5.0	11.1	6.9	16.6	33.0	36.4	55.1	41.4
Fear	7.6	8.5	0.6	2.5	17.7	26.2	57.1	35.4	24.6	35.0
Happiness	5.8	3.7	0.8	3.7	16.0	30.3	35.5	29.9	47.6	35.7
Sadness	6.4	4.3	0.7	2.9	65.1	41.3	31.4	39.9	3.3	8.6
Disgust	5.8	7.0	8.8	17.6	12.4	23.1	40.2	33.6	38.6	37.4
Prosocial emotions										
Love	5.3	4.7	1.6	7.1	35.0	37.8	56.7	38.8	6.7	21.5
Gratitude	6.0	4.6	0.6	3.2	16.6	21.8	73.3	28.4	9.6	20.9
Sympathy	6.4	5.6	1.0	5.5	65.5	38.1	32.2	36.7	1.4	7.3

Anger

Fear
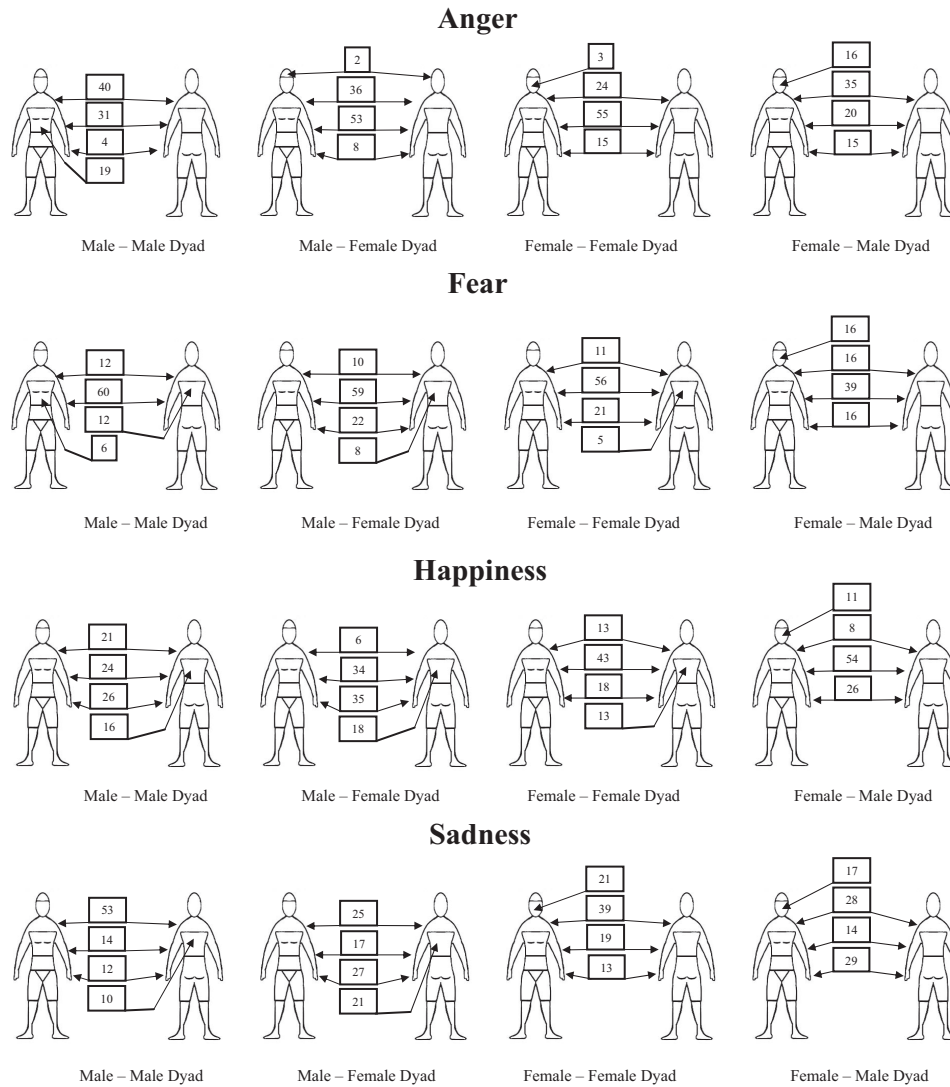

Happiness

Sadness

Figure 1. Location where and percentage of time decoder's body was contacted by encoder when emotions were accurately decoded. The figure on the left represents the front side, and the figure on the right represents the back side.

Our investigation advances the study of emotional communication in a second related fashion, by providing evidence that the tactile signaling system is just as differentiated, if not more so, than the face and voice. Our findings along with those of Hertenstein, Keltner, et al. (2006) indicate that touch communicates more than the hedonic tone and the intensity of emotions as once thought (Hertenstein & Campos, 2001; Jones & Yarbrough, 1985; Knapp & Hall, 1997). The greatest contrast between touch and the face and voice can be observed when examining positive or prosocial emotions. In the face, only one positive emotion—joy—has been reliably decoded in studies (Ekman, 1993), although there is some evidence that sympathy (Eisenberg, Fabes, Miller, & Fultz, 1989) and love are evident in the face as well (Gonzaga, Keltner, & Londahl, 2001).

In the voice, researchers have found evidence for some differentiation of positive emotional states as well. In a meta-analysis of vocal communication of emotion, Juslin and Laukka (2003) dif-

ferentiated between the communication of *happiness* and the communication of *love–tenderness*. The former category included positive emotional states such as cheerfulness, elation, enjoyment, and joy, whereas the latter category included states such as affection, love, tenderness, and passion. Thus, there is evidence for at least some degree of differentiation among positive emotions in the voice. Nevertheless, data from the current study suggest that touch demonstrates greater differentiation than the voice and perhaps even the face.

Our investigation advances the understanding of emotional communication in a third way, by documenting specific tactile behaviors that are associated with each of the emotions. For example, fear was communicated by holding the other, squeezing, and contact without movement, whereas sympathy was communicated by holding the other, patting, and rubbing. Two important points should be made regarding the tactile encoding of emotions. First, the tactile system is incredibly complex; touch can vary in its action (the specific move-
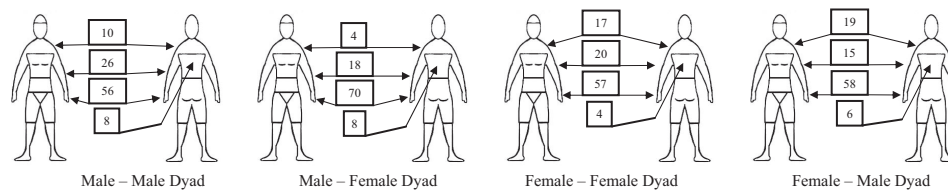
Disgust
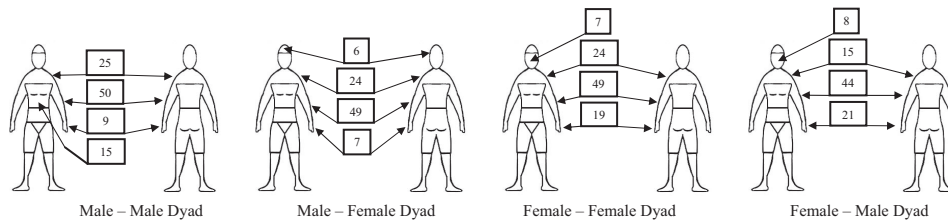
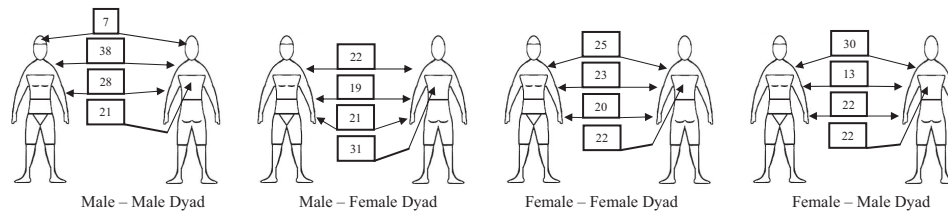
Love
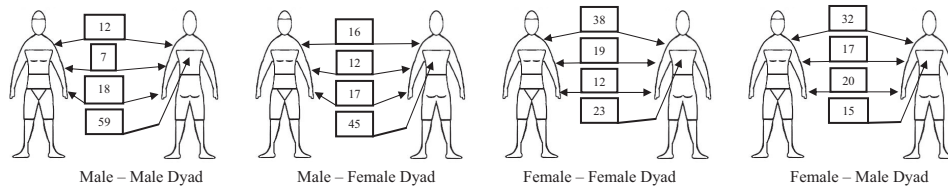
Gratitude

Sympathy

Figure 1.   (continued)

ments one uses to touch such as rubbing), intensity (degree of pressure that one uses), velocity (the rate at which one impresses on or moves across the skin), abruptness (the acceleration or deceleration that one uses to touch), temperature, location, and duration. The physical complexity of touch is what likely allows for such a differentiated signaling system. The second point involves the principle of *equipotentiality*. The principle of equipotentiality refers to the idea that the same type of touch can be assigned very different meanings or consequences. This principle is in line with functional claims of emotion that emphasize the flexibility of the emotion signaling system (Witherington & Crichton, 2007). Related to this point, much research has shown that men and women interpret touch very differently (Hertenstein, Verkamp, et al., 2006). Our data indicate that this is not the case in terms of the decoding of specific emotions (all dyad types decoded the same emotions above chance), but the genders certainly used different actions to communicate various emotions.

Our data lend support to the above statements about the tactile system. Although every quality of touch we coded was evident at

various intensities in the study, systematic differences existed between the emotions. Moreover, the principle of equipotentiality was evident. For example, equipotentiality was present to some degree in that "shaking" was used to communicate more than one emotion. This demonstrates that the same tactile signal may have varying meanings assigned to it depending on other factors such as intensity and duration, as well as the other accompanying tactile behaviors.

Several features of the current study increase our confidence in the robustness of the findings. First, we opted to allow participants to touch the decoder on the whole body rather than limiting the location of the touch to the lower half of the arm. This allowed greater degrees of freedom to the encoder and more closely mimics what happens in naturalistic contexts. It is important to note that our study, like the vast majority of studies focusing on the face and voice, included strangers to remove the possibility that people could communicate through touch because they were familiar with each other. Nevertheless, we acknowledge that people touch each other less frequently with strangers than with intimate partners or

friends, especially on the whole body (Hertenstein, Verkamp, et al., 2006). Our study shows, nevertheless, that touch does, in fact, possess the possibility of communicating distinct emotions even between strangers. Future research should address how results may differ when dyad partners are more familiar with each other. Second, unlike most studies of the face and voice which employ actors adept at emotional communication, we opted to allow subjects to touch their partners in any way they saw fit. This provided greater variability in our study in terms of encoding behaviors, and it deals with one critique of the facial and vocal literature, that of employing highly prototypical displays of emotion. Finally, we included the response option *none of these terms are correct*, which reduces the likelihood of inflated accuracy rates (Frank & Stennett, 2001).

There are conceivable alternative explanations for the data in the current study. Like most studies of facial (Ekman, 1993) and vocal communication (Scherer et al., 2003), we conceptualized the study in terms of the communication of emotions. One of the most significant alternative interpretations is that encoders may have been communicating intentions rather than emotions. Fridlund (1997), in fact, has raised this issue in reference to the facial expression literature; our study is subject to this alternative explanation and it is one that future research should explore.

What might be the evolutionary origins of a tactile signaling system? Hertenstein, Verkamp, Kerestes, and Holmes (2006) have recently suggested that social grooming, also known as *allogrooming*, may underlie the development of such a system. Despite the necessity of grooming to protect nonhuman primates from disease, most researchers agree that the prevalence of grooming in species is indicative of important social functions (Boccia, 1983; Sparks, 1967). Support for this comes from evidence that nonhuman primates in captivity groom equally as much as those in the wild, despite the lack of ectoparasites requiring removal (Suomi, 1990). In addition, primates of a lower status are groomed less, although they are as susceptible to parasites as are primates of a higher status (Sparks, 1967). The evidence indicates that grooming maintains social relationships between nonhuman primates of every sex, age, and rank. It is plausible that humans' tactile communication system may have evolved from the intricate system of tactile contact evident in nonhuman primates. It is also plausible that grooming in nonhuman species is particularly relevant for the differentiation of prosocial emotions, which ultimately act as signals of reciprocal alliances (Keltner et al., 2006).

Several important questions related to touch and emotion await investigation. First, what are the evolutionary origins of the tactile communication system? One plausible explanation—grooming—was offered above, but this and other evolutionary explanations deserve more empirical and theoretical attention. Second, how does the signaling of emotions by the tactile system operate in more naturalistic contexts? Preciously few naturalistic studies of facial and vocal communication of emotion have been conducted, and touch is no exception. Third, to what degree is the communication of emotion via touch universal versus culturally specific? Our data are limited insofar as they are limited to a U.S. sample. Some researchers have investigated cultural differences in touch (e.g., Hall, 1966), but never from an emotion communication perspective. It is important to note that research indicates that touch may be interpreted differently depending on one's culture (Field, 2001). Is this the case with the communication of emotion? These and other questions await the attention of researchers.

References

Banse, R., & Scherer, K. R. (1996). Acoustic profiles in vocal emotion expression. *Journal of Personality and Social Psychology, 70,* 614–636.

Barnett, K. (1972). A theoretical construct of the concepts of touch as they relate to nursing. *Nursing Research, 21,* 102–110.

Boccia, M. L. (1983). A functional analysis of social grooming patterns through direct comparison with self-grooming in rhesus monkeys. *International Journal of Primatology, 4,* 399–418.

Davidson, R. J., Scherer, K. R., & Goldsmith, H. H. (2003). *Handbook of affective sciences.* London: Oxford University Press.

de Waal, F. (1989). *Peacemaking among primates.* Cambridge, MA: Harvard University Press.

Eibl-Eibesfeldt, I. (1989). *Human ethology.* Hawthorne, NY: Aldine de Gruyter.

Eisenberg, N., Fabes, R. A., Miller, P. A., & Fultz, J. (1989). Relation of sympathy and personal distress to prosocial behavior: A multimethod study. *Journal of Personality and Social Psychology, 57,* 55–66.

Ekman, P. (1993). Facial expression and emotion. *American Psychologist, 48,* 384–392.

Elfenbein, H. A., & Ambady, N. (2002). On the universality and cultural specificity of emotion recognition: A meta-analysis. *Psychological Bulletin, 128,* 203–235.

Field, T. (2001). *Touch.* Cambridge, MA: MIT Press.

Frank, M. G., & Stennett, J. (2001). The forced-choice paradigm and the perception of facial expressions of emotion. *Journal of Personality and Social Psychology, 80,* 75–85.

Fridlund, A. J. (1997). The new ethology of human facial expressions. In J. A. Russell & J. M. Fernandez-Dols (Eds.), *The psychology of facial expression* (pp. 103–129). Cambridge, England: Cambridge University Press.

Geldard, F. A. (1960, May 27). Some neglected possibilities of communication. *Science, 131,* 1583–1588.

Gonzaga, G. C., Keltner, D., & Londahl, E. A. (2001). Love and the commitment problem in romantic relations and friendship. *Journal of Personality and Social Psychology, 81,* 247–262.

Hall, E. T. (1966). *The hidden dimension.* Garden City, NY: Anchor/Doubleday.

Hertenstein, M. J., & Campos, J. J. (2001). Emotion regulation via maternal touch. *Infancy, 2,* 549–566.

Hertenstein, M. J., Keltner, D., App, B., Bulleit, B. A., & Jaskolka, A. R. (2006). Touch communicates distinct emotions. *Emotion, 6,* 528–533.

Hertenstein, M. J., Verkamp, J. M., Kerestes, A. M., & Holmes, R. M. (2006). The communicative functions of touch in humans, nonhuman primates, and rats: A review and synthesis of the empirical research. *Genetic, Social, and General Psychology Monographs, 132,* 5–94.

Jones, S. E., & Yarbrough, A. E. (1985). A naturalistic study of the meanings of touch. *Communication Monographs, 52,* 19–56.

Juslin, P. N., & Laukka, P. (2003). Communication of emotions in vocal expression and music performance: Different channels, same code? *Psychological Bulletin, 129,* 770–814.

Keltner, D., & Buswell, B. N. (1997). Embarrassment: Its distinct form and appeasement functions. *Psychological Bulletin, 122,* 250–270.

Keltner, D., Horberg, E. J., & Oveis, C. (2006). Emotional intuitions and moral play. *Social Justice Research, 19,* 208–217.

Knapp, M. L., & Hall, J. A. (1997). *Nonverbal communication in human interaction* (4th ed.). Fort Worth, TX: Harcourt Brace College Publishers.

Lazarus, R. (1991). *Emotion and adaptation.* New York: Oxford University Press.

Scherer, K. R., Johnstone, T., & Klasmeyer, G. (2003). Vocal expression of emotion. In R. J. Davidson & H. H. Goldsmith (Eds.), *Handbook of affective sciences* (pp. 433–456). London: Oxford University Press.

Smoski, M. J., & Bachorowski, J. A. (2003). Antiphonal laughter between friends and strangers. *Cognition and Emotion, 17,* 327–340.

Sparks, J. (1967). Allogrooming in primates: A review. In D. Morris (Ed.), *Primate ethology* (pp. 148–175). Chicago: Aldine Publishing.

Stack, D. M. (2001). The salience of touch and physical contact during infancy: Unraveling some of the mysteries of the somesthetic sense. In G. Bremner & A. Fogel (Eds.), *Blackwell handbook of infant development* (pp. 351–378). Malden, MA: Blackwell.

Suomi, S. J. (1990). The role of tactile contact in rhesus monkey social development. In K. E. Barnard & T. B. Brazelton (Eds.), *Touch: The foundation of experience* (pp. 129–164). Madison, CT: International Universities Press.

Tracy, J. L., & Robins, R. W. (2004). Show your pride: Evidence for a discrete emotion expression. *Psychological Science, 15,* 94–97.

Weiss, S. J. (1992). Measurement of the sensory qualities in tactile interaction. *Nursing Research, 41,* 82–86.

Witherington, D. C., & Crichton, J. A. (2007). Frameworks for understanding emotions and their development: Functionalist and dynamic systems approaches. *Emotion, 7,* 628–637.