Applied Psychophysiology and Biofeedback, Vol. 31, No. 2, June 2006 (© 2006)
DOI: 10.1007/s10484-006-9008-4

The Effect of Emotional Distance on Psychophysiologic Concordance and Perceived Empathy Between Patient and Interviewer

Carl D. Marci[1,3] and Scott P. Orr[1,2]

Published online: 25 May 2006

This preliminary study investigated the effect of emotional distance on psychophysiologic concordance and perceived empathy in a clinical population. Participants included 20 adult outpatients from a mental health clinic that underwent a brief semi-structured interview with a trained psychiatrist in either an emotionally neutral or an emotionally distant condition. Simultaneous skin conductance (SC) levels of the patient and interviewer were recorded and used to calculate a measure of psychophysiologic concordance. Interviewer gaze was rated by an independent observer and used as a proxy indicator of emotional distance. Observer ratings of interviewer gaze, SC concordance, and patient ratings of perceived interviewer empathy were significantly lower in the emotionally distant condition compared with the emotionally neutral condition ($p < 0.05$). Results suggest that increased emotional distance is associated with decreased psychophysiologic concordance and reduced subjective ratings of perceived empathy. The observed differences in psychophysiologic concordance support the use of this measure as a potential marker of empathy in a clinical population in an interview setting.

KEYWORDS: empathy; emotional distance; skin conductance; psychophysiology; gaze.

INTRODUCTION

Empathy, simply defined as experiencing or feeling what another person is experiencing or feeling, is an important psychosocial construct that is critical for healthy social interaction (Bohart & Greenberg, 1997). Higher perceived clinician empathy has been implicated in improved patient satisfaction and increased health-related behaviors (Calia, 2004; Cape, 2001; Malin, Hemminki, Raeikkoenen, Sihvo, & Peraelae, 2001; Strug et al., 2003; van Dulmen & Bensing, 2002). In contrast, the absence of perceived empathy is one of the best predictors of poor outcomes in psychotherapy (Mohr, 1995) and has been

[1]Department of Psychiatry, Massachusetts General Hospital and Harvard Medical School, 15 Parkman Street WACC 812, Boston, Massachusetts 02114.
[2]Veterans Affairs Medical Center, Manchester, New Hampshire.
[3]Address all correspondence to Carl D. Marci, Director of Social Neuroscience, Department of Psychiatry, Massachusetts General Hospital, 15 Parkman Street, WACC 812, Boston, Massachusetts 02114; e-mail: cmarci@partners.org.

associated with increased rates of physician malpractice (Levinson, 1994). Despite its apparent clinical importance, relatively little is known about the psychophysiology of perceived empathy during a patient–clinician encounter.

Evolutionary psychologists have been interested in understanding the critical role of pro-social and altruistic behaviors such as empathy in the formation of sustainable human social structures (Brothers, 1989; Buck & Ginsburg, 1997). In addition, research into infant–mother interactions suggests that developing infants are predisposed to respond to and share the emotional states of their primary care-givers (Cohn & Tronick, 1988; Field, Healy, Goldstein, & Guthertz, 1990; Jaffe et al., 2001; Tronick, Brushweiler-Stern, Harrison, Lyons-Ruth, & al., 1998). More recently, neuroscientists have discovered "mirror" mechanisms in monkeys and humans that are implicated in the ability to take another's emotional perspective (Kohler, 2002; Miller, 2005; Singer et al., 2004). Given that emotional and attitudinal states have physiologic and neurobiologic bases (Cacioppo & Gardner, 1999; Cacioppo & Petty, 1981; Ochsner & Feldman Barrett, 2001), it seems logical that shared emotional and attitudinal states would also have shared physiologic and neurobiologic bases.

More direct evidence for a physiologic underpinning for empathy comes from studies of the vicarious experience of fear conditioning and research measuring psychophysiology during psychotherapy. For example, in a typical vicarious fear-conditioning experiment participants watch videotapes of the expressions of an actor receiving an electric shock (unconditioned stimulus) paired with a neutral non-threatening stimulus (conditioned stimulus) (Berber, 1962). After several trials of watching the paired stimuli, the observer develops a psychophysiologic reaction to the previously neutral stimulus despite never having received an electric shock – the so-called vicarious response. Vicarious fear-conditioning has been demonstrated with measures of skin conductance (SC) (Vaughan & Lanzetta, 1980) and heart rate (HR) (Craig, 1968; Craig & Lowery, 1969).

Other support for a shared physiology during empathy comes from psychotherapy research in which both patient and therapist are monitored for physiologic responses during therapy sessions. Early studies in the 1950s suggested that patients and therapists were highly reactive to each other producing physiologic responses that often varied together in "concordance" in some moments and oppositely in "discordance" during other moments throughout a psychotherapy session (Di Mascio, Boyd, Greenblatt, & Solomon, 1955; Lacey, 1959). Subsequent research produced similar results using different measures and study designs (Coleman, Greenblatt, & Solomon, 1956; Di Mascio, Boyd, & Greenblatt, 1957; McCarron & Appel, 1971; Stanek, Hahn, & Mayer, 1973). For example, a study by Robinson et al. observed a relationship between concurrent SC fluctuations and perceived empathy in sessions of counselor-client dyads (Robinson, Herman, & Kaplan, 1982) and a more recent study showed increased physiologic linkage in observers of a conflict discussion in married couples (Levenson & Ruef, 1992).

Given the importance of empathy in the patient–clinician relationship and prior research using psychophysiology during social interaction, the present study examined whether changing an interviewer's emotional distance from a patient could measurably influence the degree of psychophysiologic concordance and perceived empathy experienced during the interaction. A consistent demonstration of the relationship between these variables would have implications for objective measures for training and improving empathic relatedness in clinical practice.

For the purposes of the present study, emotional distance was controlled by the use of one of two interviewer response conditions. In the neutral response condition, the interviewer reacted to the verbal and emotional cues from the patient in a socially acceptable manner consistent with everyday patient–clinician interaction throughout a brief semi-structured interview. In contrast, in the emotionally distant response condition, the interviewer did not react to verbal or emotional cues and simply averted eye contact and constrained any nonverbal responses during a similarly structured interview. We hypothesized that the patient–interviewer interaction during the emotionally distant condition when compared with the emotionally neutral condition would produce significantly less psychophysiologic concordance and decreased patient perceived empathy.

METHODS

Participants

Participants included 20 outpatients from the Massachusetts General Hospital Department of Psychiatry Outpatient Division recruited as part of a larger study investigating the relationship between psychophysiologic concordance and empathy during psychotherapy (Marci, Ham, Moran, & Orr, 2006). Participants were eleven adult males and nine adult females between 21 and 65 years of age with various mood and anxiety disorders who had been seeing their present therapist for more than four sessions. Participants were assessed by the clinician of record for eligibility and not included in the study if they showed evidence of active psychosis, homicidal or suicidal ideation, active substance abuse, or significant character pathology that might interfere with their ability to accurately assess empathic relatedness during a social interaction. The first author, a staff psychiatrist skilled in the practice of psychotherapy, served as the interviewer throughout the study, and was previously unknown to the patient participants. All participants were blinded to the goals of the interview. The study was approved by the Massachusetts General Hospital Human Subjects Committee and informed consent was obtained from all participants prior to the initiation of study procedures.

Procedures

The study consisted of a brief semi-structured question and answer session in which the interviewer asked participants scripted questions about the local weather over the past year. This interview lasted approximately 5–10 min and took place prior to the participants' regularly scheduled psychotherapy session that was part of the larger study referred to above. Participants were divided into one of two conditions: emotionally neutral and emotionally distant. Note that in this preliminary investigation, patients were not randomized due to the ad hoc nature of the study design as an adjunct to the larger psychotherapy study. All participants were informed that they were going to have a brief interview prior to their regularly scheduled psychotherapy in order to measure their baseline physiology and test the equipment.

The first ten participants were in the emotionally neutral condition ($n = 10$), during which the interviewer read scripted questions in an emotionally neutral manner, attended to the emotional and verbal content of the participants' responses to questions, and gave nonverbal responses in a socially and clinically acceptable manner (e.g. mutual eye gaze, head nodding). The second ten participants were in the emotionally distant condition ($n = 10$), during which the interviewer read the same scripted questions in an emotionally neutral manner. However, in the emotionally distant condition the interviewer did not acknowledge the emotional and verbal content of the participants' responses and made a conscious effort to minimize the use of socially affirming nonverbal responses (e.g. mutual eye gaze, head nodding). Instead, the interviewer used a self-distraction technique that focused on controlled breathing and made a conscious effort to minimize eye contact and nonverbal responses to the participant throughout the brief interview.

The brief interview consisted of a semi-structured interaction utilizing a scripted questionnaire about the local weather that was created for this study (script available upon request). A scripted interview was used to eliminate the interviewer's verbal content as a confounding variable across participants while the local weather was chosen as a topic to minimize emotional intensity and patient bias. A sample question from the script includes, "How do you think the weather today compares to the weather yesterday?" The interviewer deviated from the script only when the patient participant gave a one word response to a question (e.g., "fine"), in which case the interviewer would routinely ask, "Can you say more about that?" The brief duration of the interaction was chosen to reflect the brief nature of modern primary care clinical encounters (Mechanic, McAlpine, & Rosenthal, 2001).

Following the interview, the respective therapist for the patient would enter the room and take the place of the interviewer for a regularly scheduled psychotherapy session. The psychotherapy session also included continuous monitoring of SC levels from both the patient and therapist. Digital audio-video recordings from a single camera at a wide angle setting were obtained for all interactions to capture both patient and interviewer for the purposes of observer behavior coding of interviewer gaze (Sony Digital 8 DCR-TRV510, Sony Corporation of America, New York, NY).

Interviewer Gaze

Interviewer gaze was assessed as an objective nonverbal proxy indicator of emotional distance for comparison of interviewer behavior in the emotionally neutral versus the emotionally distant condition (de Roten, Fivaz-Depeursinge, Stern, Darwish, & Corboz-Warnery, 2000; Kleinke, Staneski, & Berger, 1975). Interviewer gaze was assessed by an independent observer blinded to the goals of the study who reviewed the digital video recordings of the interviews in a random order with the sound off. The observer coded the interviewer gaze continuously from the video marking every second in a computer database in a binary "yes" versus "no" scale as either gaze positive (i.e., interviewer looking in the direction of the face of the participant) or gaze negative (i.e., interviewer looking away from the face of the participant). The observer was encouraged to review the videotapes multiple times using the slow motion feature that advances the video frame by frame. In order to enhance reliability, spot adherence checks of five randomly chosen videos were made by an additional observer following the same procedures. The additional observer was also blind to the goals of the study.

Psychophysiologic Measures

Simultaneous measures of SC level were obtained from both the interviewer and the patient participants. Skin conductance, which reflects the ability of the skin to conduct electrical current, is a commonly used measure of psychophysiologic arousal (Hugdahl, 1995). This measure was chosen because of its use in prior studies of psychophysiology in social interaction as reviewed above. Continuous SC level was collected and analyzed using an ADInstruments PowerLab 8SP computer based modular instrument system and Chart Software Version 4.2 (ADInstruments, Sydney, Australia). For convenience, dry Ag-AgCl electrodes were used to measure SC level from the distal palmer surface of the third and fourth digits of each individual's non-dominant hand.

Following data collection and calculation of mean and standard deviation for interviewer and patient participant, the continuous SC levels from the patient–interviewer interactions and the patient–therapist sessions were used to calculate a measure of psychophysiologic concordance developed for this study. As a first step, a smoothing function using a 1.5 sec Bartlett window was applied to the continuously recorded SC level values (Oppenheim & Schafer, 1999). Next, the average slope of the SC level within a moving 5-second window was determined. Thus, after calculating the first 5-second slope value, the window moved forward one second and the next 5-second slope value calculated, thereby producing successive 5-second SC slope values at 1-second increments. Slope was chosen as the index of SC activity because the rate of change in SC level (as an indicator of physiologic arousal) was of primary interest and was expected to be a better determinant of psychophysiologic concordance between interacting individuals than individual discrete peaks or absolute SC level. Individual peaks and absolute SC level tend to show idiosyncratic drift over time and response amplitude and frequency can vary considerably from person to person (Hugdahl, 1995).

Pearson correlations with lag-zero were then calculated over successive, running 15-second windows (corresponding to 15 slope averages) between time-locked patient and interviewer SC slope values. Finally, a single session index was calculated from the ratio of the sum of the positive correlations across the entire interview divided by the sum of the absolute value of negative correlations across the interview. Because of the skew inherent in ratios, a final natural logarithmic transformation of the resulting index was calculated. Thus, an index value of zero reflects equal positive and negative correlations or balanced concordance for the interaction. Concomitantly, a value greater than zero reflects relatively more positive SC concordance over time while a value less than zero reflects relatively more negative SC concordance over time.

Empathic Understanding

Immediately following the interview, participants completed a modified version of the Barrett–Lennard Relationship Inventory Empathic Understanding Sub-scale (EUS) with specific reference to the interviewer during the scripted weather conversation. The EUS is a clincally validated paper-and-pencil questionnaire with 16 items designed to assess patient perception of clinician empathy during psychotherapy (Barrett-Lennard, 1962). The empathy scale was modified to allow assessment of the participants' perception of their empathic experience of the interviewer during the semi-structured question and answer session. Thus, in the modified version, “my therapist” was replaced by “the interviewer.” A sample question from the modified EUS is, “The interviewer was interested in knowing what my experiences meant to me.” Each question uses a scale ranging from +3 (strongly agree) to −3 (strongly disagree). The EUS is a forced choice questionnaire and offers only non-zero options. Total scores can range from −48 to +48 with higher scores indicating greater perceived empathic understanding. In addition, as part of the larger study assessing therapist empathy referred to above, participants completed the unmodified version of the EUS immediately following their full-length psychotherapy session. Participants were told to rate their therapists’ empathy specifically for the study session only.

RESULTS

Because of the relatively small sample size of this pilot study, traditional significance testing was supplemented by calculations of effect sizes (Cohen, 1988). The results presented below show mostly moderate to large effects for statistically significant calculations (Cohen’s $d > 0.5$) and relatively small effect sizes (Cohen’s $d < 0.3$) for non-significant results. All comparisons are two-tailed.

Table I shows a summary of participant demographic variables for the emotionally neutral and emotionally distant conditions. Because the study was not randomized, comparisons were made for all available variables for two conditions. There were no significant differences in the emotionally neutral versus emotionally distant conditions for participant mean age ($t = 0.60$; $p = 0.55$); time in psychotherapy ($t = 0.77$, $p = 0.68$); psychophysiologic concordance during a subsequent psychotherapy session ($t = 0.78$, $p = 0.79$); patient ratings of perceived therapist empathy during the subsequent psychotherapy session ($t = 0.43$, $p = 0.68$); or length of interview ($t = 0.25$, $p = 0.88$). Note that concordance and empathy scores for the subsequent therapy sessions are included due to lack of randomization and to support the findings of the current study were due to the experimental manipulation rather than a trait of the patient participants.

In addition, because the study was not gender balanced, comparisons between female and male participants were made to test for gender effects. There were 5 male adults in the emotionally neutral and 6 male adults in the emotionally distant conditions. In comparison, there were 5 female adults in the emotionally neutral and 4 female adults in the emotionally distant conditions. There were no significant differences between the distribution of male

Table I. Comparison of Patient Variables for Emotionally Neutral versus Emotionally Distant Conditions

Variable	Emotionally neutral ± *SD*	Emotionally distant ± *SD*	*p*-value	Effect size
Age (years)	36.3 ± 8.6	39.4 ± 13.7	0.55	0.27
Time in psychotherapy (number of sessions)	82.3 ± 66.6	90.8 ± 64.4	0.68	0.13
Physiologic concordance with therapist	0.45 ± 0.25	0.43 ± 0.23	0.79	0.08
Perceived empathy with therapist	24.8 ± 9.7	26.4 ± 6.9	0.78	0.19
Length of interview (min:sec)	6.22 ± 0.06	6.16 ± 0.05	0.881	0.21

Note: SD = standard deviation.

and female patients in the two conditions ($\chi^2 = 0.20$, $p = 0.65$). In addition, there were no differences between female and male participants in age ($t = 1.45$, $p = 0.16$), duration of interviewer gaze ($t = 0.03$, $p = 0.98$), psychophysiologic concordance ($t = 0.23$, $p = 0.83$), or empathy ratings ($t = 0.15$, $p = 0.90$).

Finally, there were 7 patients in the emotionally neutral versus 8 patients in the emotionally distant conditions with a mood disorder compared with 3 patients in the emotionally neutral versus 2 patients in the emotionally distant conditions with an anxiety disorder. Again, there was no significant difference in the two conditions in the distribution of mood versus anxiety disorders ($\chi^2 = 0.27$, $p = 0.61$). Of note, 17 of the 20 twenty participants were on psychotropic medications (9 in the emotionally neutral and 8 in the emotionally distant conditions). The most common medication was a selective-serotonin reuptake inhibitor.

Interviewer Gaze

As a check on the reliability of the primary observer's gaze ratings, a second rater viewed and scored a subset ($n = 5$) of the videotaped interviewer–patient interactions. The inter-rater reliability of this subset of gaze ratings was very high ($\kappa = 0.88$). Ratings of the primary observer confirmed that there was a significant difference in the duration of interviewer gaze between the two conditions. The mean duration of interviewer gaze in the direction of the participant for the emotionally neutral condition was 62.6 sec ($SD = 58.9$) while in the emotionally distant condition the duration was 11.8 sec ($SD = 20.6$; $t = 2.56$, $p = 0.026$; Table II). Figure 1A shows the 95% confidence intervals for the mean interviewer gaze in the emotionally neutral versus distant conditions.

Physiologic Concordance

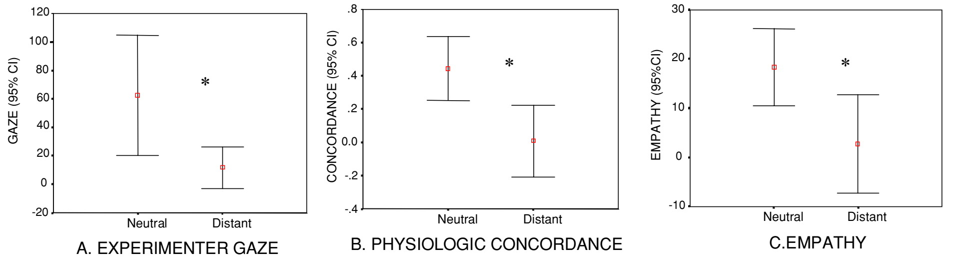
There were no differences in the mean SC for the interviewer in the emotionally neutral condition (mean = 7.97; $SD = 5.11$) versus the emotionally distant condition (mean = 10.26; $SD = 6.61$; $t = 0.87$, $p = 0.397$). The same was true for patient participant mean SC in the emotionally neutral condition (mean = 9.67; $SD = 5.52$) versus the emotionally distant condition (mean = 7.17; $SD = 3.49$; $t = 1.21$, $p = 0.242$).

In contrast, the psychophysiologic concordance score for the emotionally neutral condition was 0.44 ($SD = 0.27$). This was significantly higher than the score for the emotionally

Table II. Comparison of Variables for Emotionally Neutral versus Emotionally Distant Conditions

Variable	Emotionally neutral ± *SD*	Emotionally distant ± *SD*	*p*-value	Effect size
Interviewer gaze (number of seconds)	62.6 ± 58.9	11.8 ± 20.6	0.026*	1.15
Physiologic concordance with interviewer	0.44 ± 0.27	0.01 ± 0.30	0.003*	1.51
Perceived empathy with interviewer	18.3 ± 10.9	2.7 ± 13.9	0.012*	1.24

Note: SD = standard deviation.
*Statistically significant.

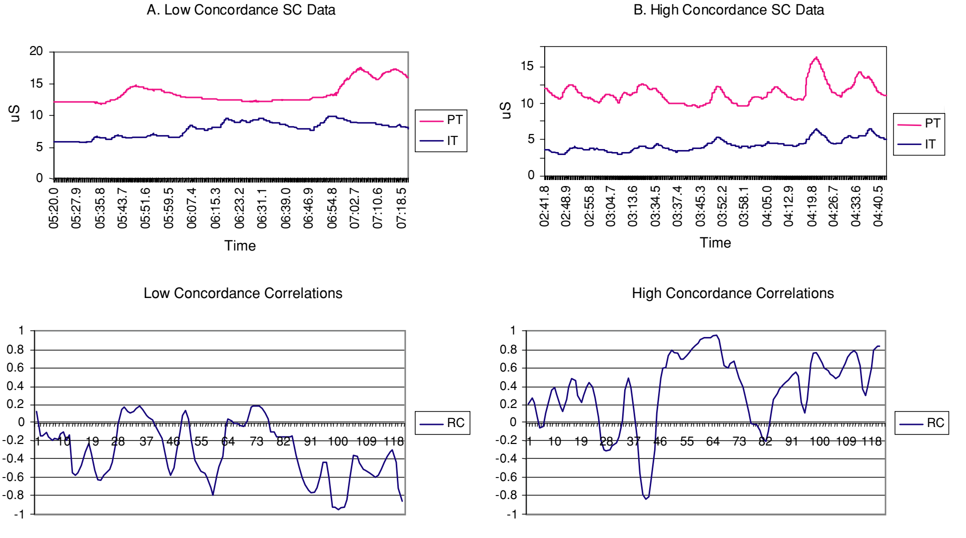


CI = Confidence Intervals, *p < 0.05.

Fig. 1. Mean experimenter gaze, physiologic concordance and empathy in emotionally neutral versus emotionally distant interactions.

distant condition of 0.01 ($SD = 0.30$; $t = 3.41$, $p = 0.003$; Table II). Figure 1B shows the 95% confidence intervals for the mean psychophysiologic concordance score in the emotionally neutral versus emotionally distant conditions.

For the purpose of illustrating the concept of psychophysiologic concordance, Fig. 2 shows examples of low (2A) and high (2B) two-minute segments of SC concordance from two different patient–interviewer dyads. The low example is from the emotionally distant condition and the high example is from the emotionally neutral condition. The raw SC levels are adjusted to fit the graph. In each example, the patient SC levels are in the upper data series and the interviewer SC levels are in the lower data series. Below each segment of SC data is a graph of the corresponding running SC correlations for the low and high concordance examples, respectively (Fig. 2).



PT = Patient Subject, IT = Interviewer, RC = Running Correlation

Fig. 2. Moments of low (A) and high (B) patient–interviewer skin conductance data (top) with corresponding physiologic concordance correlations (bottom).

Empathic Understanding

The emotionally neutral condition produced a mean patient rating of interviewer empathy on the EUS of 18.3 ($SD = 10.9$). The mean EUS score for the emotionally distant condition was 2.7 ($SD = 13.9$). The difference was statistically significant ($t = 2.79$, $p = 0.012$). Figure 1C shows the 95% confidence intervals for the mean empathy ratings in the emotionally neutral versus distant conditions.

DISCUSSION

The results of this preliminary study suggest that a clinician-interviewer's avoidant gaze and failure to nonverbally affirm comments made by a patient influence a measure of psychophysiologic concordance and patient ratings of perceived empathy during a brief semi-structured interview. Despite several limitations in the study design, the findings reveal significantly lower psychophysiologic concordance and lower subjective ratings of interviewer empathy when the interviewer behaved in an emotionally distant, compared to an emotionally neutral, manner. The observed differences in psychophysiologic concordance support the use of this measure as a potential marker of empathy in a clinical population in an interview setting.

The present results are consistent with those obtained from prior research on psychophysiologic concordance during clinical interviews (Coleman et al., 1956; Di Mascio et al., 1957; Robinson et al., 1982; Roessler, Bruch, Thum, & Collins, 1975). Interestingly, in contrast to the relationship to empathy that we report, a commonly referenced study of dissatisfied married couples found that psychophysiologic linkage can also be a marker for highly negative affective states and later marriage dissolution (Levenson & Gottman, 1983, 1985). In the present study, averting interviewer gaze—an act that could be perceived as socially hostile—led to decreased physiologic concordance. In the Levenson and Gottman (1983) study, an index of psychophysiologic linkage combining SC, HR, and motion from male and female married partners was greater for unsatisfied couples than for more satisfied couples as measured during a conflict discussion. There are several possible explanations for these seemingly disparate results including the significant difference in the study measures, populations, and the context in which they were studied (i.e., married couples in need of counseling in conflict versus patient–clinician during an emotionally neutral interview).

Another possible explanation for the seemingly disparate results is the use of different techniques for analyzing the time-series data. For example, in addition to using a smaller window size, the approach taken in the present study did not control for possible autocorrelation. Autocorrelation refers to the predictability of recent past responses from proximal future responses (Crosbie, 1995). The argument in favor of controlling for autocorrelation includes the reasoning that participants who have innately high autocorrelation are more likely to show higher correlations with other individuals in part due to the increased frequency of their responses. A higher response frequency may artificially increase the probability of a concordant response with another person and increases the risk of type I error. However, Robinson et al. (1982), using an SC peak counting method, suggested that "effort" on the part of the therapist might also produce a higher frequency of autocorrelated responses. They cautioned against correcting for autocorrelation arguing that "effort," as measured by response frequency, may actually be a significant factor for the development of an empathic relationship. Robinson et al. (1982) advocated for a quantification process that accurately reflected all SC responses.

In a comparison of statistical strategies for analyzing time-series data from socio-behavioral interactions, Warner (1992) concluded that autocorrelation may contain useful information and suggested, as did Robinson et al. (1982), that autocorrelation might be useful in predicting affect in intimate dyads (e.g. romantic couples or mother–infant dyads). Consistent with this position, the scoring algorithm used in the present study did not attempt to correct for autocorrelation. Moreover, by using a narrow 5-second window and a running correlation of the slope, the present scoring algorithm takes maximal advantage of all available SC data rather than focusing on short segments (e.g., Malmo, 1957), individual peaks (e.g., Robinson et al., 1982), or a larger 10-second non-overlapping window (e.g., Levenson & Gottman, 1983) as in prior studies. While the present time-series approach runs the risk of increased type I error, the present study supports and builds on prior literature over several decades of dyadic interaction. In contrast, the approach of Levenson and Gottman (1983), which controls for autocorrelation and combines SC with measures of HR and motion, to our knowledge has never been replicated.

The present approach to measuring physiologic concordance was designed to increase the sensitivity and flexibility of a biologically based scoring algorithm for social interactions. As measured in the present study, physiologic concordance reflects the time-locked ebb and flow in sympathetic arousal over the course of the brief semi-structured interview between the patient and the interviewer. Given the nature of the present algorithm, it is possible to speculate that during moments of high physiologic concordance in the emotionally neutral condition, there are more shared internal and external cognitive and emotional representations between the patient and the interviewer resulting in a more synchronous pattern of arousal. In contrast, during moments of low physiologic concordance in the emotionally distant condition, the cognitive and emotional stimuli are discrete, dissimilar, and more idiosyncratic resulting in more discordant changes in SC levels. These patterns are represented in Fig. 2A and B, respectively, and may be a physiologic manifestation of recently reported "shared representational networks" involving the prefrontal and inferior parietal cortices (Decety & Chaminade, 2003). It is also important to note, that while the present study included patients on selective-serotonin reuptake inhibitors (SSRI), the focus of the present algorithm on the first derivative of the raw SC values limits any possible influence of the known reduced overall SC level (without a reduction in SC response) with SSRI use (Siepmann, Grossmann, Muck-Weymann, & Kirch, 2003; Thorell, Kjellman, & d'Elia, 1987) or the reductions in SC level and responsiveness associated with depression (Thorell, Kjellman, & D'Elia, 1987).

The results of the present study indicate that perceived empathy and physiologic concordance could be significantly reduced with a simple shift in gaze and attention. This shift in gaze and attention is not unlike being distracted during a clinical interview such as when a clinician pauses to review a test result or consider a differential diagnosis while the patient is still talking. Short office visits, increased numbers of patients, and the multitude of distractions in modern health care are proposed as having a negative impact on the ability of clinicians to be empathic with their patients (Arnetz, 2001). Given the importance of empathy in the clinical encounter and the malleability of empathic perception demonstrated by these results, additional studies designed to understand the physiologic nature of empathic perception are warranted. Furthermore, if empathy can be successfully decreased in the context of a patient–clinician interview, it is likely that it can also be increased. Several studies support the possibility of improved empathic awareness following targeted training (Hammond, Hepworth, & Smith, 2002; Nerdrum, 1997). Thus, it is possible that the present methodology, once validated, could be used in conjunction with didactic interactions to enhance training in empathic awareness for all health care professionals.

The present study has several limitations including non-randomization to the two emotional response conditions, the use of a single interviewer in a semi-structured non-clinical conversation, the use of a single proxy behavioral indicator of complex non-verbal communication, and a novel approach to the calculation of psychophysiologic concordance. These limitations can be readily addressed in future work by randomly assigning patients to experimental conditions as they enroll in the study, by including additional interviewers in more realistic clinical settings, and by adding additional observer measures of empathy. Consideration should also be given to the duration of the interaction and the inclusion of female interviewers and gender balance of patients in order to assess whether duration or interviewer and patient gender moderate the effects of emotional distance. Additional studies comparing alternative time-series algorithms for calculating physiologic concordance, including models that control for autocorrelation, are needed. Finally, future analyses examining whether increased perceived empathy is associated with increased physiologic concordance during a live clinical intervention are underway (Marci, Ham, Moran, & Orr, 2006).

Despite these limitations, it can be argued that using psychophysiology as an index of empathic connection, following further validation, offers several advantages over current approaches. First, the measures are biologically based and free of the self-report and observer bias found in most empathy research tools (Benbassat & Baumal, 2004). Second, because SC is uniquely regulated by the sympathetic branch of the autonomic nervous system, it is not directly influenced or confounded by parasympathetic and other neuro-hormonal influences, thereby helping to simplify interpretive models (Lidberg & Wallin, 1981). Third, the technology used to collect psychophysiology is relatively inexpensive compared with neuroimaging modalities, while new sensor technologies that are minimally intrusive are increasingly available allowing for continuous measurement of social interactions in a variety of clinical settings (Sung, Marci, & Pentland, 2005). Finally, there is growing understanding of the neurobiological mechanisms that control SC responses (Critchley, Elliott, Mathias, & Dolan, 2000; Fredrickson et al., 1998; Patterson, Ungerleider, & Bandettini, 2002). This increased understanding, when combined with other neuroimaging research on empathy (Carr, Iacoboni, Dubeau, Mazziotta, & Lenzi, 2003; Farrow et al., 2001; Singer et al., 2004), and evidence for physiologic concordance during social interaction suggested by the present study, offers exciting opportunities to build clinically applicable models of empathic awareness.

ACKNOWLEDGMENTS

Funding for this project comes from NIMH F32MH072073–01 and an unrestricted grant from the Massachusetts General Hospital Endowment for the Advancement of Psychotherapy.

REFERENCES

Arnetz, B. B. (2001). Psychosocial challenges facing physicians of today. *Social Science and Medicine*, *52,* 203–213.

Barrett-Lennard, G. T. (1962). Dimensions of therapist response as causal factors in therapeutic change. *Psychological Monographs: General and Applied*, *76*(43), 1–36.

Benbassat, J., & Baumal, R. (2004). What is empathy and how can it be promoted during clinical clerkships? *Academic Medicine*, *79*(9), 832–839.

Berber, S. M. (1962). Conditioning through vicarious instigation. *Psychological Review*, *9*(5), 450–466.

Bohart, A. C., & Greenberg, L. S. (1997). Empathy and psychotherapy: An Introductory overview. In L. S. Greenberg (Ed.), *Empathy reconsidered: New directions for psychotherapy* (pp. 3–31). Washington, DC: American Psychological Association.

Brothers, L. (1989). A biological perspective on empathy. *American Journal of Psychiatry*, *146*(1), 10–19.

Buck, R., & Ginsburg, B. (1997). Communicative genes and the evolution of empathy. In W. J. Ickes (Ed.), *Empathic accuracy* (pp. 17–43). New York, NY: Guilford Press.

Cacioppo, J. T., & Gardner, W. L. (1999). Emotion. *Annual Review of Psychology*, *50,* 191–214.

Cacioppo, J. T., & Petty, R. E. (1981). Attitudes and cognitive response: An electrophysiologic approach. *Journal of Personality and Social Psychology*, *37,* 2181–2199.

Calia, R. (2004). 'Only connect': The centrality of doctor-patient relationships in primary care. *Family Practice*, *21*(3), 232–233.

Cape, J. (2001). Patient-rated therapeutic relationship and outcome in general practitioner treatment of psychological problems. *British Journal of Clinical Psychology*, *39*(4), 383–395.

Carr, L., Iacoboni, M., Dubeau, M., 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 Science*, *100*(9), 5497–5502.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum Associates.

Cohn, J. F., & Tronick, E. Z. (1988). Mother-infant face-to-face interaction: Influence is bidirectional and unrelated to periodic cycles in either partner's behavior. *Developmental Psychology*, *24*(3), 386–392.

Coleman, R., Greenblatt, M., & Solomon, H. C. (1956). Physiolgical evidence of rapport during psychotherapeutic interviews. *Diseases of the Nervous System*, *17,* 71–77.

Craig, K. D. (1968). Physiologic arousal as a function imagined, vicarious, and direct stress experiences. *Journal of Abnormal Psychology*, *73,* 513–520.

Craig, K. D., & Lowery, H. J. (1969). Heart-rate components of conditioned vicarious affective arousal. *Journal of Personality and Social Psychology*, *11,* 381–387.

Critchley, H. D., Elliott, R., Mathias, C. J., & Dolan, R. J. (2000). Neural activity relating to generation and representation of galvanic skin conductance responses: A functional magnetic resonance imaging study. *Journal of Neuroscience*, *20*(8), 3033–3040.

Crosbie, J. (1995). Interrupted time-series analysis with short series: Why it is problematic; how it can be improved. In J. M. Gottman (Ed.), *The analysis of change* (pp. 361–395). Mahwah, NJ: Lawrence Erlbaum Associates.

de Roten, Y., Fivaz-Depeursinge, E., Stern, D. J., Darwish, J., & Corboz-Warnery, A. (2000). Body and gaze formations and the communicational alliance in couple-therapist triads. *Psychotherapy Research*, *10*(1), 30–46.

Decety, J., & Chaminade, T. (2003). Neural correlates of feeling sympathy. *Neuropsychologia*, *41,* 127–138.

Di Mascio, A., Boyd, R. W., & Greenblatt, M. (1957). Physiological correlates of tension and antagonism during psychotherapy: A study of "interpersonal change". *Psychosomatic Medicine*, *19*(2), 99–104.

Di Mascio, A., Boyd, R. W., Greenblatt, M., & Solomon, H. C. (1955). The psychiatric interview: A sociophysiologic study. *Diseases of the Nervous System*, *16,* 4–9.

Farrow, T., Zheng, Y., Wilkinson, I., Spence, S., Deakin, J., Tarrier, N., et al. (2001). Investigating the functional anatomy of empathy and forgiveness. *Neuroreport*, *12,* 2433–2438.

Field, T., Healy, B., Goldstein, S., & Guthertz, M. (1990). Behavior-state matching and synchrony in mother-infant interactions of nondepressed versus depressed dyads. *Developmental Psychology*, *26*(1), 7–14.

Fredrickson, M., Furmark, T., Olsson, M. T., Fischer, H., Andersson, J., & Langstrom, B. (1998). Functional neuratomical correlates of electrodermal activity: A positron emission tomographic study. *Psychophysiology*, *35,* 179–185.

Hammond, D. C., Hepworth, D. H., & Smith, V. G. (2002). Improving therapeutic communication: A guide for developing effective techniques. San Francisco.

Hugdahl, K. (1995). Electrodermal activity. In K. Hugdahl (Ed.), *Psychophysiology: The mind-body perspective* (pp. 101–130). Cambridge, MA: Harvard University Press.

Jaffe, J., Beebe, B., Feldstein, S., Crown, C. L., Jasnow, M., Rochat, P., et al. (2001). Rhythms of dialogue in infancy. *Monographs of the Society for Research In Child Development*, *66*(2), 1–148.

Kleinke, C. L., Staneski, R. A., & Berger, D. E. (1975). Evaluation of an interviewer as a function of interview gaze, reinforcement of subject gaze, and interviewer attractiveness. *Journal of Personality and Social Psychology*, *31,* 115–122.

Kohler, E. (2002). Hearing sounds, understanding actions: Action representation in mirror neurons. *Science*, *297,* 846–848.

Lacey, J. I. (1959). Psychophysiological approaches to the evaluation of pscyhotherapeutic process and outcome. In E. A. Rubinstein & M. B. Parloff (Eds.), *Research in psychotherapy* (pp. 160–208). Washington, DC: National Publishing Co.

Levenson, R. W., & Gottman, J. M. (1983). Marital interaction: physiological linkage and affective exchange. *Journal of Personality and Social Psychology*, *45*(3), 587–597.

Levenson, R. W., & Gottman, J. M. (1985). Physiological and affective predictors of change in relationship satisfaction. *Journal of Personality and Social Psychology*, *49*(1), 85–94.

Levenson, R. W., & Ruef, A. M. (1992). Empathy: A physiological substrate. *Journal of Personality and Social Psychology*, *63*(2), 234–246.

Levinson, W. (1994). Physician–patient communication: A key to malpractice prevention. *Journal of the American Medical Association*, *272,* 1619–1620.

Lidberg, L., & Wallin, B. G. (1981). Sympathetic nerve discharges in relation to amplitude of skin resistance responses. *Psychophysiology*, *18,* 268–270.

Malin, M., Hemminki, E., Raeikkoenen, O., Sihvo, S., & Peraelae, M. L. (2001). What do women want? Women's experiences of infertility treatment. *Social Science and Medicine*, *53*(1), 123–133.

Marci, C. D., Ham, J., Moran, E. K., & Orr, S. P. (2006). Physiologic correlates of empathy and social-emotional process during psychotherapy. Manuscript in preparation.

McCarron, L. T., & Appel, V. H. (1971). Categories of therapist verbalizations and patient-therapist autonomic response. *Journal of Consulting and Clinical Psychology*, *37*(1), 123–134.

Mechanic, D., McAlpine, D. D., & Rosenthal, M. (2001). Are patient's office visits with physicians getting shorter? *New England Journal of Medicine*, *344*(3), 198–204.

Miller, G. (2005). Reflecting on another's mind: Mirror mechanisms built into the brain may help us understand each other. *Science*, *308,* 945–947.

Mohr, D. (1995). Negative outcome in psychotherapy: A critical review. *Clinical Psychology: Science and Practice*, *2,* 1–27.

Nerdrum, P. (1997). Maintenance of the effect of training in communication skills: A controlled follow-up study of level of communicated empathy. *British Journal of Social Work*, *27*(5), 705–722.

Ochsner, K. N., & Feldman Barrett, L. (2001). A multiprocess perspective on the neuroscience of emotion. In G. A. Bonanno (Ed.), *Emotions: Current issues and future directions* (pp. 38–81). New York, NY: Guilford Press.

Oppenheim, A. V., & Schafer, R. W. (1999). *Discrete-time signal processing*. Upper Saddle River, NJ: Prentice-Hall.

Patterson, J. C., Ungerleider, L. G., & Bandettini, P. A. (2002). Task-independent functional brain activity correlation with skin conductance changes: An fMRI study. *Neuroimage*, *17,* 1797–1806.

Robinson, J. W., Herman, A., & Kaplan, B. J. (1982). Autonomic responses correlate with counselor-client empathy. *Journal of Counseling Psychology*, *29*(2), 195–198.

Roessler, R., Bruch, H., Thum, L., & Collins, F. (1975). Physiologic correlates of affect during psychotherapy. *American Journal of Psychotherapy*, *29,* 26–36.

Siepmann, M., Grossmann, J., Muck-Weymann, M., & Kirch, W. (2003). Effects of sertraline on autonomic and cognitive functions in healthy volunteers. *Psychopharmacology*, *168*(3), 293–298.

Singer, T., Seymour, B., O'Doherty, J., Kaube, H., Dolan, R. J., & Frith, C. D. (2004). Empathy for pain involves the affective but not the sensory componenets of pain. *Science*, *303,* 1157–1161.

Stanek, B., Hahn, P., & Mayer, H. (1973). Biometric findings on cardiac neurosis: Changes in ECG and heart rate in cardiopathic patients and their doctor during psychoanalytical initial interviews. *Psychotherapy and Psychosomatics*, *22,* 289–299.

Strug, D., Ottman, R., Kaye, J., Saltzberg, S., Walker, J., & Mendez, H. (2003). Client satisfaction and staff empathy at pediatric HIV/AIDS programs. *Journal of Social Service Research*, *29*(4), 1–22.

Sung, M., Marci, C. D., & Pentland, A. (2005). Wearable feedback systems for rehabilitation. *Journal of Neuro-Engineering and Rehabilitation*, *2,* 2–17.

Thorell, L. H., Kjellman, B., & D'Elia, G. (1987). Electrodermal activity in relation to diagnostic subgroups and symptoms of depressive patients. *Acta Psychiatrica Scandinavica*, *76*(6), 693–701.

Thorell, L. H., Kjellman, B. F., & d'Elia, G. (1987). Electrodermal activity in antidepressant medicated and unmedicated depressive patients and in matched healthy subjects. *Acta Psychiatrica Scandinavica*, *76,* 684–692.

Tronick, E. Z., Brushweiler-Stern, N., Harrison, A. M., Lyons-Ruth, K., et al. (1998). Dyadically expanded states of consciousness and the process of therapeutic change. *Infant Mental Health Journal*, *19*(3), 290–299.

van Dulmen, A. M., & Bensing, J. M. (2002). Health promoting effects of the physician–patient encounter. *Psychology, Health and Medicine*, *7*(3), 289–300.

Vaughan, K. B., & Lanzetta, J. T. (1980). Vicarious instigation and conditioning of facial expressive and autonomic responses to a model's expressive delay of pain. *Journal of Personality and Social Psychology*, *38*(6), 909–923.